

Grassed Waterway – 412 DOCUMENTATION

I. Reference Materials

- a. Engineering Field Manual - Chapter Seven
- b. Supplement to Engineering Field Manual – Chapter Two and Seven
- c. SCS-TP-61 - Handbook of Channel Design for Soil and Water Conservation
- d. Section IV Technical Guide, Practice Standard 412, Grassed Waterway
- e. Hydrology Manual for North Dakota
- f. Soil Survey Report
- g. North Dakota Construction and Material Specifications for Conservation Practices

II. Site Investigation

The following is a list of items to be checked in the field:

- a. Does proposed waterway have an adequate and stable outlet?
- b. Determine waterway drainage area, average watershed slope, and weighted cover complex number.
- c. Log soils in waterway and review soil survey data. Is salinity a problem? Plot soils logs on waterway profile on Form ND-ENG-47.
- d. Is there a spring or base flow condition?
- e. Check for buried utilities.
- f. Determine engineering job class.

III. Design Surveys

- a. Survey notes shall be kept in loose-leaf or bound field notebooks. The notes will be kept in a format similar to that shown in Technical Release 62 and Chapter I, Engineering Field Manual.
- b. The surveyor will use sound professional judgement in gathering information for the design and construction of the grassed waterway. Information will be used to determine waterway grades and estimated quantities.

IV. Design

The design of a grassed waterway will be in accordance with Standard and Specification 412 Grassed Waterway or Outlet (Acre), Section IV, Technical Guide.

Grassed Waterway – 412 DOCUMENTATION

The steps in design are as follows:

- a. Plot centerline profile and cross sections on Form ND-ENG-59. Appropriate "E" or "N" sized sheets may be used if additional sheets are needed (SCS-ENG-315, SCS-ENG-315A, SCS-ENG-317, and SCS-ENG-317A).
- b. Determine 10 year, 24 hour, peak discharge for each waterway reach. Form ND-ENG-31 will be filled out. Chapter 5 of the Hydrology Manual for North Dakota or Chapter 2 of the Supplement to the Engineering Field Manual will be used for determining peak "Q's".
- c. Determine allowable velocities using tables in Standard and Specification 412 - Grassed Waterway or Outlet (Acre), Section IV, Technical Guide or SCS-TP-61.
- d. Determine the required waterway dimensions by using the tables in Chapter 7, Supplement to the Engineering Field Manual or by using SCS-TP-61.
- e. Determine earth work and seeding quantities. The volume of work in cubic yards will be determined by the method of average cross sectional end area.

V. Construction Plans and Specifications

The cooperator, contractor, and the cooperator's file will be provided a set of plans and specifications for the waterway construction. The plans can be Form ND-ENG-47 and ND-ENG-59, or appropriate "E" or "N" sized sheets, SCS-ENG-315, 315A, 317, and 317A.

The plans will contain, as a minimum, the following:

- a. Overall Plan View - May be superimposed on location map. Show stationing, identify reaches.
- b. Profile – Centerline of waterway. Show original ground superimposed on design, grade, stationing, reaches, etc. Centerline profiles are required.
- c. Cross Sections - Show typical cross sections for each reach.
- d. Construction Notes - Add notes to clarify or furnish direction in construction.
- e. Quantities – Estimates
- f. Job Approval

Grassed Waterway - 412 DOCUMENTATION

Construction specifications are to be provided with each set of plans. The North Dakota Construction and Material Specification for Conservation Practices shall be used for each item of work and material, as applicable or available. Additional specifications may need to be written to provide full material and installation instructions. A cover sheet and list of specifications is to be provided with the specifications.

VI. Layout

Layout surveys will be recorded in loose-leaf or bound survey books. Set necessary stakes for at alignment, depth, width, and side slopes. Set grade stakes as needed. Survey notes will be kept in the format as shown in Chapter I, Engineering Field Manual and/or Technical Release 62.

VII. Compliance Checking - "As-Built" Plans

- a. Compliance checking - record in field notes.
 1. For waterways where the drainage area is less than 40 acres:
 - (a) Record a minimum of one cross section per reach to verify width and depth.
 - (b) Measure length and area seeded.
 - (c) Check all quantities.
 2. For waterways where the drainage area is 40 acres or greater:
 - (a) Record a minimum of one cross section per reach not to exceed 400 feet between cross sections. Check centerline profile.
 - (b) Measure length and area seeded.
 - (c) Check all quantities.
 3. Statement of compliance on "as-built" plans - state the construction is complete according to plans and specifications. Date and sign by individual making determination.
 4. Statement regarding adequacy or status of vegetation and topsoil placement.
 5. Complete Form ND-ENG-47.

Grassed Waterway - 412 DOCUMENTATION

The key items to inspect on waterway construction are:

1. Waterway top width, bottom width, depth compliance, side slopes, finger dikes, field inlets, and depth of topsoil as appropriate.
2. Waterway grade compliance.
3. Seeding - proper mixtures, drills, rates and techniques are followed.

b. "As-Built" Plans

"As-built" plans are a record of constructed facilities. Changes from design are to be superimposed in a different color on the official file copy of the plans. On the "as-builts" show:

1. Significant design changes.
2. Significant changes in linear measurements.
3. Final quantities
4. Identify "as-builts" on plans