

Technical Resources

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Engineering Spreadsheets

NOTICE – The following engineering spreadsheets have been developed to assist in the design of typical engineering practices. The designer should verify that the design complies with NRCS standards and that a standard applies to the site. The designer must understand the assumptions and calculations contained in the spreadsheets and is responsible for their use. Most if not all spreadsheets contain macros.

Many engineering spreadsheets are available for use. CAD drawings are available in the [Wisconsin eCAD drawings section](#).

These documents require Microsoft Excel.

** [Instructions for MS Excel 2007 Users](#) (PDF; 502 KB)*

Title	Description
Area By Coordinate Method	Calculates cross-section area or plane surface based on manual input of X and Y coordinate pairs.
Animal Units Calculator	Calculates the total number of animal units based on animal type, number of animals, and average weight, using a 1,000-pound equivalent. These calculations are needed to determine if a Wisconsin Pollutant Discharge Elimination System (WPDES) permit is needed (Wisconsin Administrative Code NR 243). Includes a Help tab.
BARNY	Evaluation of concentrated livestock areas using BARNY buffers. Includes a Help tab.
Barnyard Evaluation Rating Tool (BERT)	Rating tool for concentrated livestock areas to determine if the area is a resource concern by calculating a rating at the edge of a concentrated livestock area and the end of a buffer. Includes a Help tab.
BTU Conversion Calculator	The quantity of BTUs is calculated from the data entered for different energy sources. Conversion factors are included. Total BTU's will be the total of the BTU's calculated for each energy source. "BTU's saved" is calculated by subtracting "Total BTU's used with conservation system" from "Total BTU's used with baseline system." Energy savings percentage is calculated by dividing "BTU's Saved" by "Total BTU's used with baseline system."
Concrete Delivery Check, Job Sheet 821	Calculates concrete delivery tickets based on WCS-4 (3/19) criteria. Automates Job Sheet 821 calculations.
Concrete Mixture and Materials, Job Sheet 813	Calculates concrete design mixture and materials based on WCS-4 (3/19) criteria. Automates Job Sheet 813 calculations.
Concrete Evaporation Rate Calculator	Calculates concrete bleed water evaporation rates based on WCS-4 (6/16) criteria. Warnings are provided for rates that may cause drying shrinkage cracking.
Cross Section Plotting	Plots cross section of streambank based on manual input of elevation and distance for existing ground, top of water, constructed grade, and riprap. This spreadsheet could be modified for cross sections of other features.
Culvert Design	Calculates capacity of circular culverts based on culvert material, inlet type, diameter, and length. Analysis is also based on water and culvert elevation. Includes a Help tab.

Culvert Protection (MN TR-3)	Aids in design of riprap outlet basin for culverts. Includes three alternative designs: horizontal blanket, preformed scour hole, and lined channel expansion. Also aids in design of culvert inlet protection. Includes a Help tab.	
Drain Diaphragm Design	Calculates the size and placement of a filter diaphragm for pipes through dams. Includes a Help tab.	
Estimated Fill Computations	Calculates the estimated volume of earth fill required to build dikes or dams. Able to accommodate sloping land, upstream and downstream berms, and core trenches. Also does calculations with percentages for compaction and settlement.	
Feed Storage Area Runoff - Treatment (Pre-2016 Standard)	Calculates runoff using EFH-2, the size of the vegetated treatment area, and the first flush (the initial contaminated runoff volume), the size of pump needed, the size of the tank, and the annual runoff volume collected. Includes a Help tab.	
Flood Frequency USGS 2017 Method	Calculates peak flood discharge for streams with large drainage areas based on the USGS report, "Flood-Frequency Characteristics of Wisconsin Streams." Inputs depend on the Wisconsin Flood Frequency area. Includes a Help tab. Read the help sheet for Ksat units explanation.	
Gradation (Riprap - EFH Chapter 17 Method)	Calculates riprap gradation from manual inputs of measured sample. Includes a Help tab.	
Gradation (Rock Chute - EFH Chapter 6)	Calculates riprap rock chute gradation from manual inputs of measured sample. Includes a Help tab.	
Grassed Waterway Design	Aids in grassed waterway design using Chapter 2 of the Engineering Field Handbook hydrology routine. Read the help sheet for Ksat units explanation.	
Lakeshore Riprap Design Computations	Assists with design, calculates the quantities of riprap, geotextile, and filters needed based on lakeshore length, wind direction, lake depth, wave height, lake elevation, and rock design. There is no Help tab. Use Engineering Field Handbook, Chapter 16; and Wisconsin NRCS FOTG Standard 580 for help with design inputs.	
Lined Waterway Design	Assists in lined waterway design. If peak flows of the watershed are unknown, a copy of Chapter 2 of the Engineering Field Handbook is included. Includes a Help tab.	
Livestock Pipeline - Single Line	Calculates single line pipeline pressure based on user inputs. Includes a Help tab.	
Livestock Pipeline - Multiple Spurs	Calculates multiple line pipeline pressure based on user inputs. Up to six separate pipelines or spur lines can be accommodated. Includes a Help tab.	
Manning's N Applications (Trapezoidal and Circular)	Calculates capacity and velocity of trapezoidal or circular flow conduits by using Manning's equation.	
Milking Center Waste Volume	Calculates estimated milking center wastewater volume based on many user inputs such as size of milking system, whether there is a plate cooler, parlor washdown, milk house wash down, bulk tank wash, etc. Includes a Help tab.	1
Milking Center Wastewater Treatment - Buffer Process	Calculates size of buffer needed for milkhouse wastewater based on user inputs. Includes a Help tab.	
Natural Channel Flow	Calculates the flow capacity of a stream which varies in roughness across its profile. Up to 24 different sets of cross section data can be entered. Includes a Help tab.	1
Peak Discharge, EFH Chapter 2 Method	Calculates hydrology (peak discharge, runoff volume, etc.) for small watersheds using the method found in Chapter 2 of the Engineering Field Handbook. Data is based on user input such as drainage area, slope, and soil hydrologic group.	
Pond	Assists with designing embankment pond structures with pipe outlets following procedures in Chapters 3 and 6 of Engineering Field Handbook. Watershed peak flow calculations are also included. Includes a Help tab.	
Pump Sizing	Determines pump size depending on user inputs. Inputs require some knowledge and experience with pump sizing.	
Quantities	Returns a plan sheet (Standard Drawing 005) and cost estimate, and includes dropdowns for specs.	
Riprap Lined Plunge Pool for Cantilever Outlet (DN-6)	Calculates riprap-lined plunge pool location and dimensions and volumes of excavation, riprap, and geotextile below water surface. The data inputs are from Design Note 6 and outputs are	

	for Standard Drawing 320. Use when drop from pipe outlet invert to calculated tailwater is greater than or equal to the outlet pipe diameter.	
Riprap Lined Plunge Pool for Cantilever Outlet (ASABE)	Calculates riprap-lined plunge pool location and dimensions. The data inputs are from ASABE paper 94-2541 and the outputs are for Standard Drawing 320. Use when drop from pipe outlet invert to calculated tailwater is less than the outlet pipe diameter or the invert is flooded up to $0.7 \times$ the outlet pipe diameter.	
Rock Chute	Assists in designing rock chutes based on user inputs such as channel geometry, design storm data, and output profile and cross section. Calculates required D50 and quantities. Includes a Help tab.	1
Rock Riprap Lined Waterway Design	Assists in rock riprap lined waterway design. Calculates required D50 and quantities. Design follows the practice standard issued March 2013. Includes a "Help" tab.	1
Roof Gutter Design	Assists in designing roof gutters, downspouts, and roof gutter underground outlets, and is based on Wisconsin NRCS FOTG Standard 558. Includes a Help tab.	
Roof Gutter Design (simple)	Simplified version of the Roof Gutter Design spreadsheet. Includes a Help tab.	1
Seeding Mixes - Engineering	Seeding Plan sheet for 342 STANDARD mixes commonly used with engineering projects. Includes a Help tab.	1
WI-Seed Calculator STANDARD Mix - 2018	Seeding plan sheet for standard 327, 342, and 512 mixes. Includes a Help tab.	
WI-Seed Calculator CUSTOM Mix - 2017	Calculates amount of seed per acre and total pounds of seed needed for CUSTOM mixes. Also includes fertilizer recommendations, seeding dates, temporary cover crop and companion crop requirements. Includes a Help tab.	
Stadia Survey Notes Converted to N-E-Elevation SSRP - Transit & Stadia Board	Converts conventional survey notes into data suitable for downloading into CADD. Includes a Help tab.	
Stadia Survey Notes Converted to N-E-Elevation SRP-EDM-PRISM True Slope	Converts conventional survey notes into data suitable for downloading into CADD. Includes a Help tab.	
Streambank Protection	Assists with design, calculating quantities, and cost computations for the design of a rock riprap streambank protection project. Works with Chapter 16 of the Engineering Field Handbook, Wisconsin NRCS Standard Drawing Series 404. Includes a Help tab.	
Stream Classification	Spreadsheet helps to classify a stream according to the Rosgen method from field collected data. (Chapter 16 of the Engineering Field Handbook) Includes a Help tab.	
Thrust Blocks	Design and installation of Thrust Control devices according to Part 636 Structural Engineering National Design Handbook, Chapter 52 Structural Design of Flexible Conduits.	
TR-55 Peak Runoff Calculation	Calculates the peak flow runoff from a watershed using the graphical method from TR55, Urban Hydrology for Small Watersheds, based on user inputs of drainage area, channel shapes and slopes, and soil hydrologic group. Includes a Help tab.	
Unit Conversions	Conversion tool for distance, area, volume, flow, velocity, force, mass, acceleration, angle, time, and temperature.	
Underground Outlet Design Computations	Assists in sizing underground tile lines for both pressurized and non-pressurized flow conditions. Allows up to 5 inlets and 5 tile reaches, and will assist in selecting an appropriate surface inlet if one is needed. Used for round conduits only, but can accommodate round and rectangular orifices. Includes a Help tab.	
VTA Barnyard or Feed Storage (Large Size) [Sept 2016 Standard]	The Spreadsheet calculates the minimum size of a VTA to balance both the site's contributing water runoff and delivered nutrients. The larger of the two calculations must be used to	

	balance both the annual runoff and delivered nutrients.	
VTA Barnyard (Animal Lot) (Medium Size, any Distance & Small Size, Medium Distance) [Sept 2016 Standard]	This Spreadsheet calculates the annual Phosphorus (P) loading estimated to be delivered. It calculates 69 different individual storms and sums the individual loadings to obtain the annual loading. The user makes a few design choices before selecting the length that satisfies three criteria in the standard.	:
VTA Barnyard (Animal Lot) (Small size, Long Distance) [Sept 2016 Standard]	This Spreadsheet calculates the annual P (Phosphorus) loading estimated to be delivered. It calculates 69 different individual storms and sums the P loading to obtain the annual loading. The user makes a few design choices before selecting the length that satisfies three criteria in the standard.	:
VTA Feed Storage (Medium Size & Small size, Medium and Long Distances) [Sept 2016 Standard]	This spreadsheet calculates size of a vegetated treatment area to treat feed storage runoff for three different conditions.	
Vegetated Treatment Areas (Pre-2016 Standard)	Assists in designing three different treatment strip buffers: slow rate infiltration, overland flow, and buffer design using BARNY. Includes a Help tab.	1
Waste Storage Design	Assists in design of waste storage facilities based on user inputs of animal type and number, bedding used, number of days needed to store manure, feedlot area, etc. Outputs include dimensions of storage pond, cut and fill volumes, percent solids, and linear quantities. Includes a Help tab.	

For more information on the Wisconsin Engineering Spreadsheets, email scott.mueller@usda.gov

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