DESIGN AND CONSTRUCTION SUPPORT DATA FOR CONSERVATION PRACTICES

The requirements for support data listed in this supplement are the minimum needed to document design and application for most engineering practices. The support data is to be recorded and filed in accordance with NRCS policy. Design, and construction checks are to be done within the scope and technical limits established by the National Engineering Manual (NEM), Engineering Field Handbook (EFH), National Engineering Handbooks (NEH), Agricultural Waste Management Field Handbook (AWMFH) and the practice standards contained in the Field Office Technical Guide (FOTG).

If an installation is contemplated that does not seem to fit any existing WV practice standard, the State Conservation Engineer must be consulted for criteria and approval of the design.

INDEX

All Practices

All necessary support data will be filed in the cooperators file, with the participant referral, or in the conservation practice design file.

I n all cases, the practice standard is the criteria for planning, design, and installation of the measure. Drawings and/or specifications may not lessen the requirements of the standard.

Designs and construction checks shall be signed by persons with the appropriate approval authority. The proper job approval classification for the practice shall be shown on each set of drawings.

All designs will be checked by a person other than the person that completed the design, except that in single person Field Offices, practice designs which do not involve design calculations, other than quantity calculations, can be checked by the same person (ex. a spring development with pipeline and trough where minimum sizes are used and pipeline sizing calculations are not required). Under these conditions, the person that did the design can also check the design. The design should be laid aside for a day or two and then checked if possible.

An SCS-ENG-6 form shall be completed for every engineering practice designed. Installations that are known or suspected to involve public utilities shall have utility check form SCS-ENG-S completed before any ground disturbance or excavation takes place. The utility notification form WV-ENG-46, or the information contained on form WV-ENG-46, shall be placed on the front sheet of all construction drawings regardless of the existence of utilities.

When practices are installed in a system (EX. Spring Development, Pipeline, and Trough) documentation requirements listed in this supplement will be met for all of the practices in the system. The Job Approval class will be established for the system based on the most limiting practice.

A. Field Data

Field surveys shall be conducted in accordance with Technical Release 62 and/or EFH Chapter 1. Survey data shall be recorded on forms SCS-ENG-28 and SCS-ENG-29, on design forms for the practice, or in electronic survey files (see NEM Part 540). All survey notes will include:

1. Landowner and practice identification data and location sketch with adequate information to locate the property within the county and the practice within the boundaries of the property.

PREPARATION OF ENGINEERING PLANS

2. Location of all natural and manmade features, including known utilities, either in the sketch in 1. above or within the survey notes.

3. Survey party members, their function on the party (i.e. instrument, notekeeper, rodman, or chain), and the date.

4. Benchmark descriptions and elevations, and horizontal control reference point descriptions.

Centerlines and baselines will be staked beyond the limits of anticipated construction or they will be referenced to at least two permanent horizontal reference points to permit re-establishment of the centerline or baseline should they be removed by construction or other activity.

A soils or geologic investigation will be conducted for all Engineering practices involving ground disturbing activities, and/or where the feasibility and design of the practices are dependent upon the characteristics of the soil, groundwater contained in the soil, and the bedrock underlying the soil. The investigations will be conducted and information recorded (for most practices use SCS-ENG-29) in accordance with requirements in EFH Chapters 4 & 5. All borings will be numbered, located, and the ground elevation established. The minimum number of borings or pits is indicated for each practice later in this document, however, an adequate number of borings will be taken to delineate changes in soil profile, rock depth and ground water conditions. As a minimum, soil borings will extend to the greatest anticipated excavation depth. However, when depth over bedrock, soil permeability, soil strength, etc. for the remaining soil are important for the protection of groundwater or the stability and function of the practice, the borings will extend to the depth necessary to insure problems do not exist.

To improve efficiency and reduce paperwork, the required geologic investigation and recording of data can be lessened for practices under the following conditions:

a. The employee doing the field investigation is the person who will approve the design of the practice.

b. Soils in the area of the practice are uniform.

c. The practice will not cover the original ground with pavement or excessive fill such that the original soil profile cannot be investigated during spot checks or if the need should arise to do repairs or modifications to the practice.

d. The investigating employee has adequate experience and knowledge of the area's soils to confirm the soil series and be able to predict soil depth, groundwater level, and soil properties from a minimal amount of investigation.

e. Failure of the practice or seepage from the practice would not cause pollution of groundwater or surface water (i.e. waste treatment, chemical containment, etc.)

f. Job Approval Class for the practice is I or II.

When the above conditions are met then the investigating employee can waive the need for numbering, locating and determining the elevation of any or all soil borings; they can waive the need to extend the depth of borings to the anticipated excavation depth; and they can waive the requirement to log and record any or all soil borings. These provisions do not relieve the investigating employee of the responsibility for doing adequate investigations to insure the function and safety of the practice, but they do provide a means for experienced employees to reduce the workload associated with design of engineering practices while still providing a quality product. These provisions shall apply unless otherwise required in the documentation for the specific practices in the following pages of this supplement.

Many engineering practices will require runoff calculations to size the components of the practice. An important part of these calculations is determining the land use and hydrologic condition of the drainage area. This information can only be accurately assessed in the field. Therefore, the drainage area will be inventoried for major land uses and the hydrologic condition of those areas. For large drainage areas, drainage areas with many , different land uses, or varying hydrologic conditions within the same land use, the information will be recorded in the field (For most practices use SCS-ENG-29). Consideration needs to be given to the potential for land use change in the future.

B. Design

Procedures contained in EFH Chap. 2 or TR-55 will be used to determine total runoff and peak runoff when needed. Where drainage area or other items exceed the limits of these two references, the procedures in NEH-4 will be used. Computer programs EFM2, PEAK, or TRSS will normally be used to determine runoff. However, runoff can be determined using worksheets 1 & 2 of EFH Chap. 2 or WV-ENG-1 when using procedures in EFH Chap. 2. Worksheets 2, 3, 4, 5a, & 5b in TR-55 can be used to record the calculations for that procedure.

Seeding and mulching requirements will be developed according to WV Standard 342, Critical Area Planting, for all practices resulting in disturbance of natural vegetation.

Where practices need to be fenced to protect them from damage from livestock or to provide protection to humans or livestock, the fencing requirements will be determined according to WV Standard 382, Fencing.

PREPARATION OF ENGINEERING PLANS

Quantities of all materials and items of work will be determined for the practice and the calculations will be maintained in the office file. A cost estimate will be prepared when requested by the landowner or when required for cost share purposes with a copy maintained in the office file.

C. Construction Drawings and Specifications

Construction drawings are the most desirable way to transfer information to the landowner and/or construction personnel. Well-drafted pictorial views are always better than narrative descriptions.

Construction drawings shall be prepared in duplicate (original and blueline or photo copy) in conformance with requirements of EFH Chap. 5 and NEM. Part 541. The copy shall be given to the landowner and the originals filed in the field office. This provides for future changes to the drawings, if needed. When the landowner is going to hire the work done, a second copy of the drawings and specifications will be provided to the landowner for use by his contractor.

Specifications provide a narrative description of construction methods & procedures and of the quality of materials to be used in installation of the practice. A set of specifications will be developed for each design to cover all construction procedures, methods, and materials used in construction of the practice. Specifications will be prepared for the specific practice using standard NEH 20 specifications, WV "700 series" specifications developed for CO-01 measures (Appendix A of Tech. Guide Section IV), and/or from specifications attached to the practice standard. Where unique construction methods or materials are needed, specific specifications for those items will be prepared and submitted to the State Conservation Engineer for approval. A copy of the specifications will be provided with each set of drawings given to the landowner or contractor. Standard specifications do not need to be maintained in the office file; however, a list of standard specifications given to the landowner or contractor and a copy of any unique specifications will be maintained with the office copy of the design.

The requirements for Critical Area Planting will be included on the construction drawings or in an appropriate seeding specification. (Specification 706 can be used for most practices).

Details of fencing will be included on the drawings and appropriate specifications. (WV-ENG-56, 57 or 58, and specification 792 may be used for most practices).

A complete materials list and quantities table will be included on, or attached to, all copies of the construction drawings.

D. Operation and Maintenance

An Operation and Maintenance Plan will be developed for all practices to aid the landowner in operating and maintaining the practice in satisfactory condition. The Plan will be developed concurrently with the design and in consultation with the landowner so his needs can be incorporated in the design. Information contained in the practice standard, EFH chapters for the specific practices, and AWMFH Chap. 13 will be utilized in development of the O&M Plan. "Maintenance Tips Brochures," available for some practices, will be included in the O&M Plan. A copy of the O&M Plan will be maintained in the office file. Maintenance Tips Brochures do not need to be maintained in the file, however, the file will be documented to show the
information was provided to the landowner. The file will also document that O&M was discussed with the landowner.

E. Construction Check and "As Built" Information

Surveys and measurements will be made to assure that the requirements of the drawings and specifications have been met, and to record "As Built" information. (SCS-ENG-28 and 29 or standard forms designed for the practice.)

A set of "As Built" drawings will be prepared by marking a set of drawings with the words "As Built" and changing all values and information that are different from the design, with red pencil. Adequacy of seeding and mulching or vegetation establishment, fencing, and disposal of waste material will be checked and any differences from the original design will be noted.

PREPARATION OF ENGINEERING PLANS

Access Road (560)

(Also* see *documentation requirements for "All Practices", pg. WV5-23(2)

A. Field Notes (SCS-ENG-28 or 29)

1. Topographic surveyor stakes the road centerline and cross section with sections no further than 50 ft. apart.

2. Soils investigation. Minimum of one soil boring for each 100 ft. of length of road and one boring in each anticipated borrow source. Record one soil boring for each change in soil profile and designate the limits for which that boring is representative. (See soils and geologic investigation under "All Practices" pg. WV5-23(3)).

B. Design

1. Determine the class of road, geometric design criteria, and surfacing requirements based on criteria contained in the standard (SCS-ENG-522 or SCS-ENG-523).

2. Determine road layout from topographic map or based on layout in the field, EFH Chap. 1 (WV-ENG-30 for curve layout).

3. Design drainage features.

   a. Size culverts - WV ENG PROG Hydraulic Formulae computer programs will-normally be used to design culverts. However, form (WV-ENG-41) can be used with exhibits 3-9 to 3-12, EFH Chap. 3; Exhibits 14-4, 14-4.1 & 14-4.2, EFH Chap. 14; or equivalent design charts to design culverts. Determine height of fill requirements using Exhibits 14-4.3 to 14-4.5, EFH Chap. 14 or equivalent design aids. Use procedures in EFH Chap. 3, EFH Chap. 6 and EFH Chap. 7 to design inlet and outlet structures for culverts. (SCS- ENG-522 or SCS-ENG-523).

   b. Size grade dips and/or side ditches using Manning's Equation. Use WV ENG PROG Hydraulic Formulae computer program for Manning's Equation; or use EFH Chap. 3 or EFH Chap. 14, Exhibits 14-6, 14-6.1 or 14-6.2. (SCS-ENG-522 or 523).

   c. Use Standard Bridge designs where possible or design bridges according to appropriate State standards. (SCS-ENG-522 or 523).

4. Plot sufficient cross-sections to determine cut and fill. (SCS-ENG-315 or SCS-ENG-316).

C. Construction Drawings and Specifications

1. Plan view. (SCS-ENG-313, 317, 318, or 350; or WV-ENG-5).
    a. Contours (when topography is needed to show details for road.)
    b. Road layout data: Centerline, including angular alignment and curve layout data; top of cut slopes and/or toe of fill slopes; road width; and berm widths if any.
    c. Location of existing natural or cultural features.
    d. Benchmarks, baselines, stations, references, and North Arrow.
    e. Location of all planned structures, including fences, with layout data.

2. Profiles. (SCS-ENG-316, 317, and 318; or WV-ENG-5).
    a. Existing ground line along centerline of planned road.
    b. Elevations, grades, and vertical curves.
    c. Logs of soil borings.
    d. Stations of grade changes, intersections, etc.

3. Cross sections. (SCS-ENG-315 or 316).
    a. Show typical sections for each road width, ditch configuration, cut or fill slope, surfacing requirement, etc.

4. Structure Details. (SCS-ENG-313, 315, 316, 317, 318, or 350).
    a. Show profiles and cross sections of culverts, grade dips, and side ditches.
    b. Details of concrete, riprap, etc. in inlet and outlet structures. WV-ENG-54 may be used for concrete reinforcement steel schedules.

D. Operation and Maintenance

1. Develop an O&M Plan. Include the brochure "Maintenance Tips for Access Roads".

E. Construction Check and "As Built" information.

1. Survey road centerline profile, minimum 50 ft. intervals; one cross section for each typical road section; elevations of inlet and outlet of culverts & culvert length; one cross section and profile of road dips or bars; and dimensions of bridges. (SCS-ENG-28 and 29).

PREPARATION OF ENGINEERING PLANS

Diversion (362) and Grassed Waterway Outlet (412)

(Also see documentation requirements for "All Practices", pg. WV5-23(2))

A. Field Notes (SCS-ENG-28 or 29)

1. Survey centerline profile and representative cross- sections. The irregularity of the topography will dictate the frequency of centerline profile shots and the number of cross sections. However, as a minimum, profile shots will be taken at 50 ft. intervals and one cross section will be taken for every 200 ft. of length.

2. Soils investigation. Minimum of one soil boring per 100 ft. of length. Record one soil boring for each change in soil profile and designate the limits for which that boring is representative. (See soils and geologic investigation under "All Practices" pg. WV5-23(3)).

B. Design

1. Determine permissible velocity for waterways and diversions from EFH table 9-1. (WV-ENG-2)

2. Use ENG_ PROG computer program, WW, to design diversions or waterways or:

   a. Use EFH WV exhibit 7-5 and 7-5.1, and national exhibit 7-5 to compute design velocity and dimensions for parabolic waterways. (WV-ENG-2)

   b. Use exhibits 9-2, EFH chap. 9, to compute design velocity and dimensions for parabolic diversions. (WV-ENG-2)

3. Use EFH exhibit 7-1 and Manning's equation, EFH Chap. 3 or WV ENG_PROG computer program, to determine the dimensions of "V" shaped and trapezoidal diversions or trapezoidal waterways. EFH exhibit 9- 4may be used to determine the dimensions of "V" shaped or trapezoidal diversions or trapezoidal waterways with slopes of 0.5% or less. EFH exhibits 14-6.1 & 14-6.2 may be used to size "V" shaped and trapezoidal diversions or trapezoidal waterways with slopes to 2%, providing the Manning's "n" value corresponds to the "n" value obtained from EFH exhibit 7-1 for the appropriate retardance. (SCS- ENG-522 or 523). WV ENG PROG computer program, Waterway will also provide a design for trapezoidal waterways and diversions.

4. Use EFH exhibit 7-6 or 7-7 to determine rock size for stone center waterways or diversions when necessary. (SCS-ENG-522 or 523).

C. Construction Drawings and Specifications

1. Plan view. (WV-ENG-5 or SCS-ENG-350)
    a. Waterway or diversion layout data. Show centerline, beginning and ending stations, stations of changes in alignment, and angular alignment and curve layout data if needed.
    b. Benchmark location & elev., existing natural or manmade features, North Arrow, and soil boring locations.
    c. Location of planned fences.

2. Profiles. (WV-ENG-5, SCS-ENG-316, 317 or 318).
    a. Show soil borings; stations & elevations of beginning, ending and all grade changes; and all slopes.

3. Cross Sections. (WV-ENG-3 for parabolic diversions and waterways or WV-ENG-4 for trapezoidal waterways & for other cross-sectional shapes SCS-ENG-315, 316, 317 or 318).
    a. Show dimensions of each typical section and stations that apply for each section.

4. Specifications for Waterways or Diversions that involve only earthmoving and establishment of vegetation are included on the back of forms WV-ENG-3 or WV-ENG-4.

D. Operation and Maintenance

1. Develop an O&M Plan. Include the brochure "Maintenance Tips for Grassed Waterways" or "Maintenance Tips for Diversions".

E. Construction Check and "As Built" Information.

1. Survey centerline profile, minimum 50 ft. intervals, and one cross section for each typical section. Cross sections for parabolic waterways will consist of a minimum of seven survey points (one shot at the centerline, one shot on either side of the centerline at 1/4 the distance to the outside edge of the waterway, one shot on either side of the centerline at 1/2 the distance to the outside edge of the waterway, and one shot at each edge of the design topwidth). Cross sections for parabolic diversions will have the same seven survey points as for waterways plus a point at the top of the berm, a point at 2 ft. beyond the berm centerline and one at the toe of slope for the berm fill. Trapezoidal and

PREPARATION OF ENGINEERING PLANS

"V" shaped diversions and trapezoidal waterways will have adequate survey points to define the "As Built" side slopes and bottom width (trapezoidal). (SCS- ENG-28 and 29).

Embankment Ponds (350. 377. 378. 410)

(Also* see *documentation requirements for "All Practices", pg. WV5-23(2))

A. Field Notes (SCS-ENG-28 or 29, or WV-ENG-7)

1. Survey profile along centerline of dam. Zero station on the right looking downstream, and well above the anticipated top of dam elevation or top of cut slope for the ESW, as applicable. Survey points will be no further than 50 ft. apart, but will be taken more often when necessary to define changes in topography. Extend the survey to a point well above the anticipated top of dam or well above the' anticipated top of cut slope for the ESW as applicable, on the opposite side of the valley.

2. Survey ESW inlet and outlet so design slopes can be determined and to assure flow is controlled to a point past the downstream toe of the embankment. In most cases this can be accomplished by surveying a profile along the inside edge of the planned emergency spillway. In some cases the topography will be such that it will be obvious that the spillway can be installed to meet standards and only one or two survey points upstream and downstream of the centerline of dam, in the area of the planned ESW, will be necessary to determine slopes. In some cases where it is not obvious where the ESW will be installed or what the exact elevation will be, it may be necessary to survey two or three cross sections on the embankment centerline so topography can be developed (other topographic survey methods are also acceptable) in the area of the ESW. This will allow the designer to locate and align the ESW and determine slopes and cut depths to meet the requirements of practice standard 378.

3. Survey a valley profile at the low point in the valley. Extend the profile beyond the anticipated upstream and downstream toe of fill for the embankment and record the stations where the valley profile and the centerline of dam profile intersect. If the valley profile and centerline of dam do not intersect at 90° then record the approximate angle of intersection. If the PSW will not outlet at a point on the valley profile then the elevation of the ground at the anticipated outlet and the location, referenced to the other surveys, will be recorded. In this case, a waterway or other practice will be needed to convey the PSW flow to the original channel downstream of the pond (see those standards for required documentation data).

4. Collect information for the livestock watering trough and pipeline as required for those practices.

5. As a minimum, all ponds will have the pool elevation flagged or staked on the ground and the contour located either by cross section from a baseline up the valley, transit/stadia surveyor other type of survey. (Suggest that a contour two to four ft. above and one two to four ft. below the anticipated pool level also be surveyed. This will permit changes in the pool level during design without need for additional survey and will also accommodate development of stage-area information for entry into the POND program, thereby taking advantage of storage in reducing ESW size requirements). Sediment ponds and any other ponds where sediment or flood storage volume will be needed will require a topographic survey of the pool area.

6. Soil investigation. As a minimum, 5 soil borings will be taken: 3 on the centerline of dam (1 in the floodplain and 1 on each abutment), 1 in the ESW exit channel, and 1 in the anticipated borrow area. Borings along the centerline of the embankment will always be recorded. (See soils and geologic investigation under "All Practices" pg. WV5-23 (3)).

B. Design

1. Use WV-ENG-7 or the computer printout from the POND program to document design. Record design calculations, not required on WV-ENG-7 or on the computer program printout, on SCS-ENG-522 or 523.

2. Plot topographic information for pool area (WV-ENG- 5, or SCS-ENG-313, 317, 318, or 350). Determine pool area, stage-area, or stage-storage information using a planimeter or the AREA-VOL computer program. (WV-ENG-7, or SCS-ENG-522 or 523).

3. Design principal spillway.

   a. Use minimum pipe size and stage between PSW and ESW crest as required by the standard for small ponds. When it is desirable to increase pipe size above the minimum in order to reduce ESW size and for larger ponds requiring passage of a design storm, size the pipe and inlet using the POND program or the following EFH design aids as appropriate: EFH Chap. 6; EFH Chap. 3, supplemental pages WV3-111(1) to WV3-111(14); and/or EFH Chap. 11, exhibit 11-4, supplemental pages WVll-56A to WVll-56D, or supplemental pages 11-65 to 11-68. WV ENG_PROG Hydraulic Formulae computer programs for design of hooded inlet spillways or pipe drop spillways can also be used. (WV-ENG-7, or SCS-ENG-522 or 523).

   b. Use EFH Chap. 6, supplemental pages 11-69 to 11-73 to determine detention time for sediment ponds. (SCS-ENG-522 or 523).

   c. Use EFH Chap. 6 design aids to design PSW appurtenances (trash racks, anti-vortex devices, seepage control, and cantilever outlet supports). (SCS-ENG-522 or 523). Also, standard forms WV-ENG-11, 12, 13 & 14 and TSC-NE-ENG- 622, 630, 634 & 636 can be used to design appurtenances.

d. Design outlet protection for PSW pipes based on requirements in the standard. Use the minimum size splash pad as required for small pipe diameters. Use EFH Chap 7, supplemental pages WV7-48 (5) to WV7-48 (7) or Design Note 6 procedures (computer program DN-6) to design outlet protection for ponds with large pipe sizes. (SCS-ENG-522 or 523, or computer printout for DN-6).

4. Design pond drain and/or water supply pipe using criteria contained in the standard. If a design capacity is required, use procedures contained in EFH Chap. 3 or WV ENG_ PROG Hydraulic Formulae programs. Design livestock watering trough (Std. 614) or ramp if a trough cannot be installed. (WV- ENG-7, or SCS-ENG-522 or 523).

5. Design emergency spillway. Use WV ENG_PROG POND program or:

   a. Determine allowable exit channel velocity from EFH Chap. 11, exhibit 11-2. (WV-ENG-7).

   b. Determine spillway dimensions from exhibit 11- 2.1 and the practice standard (WV-ENG-7). Include bottom width, length of level section, side slopes, inlet channel slope, and minimum & maximum outlet channel slopes.

   c. Determine top of dam elevation based on depth of flow determined in b. above and the freeboard requirements contained in the standard (WV-ENG-7).

6. Determine embankment configuration from WV standard 377 and calculate fill quantity, including overbuild for settlement, using EFH Chap. 11, exhibit 11-6.1, the POND program, or the BLAINVOL centerline height computer program. (WV-ENG-7, SCS-ENG-522 or 523, or computer printout).

C. Construction Drawings and Specification

1. Plan view. (WV-ENG-5, or SCS-ENG-313, 317, 318 or 350).
   a. Centerline of dam, centerline of PSW & ESW, and any baselines. Show stations of intersection of centerlines and/or baselines. Show stations at changes in alignment of centerlines or baselines.

   b. Top width of dam, bottom width of ESW, level section of ESW, top of cut slope for ESW, toe of fill slopes for embankment. Show embankment sideslopes, ESW cut slopes, and ESW inlet & outlet channel slopes.

   c. Location and alignment of pond drain and/or water supply pipe. Location of trough or livestock water access ramp.

   d. Location of existing natural or manmade features including any known utilities.

   e. Benchmarks, reference points (if any), soil borings and North Arrow.

f. Pool layout and proposed borrow area.

g. Location of planned fence.

2. Profiles. (WV-ENG-S or SCS-ENG-316, 317, or 318).

a. Profile centerline of dam. Show original ground line, soil borings, approximate bottom of cutoff trench, waterline elevation, top of settled embankment, top of constructed embankment, ESW sideslopes & bottom width (ESW to be cut at least to a depth of Hp in original ground), top of cut slope for the ESW, and locations of PSW or other pipes going through the embankment.

b. Profile along inside edge of ESW or along centerline of ESW. Show original ground line, soil borings, and excavation line. Show inlet and outlet channel slopes, elev. of level section, and length of level section. The outlet channel should be in cut to a depth of Hp for a distance downstream equal to the downstream toe of the fill, or a dike will be required to maintain flow in the ESW.

3. Cross section of embankment. (WV-ENG-8, 9, or 10, or SCS-ENG-315 or 316).

a. Elevations of normal pool & PSW inlet, PSW outlet & outlet channel, ESW crest, and berms, if required.

b. Top width of embankment and slopes of embankment.

c. Pipe length & type for PSW, pond drain, and/or water supply pipes. Include details of seepage control measures on pipes, when required by the practice standard.

d. Inlet and outlet details for the PSW, or when special requirements are necessary use the forms listed in 6. below.

e. Details of inlet and outlet for pond drain and/or water supply pipes.

4. Show detailed dimensions and layout data for any PSW appurtenances and outlet protection measures. The following engineering standard forms may be used, as needed.

WV-ENG-ll	Hood Inlet w/Baffle (6" to 15" dia.)
WV-ENG-12	Canopy Inlet
WV-ENG-13	Pipe Drop Inlet w/Baffle
WV-ENG-14	Concrete Box Drop Inlet w/Baffle
WV-ENG-15	Drop Inlet w/Canopy or Hood
WV-ENG-16	Riprap Lined Outlet
WV-ENG-17	Riprap Lined Plunge Pool
WV-ENG-60	Floating Inlet Water Supply Detail
TSC-NE-ENG-622	CMP Hood Inlet (15" to 36" dia.)
TSC-NE-ENG-626	Watertight Coupling Bands for CMP
TSC-NE-ENG-628	Flange Connection for CMP

TSC-NE-ENG-630	Metal Diaphragm for CMP
TSC-NE-ENG-634	Anti-vortex Detail
TSC-NE-ENG-636	Pipe Spillway Trash Guard
TSC-NE-ENG-670	Debris Basin Drop Inlet Spillway

5. The following forms may be used on larger, more complex sites where conditions dictate more detail or to provide details for structures where standard drawings are not available (drop structures, stilling basins, livestock watering ramps etc.)

SCS-ENG-313 or 350	Plan View
SCS-ENG-316	Centerline Profile
SCS-ENG-317 or 318	Plan View I Profile
SCS-ENG-315	Cross-sections

D. Operation and Maintenance

1. Develop an O&M Plan. Include the brochure "Maintenance Tips for Ponds".

E. Construction Check and "As Built" information.

1. Survey centerline profile of embankment & ESW and cross section of embankment & ESW. Cross section the pool or otherwise survey "As Built" topography of the pool if required to document that the design volume was obtained (Ex. - Storage required in Sediment Ponds). Record elevations of inlet and outlet of PSW, outlet channel and/or outlet structures if installed. (SCS-ENG-28 & 29, or WV-ENG-8, 9, or 10).

Excavated Pond or Reservoir (378. 552)

(Also* see *documentation requirements for "All Practices", pg. WV5-23(2))

When Excavated Ponds or Reservoirs require installation or construction of an embankment, a Principal Spillway Pipe, a Pond Drain or Water Supply Pipe, and/or an Emergency Spillway, the requirements for Embankment Ponds will be met in addition to the following requirements for excavated ponds:

A. Field Notes (SCS-ENG-28 and 29)

1. Topographic survey of the pond area, or establish a baseline and cross section the pool at 50 ft. intervals minimum. At least two cross sections will be taken for all ponds. One cross section should be through the lowest point within the bounds of the pond, or the low point elevation should be determined, to establish the control elevation for the pond.

2. Soils Investigation. Take a minimum of one soil boring on each cross section for each 50 ft. of length of the section. When the pond is surveyed by topographic procedures, grid the pond area with soil borings at 50 ft. intervals, minimum. Record at least one boring for each soil profile encountered and indicate the length along each section or the area within the pond boundary that is represented by that soil profile. (See soils and geologic investigation under "All Practices" pg. WV5-23(3)).

B. Design

1. Determine water storage volume requirements based on livestock needs and site conditions (SCS-ENG-522 or 523).

2. Determine dimensions of excavation for the pool based on plotted cross sections (SCS-ENG-315) and EFH Chap. II, Exhibit 11-6.2.

3. Determine volume of excavation from EFH Chap. II, Exhibit 11-6.2, when topography is flat and uniform. When topography is steep or nonuniform, determine the excavation quantity from plotted cross sections using the Average End Area method for volume calculations (SCS-ENG-522 or 523). WV ENG PROG AREAVOL computer program can also be used to determine the excavation quantity from the cross sections.

C. Construction Drawings and Specifications

1. Plan View. (TSC-NE-ENG-638, WV-ENG-5, or SCS-ENG- 313, 317, 318, or 350).

   a. Layout data for pond. Show baseline or survey stations with distances and angular measurements to locate the pond on the ground.

   b. Bottom dimensions of pond, side slopes, and top of cut slope.

   c. Location and alignment of pond drain and/or water supply pipe (if used). Location of trough (if used) or livestock water access ramp.

   d. Location of existing natural or manmade features including any known utilities.

   e. Benchmarks, reference points (if any), soil borings, and North Arrow.

   f. Waste disposal area and proposed borrow area (if needed).

   g. Location of planned fence.

2. Cross sections of pool. (TSC-NE-ENG-638, or SCS-ENG- 315 or 316).

   a. Elevations of normal pool, original ground, and bottom of pond.

   b. Pond sideslopes and bottom dimension in both directions.

   c. Show soil borings.

3. Details. (SCS-ENG-313, 315, 316, 317, 318, or 350).

    a. Cross sections, profiles and plan details of livestock water access ramps or other structures as needed.

D. Operation and Maintenance

1. Develop O&M Plan. Include the brochure "Maintenance Tips For Ponds".

E. Construction Check and "AS Built" Information

1. Survey typical cross section of pool in both directions. Record final ground line, water line, sideslopes, bottom elevation, and bottom dimensions. (TSC-NE-ENG-638, or SCS-ENG-28 & 29).

2. Profile centerline of livestock water access ramp and record measured width (when used). Check adequacy of surfacing material installed on ramp. Record any variations from design. (SCS-ENG-28 & 29).

Spring Development (574)

(Also* see *documentation requirements* for *"All Practices", pg. WVS-23(2))

A. Field Notes (SCS-ENG-28 or 29)

1. Record the ground elevation at the spring. When interceptor lines are planned, survey and stake the centerline with survey points no further than 50 ft. apart. For Spring Developments where interceptor lines will not be installed and it is not necessary to have a surveyed centerline for the Pipeline (see practice standard 516), establishment of a benchmark is not necessary. Under these circumstances the difference in elevation between the ground at the spring and the ground at the trough will be recorded.

2. Record or sketch the layout and dimensions of the planned spring cutoff wall.

3. Soil investigation. Take at least one soil boring at the spring to determine the depth to an impervious layer. If interceptor lines are to be installed then take soil borings along the interceptor centerline at spacings no further than 50 ft. apart. Record one soil boring for each change in soil profile and designate the limits for which that boring is representative, unless otherwise permitted by the provisions under soils investigation in the "All Practices" section of this document.

B. Design (Ref. EFH Chap. 12)

1. Determine depth of spring box, depth of cutoff wall, and need for paving the spring box floor based on soils information. (SCS-ENG-522 or 523, or record on construction drawings).

2. Plot profile(s) of interceptor lines and determine depth of lines based on soils information. (WV-ENG- 62, or SCS-ENG-315, 316, 317, or 318).

3. Determine pipe bedding requirements or requirements for gravel filters, when needed. (SCS-ENG-522 or 523).

4. Determine need for surface water diversion (practice standard 362), fencing, or other measures, such as sealing the spring with plastic or concrete, to prevent the entry of surface water. (SCS-ENG-522 or 523, appropriate drawings for diversions or fences, or record on the construction drawings).

C. Construction Drawings and Specifications

1. System Plan View. (WV-ENG-62 (preferred), WV-ENG-5, or SCS-ENG-350).

   a. Layout sketch of all components of the system, including spring, pipeline, interceptor lines (if used) and trough.

   b. Benchmark (if one is established) and North Arrow.

   c. Existing natural and manmade features, including known utilities.

   d. Location of planned fences, when required.

2. Collector Plan View. (WV-ENG-62, TSC-NE-ENG-620, or SCS-ENG-350)

   a. Layout and dimensions of spring box, cutoff wall, and interceptor lines (if planned).

3. Profile through collector. (WV-ENG-62, TSC-NE-ENG- 620, or SCS-ENG-316 or 350).

   a. Dimensions, elevations, and material details for spring box with lid and any flooring details; rock and gravel backfill; plastic sheet, soil, and/or concrete cover over spring; cutoff wall; and outlet pipe.

   b. When interceptor lines are used, show a cross section of the excavation, plot the centerline profile, plot soil borings on the profile, and show backfill & bedding requirements. (WV-ENG- 62; SCS-ENG-315, 316, 317 or 318).

4. Form WV-ENG-62 provides for all of the above details plus the information contained in the specification attached to the standard. For most designs where long interceptor lines and fencing are not needed, this form will provide all the information needed for a spring development and pipeline.

D. Operation and Maintenance

1. Develop an O&M Plan. Include the brochure "Maintenance Tips for Spring Developments."

PREPARATION OF ENGINEERING PLANS

E. Construction Check and "As Built" Information

1. Record elevation of outlet pipe in the spring box. In cases where no benchmark was established, record the difference in elevation from the outlet pipe to the top of the trough.

2. Survey "As Built" centerline profile of interceptor lines along ditch bottom or pipe invert. (SCS-ENG-28 or 29).

Pipeline (516)

(Also* see *documentation requirements* for *"All Practices", pg. WV5-23(2))

A. Field Notes *(SCS-ENG-28* or 29)

In most cases pipelines will be installed in conjunction with other practices and field information can be collected and recorded along with that practices field data.

1. Survey centerline profile, when required by the standard. Survey points should be no further than 50 ft. apart. For short, steep, gravity flow pipelines or for pressurized systems, as permitted by the standard, only the difference in elevation from the inlet (water source) to the outlet (trough), the elevation of any high points in the line, and the length of the pipeline are required.

2. Soils investigation. Take soil borings at least every 50 ft. along the pipe centerline to determine if adequate depth is available for installation. Record one soil boring for each soil profile encountered and designate the length along the pipeline for which that soil is representative. *(See soils and geologic investigation under "All Practices" pg. WV5-23(3)).*

B. Design

1. Determine the pipeline grades or total elevation difference from the inlet to the outlet. From plotted profiles (SCS-ENG-316, 317 or 318) or from field survey data when profiles are not required.

2. Determine the required capacity of the pipeline, as required by the standard. (SCS-ENG-522 or 523 or use WV ENG_PROG computer program for Pipelines).

3. Determine pipe size, material type and pressure requirements. For short, steep, gravity flow pipelines, as permitted by the standard, use the minimum pipe size required by the standard. When the standard requires capacity and pressure calculations, design the pipeline using WV ENG_ PROG computer program for Pipelines; or use EFH Chap. 12, figures 12-15A to 12-15C, and/or procedures in EFH Chap. 3.

C. Construction Drawings and specifications

1. System Plan View. (WV-ENG-5, SCS-ENG-350, or WV-ENG- 62 for spring developments)

   a. Location sketch showing all components of the system. Include water source, pipeline and the trough.

   b. Benchmark (if one is established), and North Arrow.

   c. Existing natural and manmade features including known utilities.

   d. Planned fences when required.

2. Profile. (SCS-ENG-316, 317, or 318; or WV-ENG-62 may be used for spring developments and WV-ENG-63 may be used for simple well installations). When required by the standard, the profile shall be plotted. The planned grade of the pipeline and soil borings will be shown on the plot. When a profile is not required, then the control elevations at the water source and at the point of use will be shown on the drawings along with any high or low points along the length of the pipeline.

3. Show pipe material type, length, size, applicable ASTM Specification, and applicable pressure/strength requirements on the drawings. Also show all necessary pipe fittings. May be shown on any of the drawings described in 2. above.

4. Form WV-ENG-62 for spring developments contains the information from the specification attached to the standard. For most installations of pipelines with spring developments this form contains all of the information necessary for pipeline installation.

D. Operation and Maintenance

1. Develop an O&M Plan. Include the brochures "Maintenance Tips for Spring Developments" or "Maintenance Tips For Ponds" when the pipeline is installed with those practices.

E. Construction Check and "As Built" information.

1. Survey profile along centerline of pipeline. Record elevations at 50 ft. intervals, minimum, when a profile is required in the design. For short, steep, gravity flow pipelines and pressurized pipelines where centerline profiles are not required, record control elevations at the inlet, outlet, and at any high points along the pipeline, as shown on the drawings (SCS-ENG-28 or 29).

PREPARATION OF ENGINEERING PLANS

Trough or Tank (614)

***(Also see* documentation *requirements* for *"All Practices", pg.* WV5-23(2))**

A. Field Notes (SCS-ENG-28 *or* 29)

In most cases Troughs *or* Tanks will be installed in conjunction with other practices and field information can be collected and recorded along with that practices field data.

1. Record the ground elevation at the trough location. When installed with spring developments and pipelines where no centerline profile is needed (see practice standard 516), then establishment of a benchmark is not necessary. Under these circumstances the difference in elevation between the ground at the spring and at the trough will be recorded.

2. Determine location of the outlet for the overflow pipe and measure & record the distance for quantity calculations.

3. Soils investigation. Record at least *one* soil boring to determine adequacy of soil depth for installation of plumbing and to determine the need for gravel or drainage around the trough. (See soils and geologic investigation under "All Practices" pg. WV5-23(3)).

B. Design (Ref.: EFH Chap. 12)

1. Determine the size and type of trough considering the minimum requirements in the standard, landowner wishes, site accessibility, anticipated life of the practice, flow rate from the source, no. & type of livestock, and the need for protection from freezing. (SCS-ENG-522 or 523; or select any of the standard drawings listed for Construction Drawings).

2. Determine need for drainage and or gravel or other stabilizing material around the trough based on site conditions and soils information. (SCS-ENG-522 or 523; or record on one of the standard Construction Drawings).

C. Construction Drawings and Specifications

1. System Plan View. (WV-ENG-5, SCS-ENG-350, WV-ENG-62 for spring developments, or WV-ENG-63 for wells).

   a. Location sketch showing all components of the system. Include water source, pipeline and the trough.

   b. Benchmark (if one is established), and North Arrow.

   c. Existing natural and manmade features including known utilities.

   d. Planned fences when required.

2. Trough Details. Use any of the standard drawings approved for use for trough or tank (TSC-NE-ENG-600, 602, or 604; or WV-ENG-64)); any manufacturers drawing from the list of prequalified products in the NEM, Part 512 (most of these drawings will require the addition of plumbing details); or draft the details of the trough (SCS-ENG-350). Show details of retaining walls and/or backfill placement for freeze proof troughs (SCS-ENG-315, 316, and/or 350).

3. Form WV-ENG-64 includes the information from the specification attached to the Practice standard.

D. Operation and Maintenance

1. Develop an O&M Plan. Include the brochures "Maintenance Tips for Spring Developments" or "Maintenance Tips For Ponds" when the trough or tank is installed with those practices.

E. Construction Check and "As Built" Information

1. Record the As Built elevation of the top of the trough (SCS-ENG-28 or 29).

2. Note the name of the manufacturer if a premanufactured trough was installed.

3. Check the stability of ground surrounding the trough to support the livestock traffic and the adequacy of gravel or other stabilization material installed. Record any differences from the design.

(Appendix A)
Quick Reference
Design and Construction
Support Data For Conservation Practices

The following is a quick reference guide for support data to document design and application for most engineering practices. It is intended for use by experienced personnel who only need a reminder of the documentation required but do not want to review the full supplement. The format of this reference is to list the common forms used to record documentation for the practices normally installed by Field Office Personnel. Collection of the data to complete the forms and meet all requirements for documentation is still the responsibility of the employee doing the work.

INDEX

.

PREPARATION OF ENGINEERING PLANS

All Practices

(Items in this section shown in bold print* and *underlined* are to *be provided to the landowner and* contractor as *well* as a *copy being maintained in the office file.**)

A. Utilities
1. SCS-ENG-5 Utility Postcard (only if utilities are present).
2. SCS-ENG-6 Utility Check Sheet.
3. **WV-ENG-46 Utility Notification Sticker.**

B. Field Data
1. SCS-ENG-28 & 29 Field Survey, soils investigation, & landuse inventory.

C. Hydrology
1. EFM2 computer printout, WV-ENG-1, or PEAK computer printout if runoff calculations are required.

D. Job Class and Signatures
1. **Job Approva1 Class** for the Practice, shown on drawings.
2. **Design. Desian Check. Desian Approval**, and **Construction Check** signatures; shown on drawings.

E. Specifications
1. **Standard "700 series" specifications**** (TG-IV, Appendix A), **standard specifications attached to the practice standard**,** and/or any **"non-standard specifications".**

F. Associated Practices
1. **Seeding - Spec. 706**. Seeding and application rates on the drawings** (when seeding is required).
2. **Fencing - WV-ENG-56. 57. or 58 with Specification 792**. Fencing** (when fencing is required).

G. Quantities, materials and estimates
1. Quantity calculations and **materials list**.
2. **Cost Estimate** (When requested by landowner or required for cost share).

H. Operation and Maintenance
1. **Operation and Maintenance Plan** and any **"Maintenance Tips Brochures"** .**

I. AS Built
1. **"As Built" drawings** with changes shown in red (survey on SCS-ENG-28 & 29 or on standard construction check forms for the practice).

***Standard specifications* and *brochures that* are *given* to *the landowner and contractor do not have* to *be maintained in the office file for each design. The office file will include only* a *listing of the* standard *documents provided* to *the landuser* and contractor.

Access Road (560)

(Also see documentation requirements* for *"All Practices", pg. WV-23(25))

A. Design: ***(Office file only)***

1. SCS-ENG-522 or 523 Design Calculations.
2. WV-ENG-30, Curve layout design.
3. WV-ENG-41, Culvert design; or ENG_PROG computer program hydraulic formulae.
4. SCS-ENG-522 or 523, design of grade dips and side ditches using Manning's Equation; or ENG_PROG computer program Hydraulic Formulae.
5. SCS-ENG-315 or 316, or computer generated cross sections of the road to balance cut and fill.

B. Construction Drawings: ***(Landuser/contractor file* &: *office file) *(Bold print items* are *"key* words" or *"most commonly used* forms")**

1. WV-ENG-5 or SCS-ENG-350, Plan View and layout of road.
2. WV-ENG-5, SCS-ENG-316, 317 or 318, Profile centerline of road.
3. SCS-ENG-315 or 316, Cross sections of the road.
4. SCS-ENG-313, 315, 316, 317, 318, or 350, details of structures and ditches.
5. WV-ENG-54 , Reinforcing Steel Schedule (if needed).

Diversion (362) and Grassed Waterway or Outlet (412)

(Also see documentation requirements* for *"All Practices", pg. WV-23(25))

A. Design: ***(Office file only)***

1. ENG PROG, WW computer program print out or WV-ENG-2.
2. ENG-PROG, Hydraulic Formulae computer program, Manning's Equation, for "V" shaped or trapezoidal sections; or SCS- ENG-522 or 523 for manual calculation.

B. Construction Drawings: ***(Landuser/contractor file* &: *office file) *(Bold print items are *"key* words" or *"most commonly used forms")***

1. WV-ENG-5 or SCS-ENG-350, Plan View.
2. WV-ENG-5, SCS-ENG-316, 317 or 318, Profile centerline of waterway or diversion.
3. WV-ENG-3 for parabolic cross sections of waterways or diversions; WV-ENG-4 for trapezoidal cross sections of waterways; or SCS-ENG-315, 316, 317, or 318 for other cross sections of waterways or diversions.
4. Specification Note: Specifications for construction of waterways or diversions that involve only earth moving and seeding are on the back of forms WV-ENG-3 or 4 and no other specifications are needed in these cases.

PREPARATION OF ENGINEERING PLANS

Embankment Ponds (350. 377. 378. 410)

(Also* see *documentation requirements for "All Practices", pg. WV-23(25))

A. Design: ***(Office file only)***

1. ENG_PROG, POND program computer print out or WV-ENG-7.
2. SCS-ENG-522 or 523 for various calculations not included in the forms in Item 1 (i.e. design of flared riprap outlet for psw (EFH Chap. 7), livestock watering ramp design, quantities, etc.).
3. Other ENG_PROG computer programs that may assist in design of larger ponds are:
    a. Hydraulic Formulae, Hooded Inlets or Pipe Drop Spillways.
    b. Design Note 6, DN6 program, Riprap Plunge Pools.
    c. BLAINVOL, volume by centerline heights method.
    d. AREAVOL, area and volume calculation program.
    e. WVSSRP, stadia reduction program.

B. Construction Drawings: ***(Landuser/contractor file* & *office file) *(Bold print items* are *"key* words" or *"most commonly* used forms")**

1. WV-ENG-S or SCS-ENG-313, 317, 318 or 350, Plan View.
2. WV-ENG-S or SCS-ENG-316, 317, or 318, Profiles of centerline of dam and ESW.
3. WV-ENG-8, 9, or 10; or SCS-ENG-315 or 316, Cross section of embankment.
4. For large or more complex ponds the following forms will assist in detailing paw appurtenances and outlet protection measures:

WV-ENG-11	Hood Inlet w/ Baffle (6" to IS" dia.)
WV-ENG-12	Canopy Inlet
WV-ENG-13	Pipe Drop Inlet w/ Baffle
WV-ENG-14	Concrete Box Drop Inlet w/ Baffle
WV-ENG-15	Drop Inlet w/ Canopy or Hood
WV-ENG-16	Riprap Lined Outlet
WV-ENG-17	Riprap Lined Plunge Pool
WV-ENG-60	Floating Inlet Water Supply Detail
TSC-NE-ENG-622	CMP Hood Inlet (IS" to 36" dia.)
TSC-NE-ENG-626	Watertight Coupling Bands for CMP
TSC-NE-ENG-628	Flange Connection for CMP
TSC-NE-ENG-630	Metal Diaphragm for CMP
TSC-NE-ENG-634	Anti-vortex Detail
TSC-NE-ENG-636	Pipe Spillway Trash Guard
TSC-NE-ENG-670	Debris Basin Drop Inlet Spillway

Excavated Pond or Reservoir (378. 552)

(Also see *documentation requirements for "All Practices",* pg. WV-23(25))

A. Design: *(Office file only)*
(When ponds require construction of embankments greater than 3 ft. in height; require the installation of a PSW, ESW, or water supply pipe; or have drainage areas greater than 10 acres then the requirements *for* embankment ponds will be met in addition to the following)
1. SCS-ENG-522 or 523, calculations and SCS-ENG-313 or computer generated cross sections to determine storage volume requirements and excavation volume. ENG_PROG AREAVOL program print out can also be used to determine excavation volume.

B. Construction Drawings: ***(Landuser/contractor file & office file) *(Bold print* items *are "key* words" *or "most commonly* used *forms")***
1. TSC-NE-ENG-638, WV-ENG-5, or SCS-ENG-313 , 317, 318, or 350; Plan View.
2. TSC-NE-ENG-638 or SCS-ENG-315 or 316; Cross sections of pool.
3. SCS-ENG-313, 315, 316, 317, 318, or 350; details of livestock watering access ramps or other structures.

Spring Development (574)

***(Also* see *documentation requirements for "All Practices",* pg. WV-23(25))**

A. Design: ***(Office file only)***
1. Determine depth of spring box, dimensions of cutoff wall, requirements *for* drain fill, etc. Use SCS-ENG- 522 or 523 or record the information on the construction drawings.
2. WV-ENG-62 or SCS-ENG-315, 316, 317 or 318 Profiles of interceptor lines (if required) to determine depth of lines and bedding or filter requirements.

B. Construction Drawings: ***(Landuser/contractor file & office file)***
**** (Bold print* items *are "key* words" *or "most commonly* used *forms")***
1. WV-ENG-62, WV-ENG-5, or SCS-ENG-350; System Plan View.
2. WV-ENG-62, TSC-NE-ENG-620, or SCS-ENG-350; Collector Plan View.
3. WV-ENG-62, TSC-NE-ENG-620, or SCS-ENG-316 or 350; Profile through collector.
4. WV-ENG-62 or SCS-ENG-315, 316, 317, or 318; Cross sections and centerline profiles of interceptor lines, when used.
5. Specification Note: Form WV-ENG-62 includes the specifications for simple spring developments without interceptors and no other specifications are needed.

PREPARATION OF ENGINEERING PLANS

Pipeline (516)

(Also* see documentation *requirements for "All Practices", pg. WV-23(25))

A. Design: *(Office file only)*

1. Determine required capacity from standard and record on SCS-ENG-522 or 523, or on the construction drawings.
2. Determine total elevation difference and pipe length from plotted profiles, SCS-ENG-316, 317, 318; or from field survey notes.
3. Determine pipe capacity, pressure requirements, and type of pipe. When permitted by the standard use the minimum size and type of pipe specified. When required by the standard, determine capacity, pressure and type pipe from ENG PROG computer program for pumps and pipelines; or use SCS~ENG-522 or 523 and procedures in EFH Chapters 3 and 12.

B. Construction Drawings: (Landuser/contractor *file* &: *office file) *(Bold print items* are *"key words"* or *"most commonly* used forms")

1. WV-ENG-S, SCS-ENG-350, or *WV-ENG-62i* System Plan View.
2. WV-ENG-62, WV-ENG-63, or SCS-ENG-316, 317, or 318; Profile along centerline of pipeline.
3. Specification Note: Form WV-ENG-62 for Spring Developments and Pipelines includes the specifications necessary for pipeline installation and no other specifications are necessary.

Trough or Tank (614)

(Also* see documentation *requirements for "All Practices", pg. WV-23(25))

A. Design: (Office file only)

1. Select the size and type of trough or tank based on minimum requirements of the standard, landuser wishes, site accessibility, anticipated life of the practice, source flow rate, no. & type of livestock, and the need for protection from freezing; record on SCS-ENG-522 or 523 or select the appropriate construction drawing.
2. Determine the need for drainage and/or gravel or other stabilization material around the trough; SCS-ENG-522 or 523 or record on the selected construction drawing.

B. Construction Drawings: **(Landuser/contractor *file* &: *office file)***
****(Bold print items* are *"key words"* or *"most commonly used forms"*)**

1. WV-ENG-S, SCS-ENG-350, WV-ENG-62 or *WV-ENG-63;* System Plan View.
2. TSC-NE-ENG-600, 602, or 604; *WV-ENG-64;* SCS-ENG-350 or prequalified trough manufacturers drawing; Trough Details
3. SCS-ENG-315, 316, or *350;* Details of retaining walls, freeze proof protection, etc. when needed.
4. "AS Built" Note: The name of the manufacturer of prequalified troughs needs to be recorded on "As Built" drawings.

U.S. Department of Agriculture
Soil Conservation Service

UTILITY CHECK SHEET

Reference Engr. Memo – 73

Farm Name _____ Location _____

Utilities Involved & Location _____

_____

Landowner or operator notified _____ _____
Who By Whom

How _____ Date _____
Work to be done _____ When _____

Utility Company Notified _____ _____
Who By Whom

How _____ Date _____
Request to locate utility _____
Work to be done _____ When _____
Request for company representative to be present _____
Utility marked or staked _____ Date _____
Representative present during construction _____

Contractor Notified _____ _____ _____ _____
Who By Whom How Date

Type of utility _____ Location _____
Vertical location in relation to work _____
Horizontal location in relation to work _____
Contractor shown markings or stakes _____
Utility location shown on plans _____

Other remarks _____
_____
_____
_____
_____

_____
Signature

Contact Miss Utility before you dig! 1-800-245-4848