

## DOCUMENTATION REQUIREMENTS Heavy Use Area Protection - 561

### I. Reference Materials

- a. Engineering Field Manual - Chapter Seven
- b. ND Supplement to Engineering Field Manual – Chapters Two and Seven
- c. Section IV Technical Guide, Practice Standard 561, Heavy Use Protection
- d. Hydrology Manual for North Dakota
- e. Soil Survey Report
- f. North Dakota Construction and Material Specifications for Conservation Practices
- g. Suitable Computer Software:
  - Waterway Design (e.g. Ohio Program)
  - Watershed Hydrology (e.g. EFM2, EFH2, TR55)
  - Excel Spreadsheet Hydrology (e.g. ND-ENG-12)
  - Excel Spreadsheet Yardage (e.g. ND-ENG-1)

### II. Site Investigation/Data Collection

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

- a. Does the heavy use area require hard surfacing?
- b. Determine affects heavy use protection might have on drainage patterns, watershed drainage area, average watershed slope, and weighted cover complex number for areas needing water control.
- c. Does proposed heavy use protected area have adequate, stable outlets for increased or intercepted overland flows?
- d. Log soils and review soil survey data. Is there a spring or base flow condition? Will ditches be required? Linings or drop structures?
- e. Is the proposed surfacing the most practical and acceptable?
- f. Check for buried utilities, North Dakota ONE-CALL.
- g. 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. Electronic survey notes will be documented in a format that allows complete checking by others.
- 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 Plans and Specifications

The design of heavy use protection will be in accordance with Standard 561 Heavy use Area Protection, Section IV, Technical Guide.

The steps in design are as follows:

- a. Plot the area to be protected, soils logs, and representative topography (e.g. cross sections) on appropriately sized sheets, either hand drafted or CADD developed.
- b. Determine 2-10-25 year (or other as required), 24 hour, minimum peak discharge for each watershed area. Chapter 5 of the Hydrology Manual for North Dakota, Chapter 2 of the Supplement to the Engineering Field Manual, or appropriate software will be used for determining peak "Q's". Form ND-ENG-31, or computer printout showing all input and output, is required.
- c. Determine allowable velocities, depths of materials, beddings, filters, and other design values for materials considered. Materials should be commensurate with the value and use projected.
- d. Check all values using separate methods, such as tractive force/tractive stress, with accepted analytical tools such as HYCHL or manufacturer's data.
- e. Determine earth work, material and seeding quantities. The volume of work in cubic yards will be determined by the method of average cross sectional end area. Computations will be shown, or computer printout of all input and output.
- f. NRCS personnel must submit design folder and plans to the State Conservation Engineer for approval prior to installation.

#### V. Material and Construction Requirements

The cooperator, contractor, and the NRCS cooperator's file will be provided a set of plans and specifications for the waterway construction. The plans can be shown on Form ND-ENG-47 and appropriately sized grid or plan/profile sheets.

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

- a. Overall Plan View. This may be superimposed on the location map. Show stationing and identify reaches.
- b. Profile - Representative of the surfacing. Show original ground superimposed on design grade, stationing, reaches, etc. Representative cut or fill depths at uniform distances (e.g. 25-50 foot grid shots - original ground, excavated grade, final top elevation) are required. Topography and materials will dictate precision required. Accuracy of quantities is a primary concern.
- c. Cross Sections - Show typical cross sections for each reach. Cross sections are required at all significant changes in original cross section shapes and grades to calculate quantities. If a grid method of analysis is conducted, cross sections may be shown as "typical" or representative.
- d. Construction Notes - Add notes to clarify or furnish direction for construction.
- e. Quantities - Estimates based on cross sections, contours, or grids, as appropriate.

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 and Installation Procedures

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. Electronic survey notes will be documented in a format to allow complete checking by others.

- a. Set sufficient grade stakes for subbase and finish course, as applicable.
- b. Set grades and stake quantities of other needed items such as pipe, etc.
- c. Take sufficient shots during construction to insure the design grades are being met.

#### VII. Checkout

- a. Compliance checking - record in field notes.
  - (1) Record a minimum of elevations, using grid, contour, or cross-section methods, to accurately define reconstruction, excavated grades, and top elevations for all materials requiring measurement for payment. Surveys are required at all significant changes in original shapes and grades for yardage computations. Check sufficiently to verify widths, depths, and volumes, other items such as pipe sizes and designations.
  - (2) Measure lengths, areas seeded, check calculations of all quantities computations based on neat constructed lines and grades.
  - (3) Statement of compliance on "as-built" plans - that construction is complete according to plans and specifications, and adequacy or status of vegetation and topsoil placement. Date and sign by individual making determination.