

BASIC PLANNING AND APPLICATION TRAINING MODULE FOR GRADE STABILIZATION STRUCTURES

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INTRODUCTION: As will be the case with the other training modules you will be working with, this module is NOT intended to be the only authority related to learning the specifics related to Grade Stabilization Structures (GSS). It is intended to be a reference and information guide that will enable you to become increasingly more familiar with the topic, and enable you to interact in a very short time period with your trainer. In fact, this module is not intended to teach you how to fully plan and implement Grade Stabilization Structures. Rather than a “how-to” document, this is to be regarded as a “why-to” document. That is, its intent is to enable you to recognize situations and conditions that are suitable for including Grade Stabilization Structures as a component of a conservation system, as well as situations that are NOT suitable.

1. PRE-READING LIST

You (the trainee) need to understand the basic principals and applicability of the practice. This will allow you to more readily comprehend subsequent training information, as well as provide reference points from which to develop additional questions that will enhance your understanding of the practice. The following are to be read as a minimum:

- Field Office Technical Guide

 - Section IV – Conservation Practice Standards
 - Grade Stabilization Structure (410)

- Michigan Construction Specifications

 - MI-152: Excavation

 - MI-154: Earthfill

 - MI-156: Corrugated Metal Pipe Conduit Installation

 - MI-164: Loose Rock Riprap

 - MI-165: Geotextiles

 - MI-166: Seeding

 - MI-172: Metal Fabrication and Installation

 - MI-174: Timber Fabrication and Installation

 - MI-181: Water and Sediment Control Basin

 - MI-182: Plastic (PVC, PE) Pipe

Note: Specifications are specific to different structures. Your trainer will indicate which are appropriate for the individual structure being considered.

After reading this material, it should be reviewed with the trainer to assure comprehension.

2. PREREQUISITES

The Basic Engineering Surveys for Conservation Practices Training Module should be completed before attempting this training module.

3. HOW TO WORK WITH LANDOWNERS

Working with landowners in a comfortable, professional manner is a skill that is developed by each individual. Trainers have their own technique. Individual technique should not be copied. As you progress through different training locations and trainers, you will sort out those aspects of dealing with landowners that best suit your individual needs and personality. Keep in mind, the landowner has requested your assistance, and you are there to provide a service.

In discussing GSS with the landowner, keep the following topics in mind, and make sure that the landowner is aware of and understands them:

- practicality of structure being considered (long and short term, considering investment)
- does it fit within the landowner's objectives?
- is it affordable (discuss possible cost-share and requirements)?
- maintenance and operation (including time and costs, and related practices in the conservation system)
- other possible alternatives, alone or in combination

Discuss with your trainer the top three reasons that operators in your training location DO and DON'T choose GSS as a conservation practice.

4. PLANNING PROCESS

Throughout the training process, you will need to gather and document information that will ultimately result in a complete Conservation Plan. You should refer to the following list on a regular basis during your training to insure that all information has been compiled.

1. Identify problems and opportunities
2. Determine objectives
3. Inventory resources
4. Analyze resource data
5. Formulate alternatives
6. Evaluate alternatives
7. Make decisions
8. Implement the plan
9. Evaluate the plan

5. **INVENTORY**

Identify all data needed to provide and support inventory.

In the OFFICE:

- a. Site location on plat map
- b. Locate and outline work site on FSA aerial photo
- c. Locate and outline work site on soil survey
 - 1) Obtain appropriate soils descriptions or SCS-SOI-5 sheet(s) for work site
- d. Locate site on appropriate topographic map and outline watershed
- e. County Drain Maps (if available) to locate possible outlets
- f. Existing Conservation Plan (if available)

In the FIELD:

- a. Brief site description, including problem
- b. Recent operating history
 - 1) Field sizes and orientation
 - 2) Planter and/or equipment widths
- c. Objectives, both present and future
- d. Site characteristics that will effect practice
 - 1) Verify watershed boundary
- e. Resources and capabilities (financial, construction, and maintenance)
- f. Surrounding operators' activities that may effect practice
- g. Soil boring at construction site(s)
- h. Total erosion data for site, including cropping and transport factors

6. **INTERACTION BETWEEN PRACTICES AND SITES**

The art of selecting appropriate practices for the site.

You need to visit enough sites to obtain an understanding of where, why, and how this practice will solve a resource problem.

Discuss (with your trainer) the additional benefits this practice will provide for the public, such as reduce sedimentation by controlling concentrated flow erosion. Discuss practices that will provide similar protection. The pros and cons of each of those practices should to be included in the discussion. Discuss the scope and practicality of the practice and the entire conservation system. Review the limitations of being flexible with the standards and any guidelines.

Lastly, discuss complimentary practices such as upland watershed treatment (crop rotation, tillage, methods, and diversions) to control erosion. Then discuss their costs and benefits.

7. SCS-SOI-5s

As mentioned above, SOI-5s are important information sources that can be used in the planning process. In addition, soil descriptions and characteristics are available in soil surveys, FOCS, Customer Service Tool Kit, and Chapters 2 and 4 of the Engineering Field Handbook.

Information you will find in these sources include (but is not limited to) the following:

1. Texture
2. Suitability for water management
3. Hydrologic group
4. Depth to water
5. Corrosiveness for steel or concrete

8. PHOTO INTERPRETATION

A variety of aerial photography is available, depending on your location. As a minimum, you should refer to:

1. FSA master or individual section photos
2. FSA slides for the current year

In addition, you may have available:

1. Black and white stereoscopic photos
2. Infrared photography

9. PLANT IDENTIFICATION AND SUITABILITY

In those areas of construction that will not be utilized for crop production, a permanent, protective cover must be established. Using information previously determined as to soil suitability and degree of protection needed, you will refer to Technical Guide Standard 342, Critical Area Planting.

10. SITE SUITABILITY

You must be capable of identifying the needs required by any site situation. Not only must you know where a practice such as Grade Stabilization Structure (GSS) is applicable; you must be able to identify those situations where they are **NOT** a suitable practice. These situations could include some of the following:

1. Excessive slope
2. Watershed is too large or too small
3. No tile or structure outlet
4. Unreasonable cost/benefit ratio
5. Adverse effect on adjacent property due to backwater or concentrated delivery of flow
6. Land ownership vs. location of structure
7. Potential encroachment on adjacent property
8. Necessary easements

Although there is little substitute for actual experience, you can refer to Technical Guide Standard 410 (Grade Stabilization Structure) for basic information.

Once the suitability and need for a GSS is established, you need to assess the site for any characteristics that will require special needs during the installation of the practice. Again, experience is the best teacher.

TRAINER: You must provide the trainee as many opportunities as possible to observe sites in the field that both are and are not suitable to GSS.

11. AGENCY INVOLVEMENT

It is important to know that GSS, like most technical practices, depend on the involvement and cooperation of a variety of local and state agencies.

Due to the nature of GSS, and the needs determined by individual sites, you, the landowner, or both should contact the following:

1. FSA or NRCS – Availability of cost-share money
2. County Drain Commission – Legal outlets
3. Sedimentation and Erosion Control Office (varies county to county)
 - a. Applicable permits
4. Conservation District – Some have technical assistance available.
5. MDEQ – Applicability of PA 451, Natural Resources and Environmental Protection Act (wetlands, inland lakes and streams).
6. MISS DIG – All utilities
7. County Road Commission

12. SOURCES OF REFERENCE INFORMATION

You need to be aware of the available sources of information related to the design needs for GSS. There are several combinations that can be utilized to obtain the desired design for the specific location. The sources include the following:

- Field Office Technical Guide
 - Section I-C – Erosion Prediction
 - Section III – Resource Management Systems
 - Section IV – Conservation Practice Standards
 - Critical Area Planting, 342
 - Diversion, 362
 - Grassed Waterway or Outlet, 412
 - Lined Waterway or Outlet, 468
 - Sediment Basin, 350
 - Terrace, 600
 - Subsurface Drain, 606
 - Water and Sediment Control Basin, 638
- Engineering Field Handbook
 - Chapters 1 through 10, and 14
- SCS-SOI-5s

- Computer Programs
 - Michigan Engineering Programs
 - Curve Number and Peaks (EFM-2)
 - Hydraulic Formula
 - Water and Sediment Control Basins
- Michigan Design Procedure
 - Rock Chute
 - Water and Sediment Control Basin design programs from various sources
- Michigan Engineering Standard Drawings
 - There are numerous applicable drawings. Your trainer will assist with identifying those needs depending on the structure being considered.
- Engineering Staff
- Michigan Construction Specifications

13. COST ESTIMATE

Your trainer will work with you to identify components required by both the pre-design and the actual design procedure, and then estimate the costs based on the rates specific to your location. Your trainer will also instruct you on methods of determining local average costs of the design components.

You may use form MI-ENG-10, Job Cost Estimate when doing any cost estimate work.

14. EQUIPMENT

Your trainer will help you to identify equipment required to install and maintain this practice. Equipment required for maintenance by the operator (such as that needed to remove sediment or weir obstructions, replace broken treated lumber or risers) will be addressed and discussed during your initial field evaluation.

Your trainer will take the time to actually show you the equipment, and explain to you their purpose and use in building and maintaining the GSS.

15. CONTRACTORS

Your trainer will explain how NRCS works with contractors and how contractors can be developed into more efficient installers of practices. Keep in mind that the contractors are not working for you, they are working for the landowner. Your responsibility is to provide assistance and direction to the contractor so that they can adequately install the practice that the landowner has decided upon. This in itself (developing a working relationship with the contractors) can greatly increase your efficiency as well as reduce time-related costs for the landowner.

Your trainer will also discuss how to develop a list of available contractors that can be provided to the landowner.

16. SAFETY

NOTE: You are responsible for pointing out all required MIOSHA safety requirements on the work site. If the contractor fails to satisfy these requirements, NRCS assistance will no longer be provided (after notification of the landowner).

All safety requirements, both state and national, are contained in Part 503 of the National Engineering Manual. There is a copy of this manual in each Field Office. Note Part MI 503.04(g). **In an abbreviated form it states that if you see a safety problem and, after informing the contractor, landowner or project sponsor, no action is taken, you are to document the situation and leave the site.**

MI amendments in Part 503 contain all requirements for safety statements that must be contained within the package (construction drawings, specifications, and operation and maintenance) for any engineering design.

17. TIMING

Your trainer will discuss specific needs about timing requirements for the practice installation (sequence of component installation, suitable weather, and seeding deadlines).

Also, you must discuss with the landowner when installation is suitable in regards to existing crops in the construction area, as well as other time constraints (planting, haying, and harvesting).

18. EROSION CALCULATIONS

You must include all erosion calculations and documentation in the case file that is relevant to the site in question, as well as those areas within the watershed served by the GSS being installed. Erosion calculations are basic to all cropland conservation practices. You must calculate erosion rates both before and after the practice is installed. If you are unsure, review the calculation procedures with your trainer. You will be using the following, as appropriate:

- Revised Universal Soil Loss Equation
- Wind Erosion Equation
- Gully Erosion Equation

Reference sources and tools available include the following:

- Field Office Technical Guide, Section I-C
- Wind/Water Erosion Prediction Worksheet per Field Office

Appropriate documentation is a must. Include all major soil map units involved, slope lengths, percent slope, and allowable “C” factors, as well as length of gully, depth, top and bottom width, soil texture, and total years that the gully erosion has been active.

19. ENGINEERING

Your total training for this practice will include the following:

1. Surveying – refer to Engineering Field Handbook, Chapter 1.
2. Inventory investigation requirements (Watershed delineation, Soils and Soil Borings, Runoff Curve Numbers, Location of structure site, Structure alternatives, and Outlet requirements).
3. Drafting
4. Design – including appropriate standard drawings and specifications, as well as Hydrology (EFM-2, Curve Number and Peak Discharges - OHIO Engineering Program) and the Hydraulic Formula (OHIO Engineering Program).
5. Layout
6. Engineering Job Classification
7. Engineering Review and Approval Authority

20. PRACTICE INSTALLATION

Training in this section will include the following:

1. Use of the conservation plan.
2. Discussion of availability of materials or services needed.
3. Construction layout and supervision
4. Inspection
5. “As-Built” Approval
6. Certification (1200, AD-862)
7. Review of Operation and Maintenance requirements with landowner
8. Documentation for the case file
9. On site follow up within one year to evaluate installation decisions and the resulting outcome.