

PROFICIENCY MODEL
810/819 Civil/Agricultural Engineer (GS-5/7/9)

The following sheets identify subjects, practices and formal training that should be covered to prepare an engineer for promotion to the GS-11 level in Michigan. The supervisor initials and dates the worksheet when the engineer has achieved the planned proficiency level, has obtained the experience, or has successfully completed the course. This is intended to help engineers and their supervisors develop their professional skills and prepare them for future promotions.

Subject	Elements	Full Performance KSA Level	Available Training Methods	References
A. Policy	Knowledge of NRCS Engineering policy and how it applies to the planning, design, and implementation of conservation engineering practices.	3	<ul style="list-style-type: none"> • Conservation Boot Camp • Basic Conservation Assistance - Michigan • Introduction to NRCS - Michigan • Introduction to NRCS - NEDC New Professional Engineers, Geologists, and Landscape Architects - NEDC 	<ul style="list-style-type: none"> • National Engineering Manual
B. Programs	Knowledge of USDA Conservation Programs and how they apply to implementation of conservation practices.	3	<ul style="list-style-type: none"> • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • USDA Conservation Program Manuals (e.g. EQIP, WHIP, WRP)
C. Engineering Surveys	Knowledge of basic engineering surveying principles needed for planning, design, and implementation of conservation engineering practices. These principles include the types of surveys, types of equipment, note keeping, note reduction, and care and handling of survey equipment.		<ul style="list-style-type: none"> • Conservation Boot Camp • Basic Conservation Assistance - Michigan • Michigan Conservation Training Module – Basic Engineering Surveys for Conservation Practices • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • National Engineering Manual, Part 540 - Field Surveys, Part 544 - Equipment • Engineering Field Handbook (NEH Part 650), Chapter 1 - Engineering Surveys • Technical Release No. 62, Engineering Layout, Notes, Staking and Calculations
	• Bench level circuit	4		
	• Cross-sections and profiles	4		
	• Topographic	4		
	• Construction layout	4		
	• Construction check	4		
	• Note keeping and note reduction	4		
	• Checking and adjusting instruments	4		
• Care and handling of equipment	4			
D. Hydraulics	Knowledge of and ability to appropriately apply hydraulics in the planning, design, and installation of conservation practices.		<ul style="list-style-type: none"> • Conservation Boot Camp • Michigan Conservation Training Modules for appropriate engineering practices • OJT (including state and area workshops) • Introduction to Water Surface Profiles 	<ul style="list-style-type: none"> • National Engineering Manual, Part 534 - Hydraulic Engineering • Engineering Field Handbook (NEH Part 650), Chapter 3 - Hydraulics
	• Pipe Flow (inlet control and outlet control)	4		
	• Open Channel Flow – earth and vegetated	4		
	• Open Channel Flow – lined or armored	4		
	• Weir Flow	4		
	• Orifice Flow	4		

Knowledge, Skills, and Abilities (KSAs):

1 = Aware

2 = Understand

3 = Perform with supervision

4 = Apply independently

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E. Hydrology	Knowledge of and ability to appropriately apply hydrology in the planning, design, and installation of conservation practices.		<ul style="list-style-type: none"> • Conservation Boot Camp • Hydrology Training Series (Self-Paced Modules) - NEDC • Michigan Conservation Training Modules for appropriate engineering practices • Introduction to Watershed and Floodplain Modeling - NEDC • Hydrology Tools for Wetland Restoration and Determination -NEDC • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • National Engineering Manual, Part 530 - Hydrology • Engineering Field Handbook (NEH Part 650), Chapter 2 - Estimating Runoff and Peak Discharges • Engineering Field Handbook (NEH Part 650), Chapter 19 – Hydrology Tools for Wetland Determination • Technical Release No. 55, Urban Hydrology for Small Watersheds
	• Watershed Delineation	4		
	• Curve Numbers	4		
	• Rainfall	4		
	• Runoff	4		
	• Time of Concentration	4		
	• Peak Discharge	4		
	• Hydrograph Development and Routing	2		
• Wetland Determination – Hydrology Factors	3			
F. Construction Inspection	Ability to perform construction inspection to ensure the practice is installed in accordance with the approved construction drawings and specifications and in accordance with the applicable conservation practice standard(s). Includes the following functions and materials:		<ul style="list-style-type: none"> • Conservation Boot Camp • Basic Conservation Assistance - Michigan • Michigan Conservation Training Modules for appropriate engineering practices • Michigan Conservation Training Module – Concrete Construction • Construction Inspection - NEDC • Concrete Fundamentals - NEDC • Soil Compaction and Field Control - NEDC • Liner Design for Animal Waste Containment - NEDC • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • National Engineering Manual, Part 501 - Authorizations, Part 503 - Safety, Part 512 - Construction • FOTG Section IV – Conservation Practice Standards • Engineering Field Handbook (NEH Part 650) • Michigan CO-01 Construction Specifications • Michigan Engineering Standard Drawings
	• Inspection Documentation	4		
	• Sampling and Testing	4		
	• Safety	4		
	• Concrete			
	• Earthfill	4		
	• Excavation	4		
	• Pipe	4		
	• Reinforcing steel for concrete	4		
• Rock	4			

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Subject	Elements	Full Performance KSA Level	Available Training Methods	References
G. Animal Waste Management	Knowledge of and ability to appropriately plan, design, and install conservation practices related to manure, wastes, and wastewater from livestock operations.		<ul style="list-style-type: none"> • Conservation Boot Camp • Michigan Conservation Training Modules for appropriate engineering practices • New Professional Engineers, Geologists, and Landscape Architects - NEDC • Liner Design for Animal Waste Containment - NEDC • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • National Engineering Manual, Part 537 - Environmental Engineering • Agricultural Waste Management Field Handbook (NEH Part 651) • National Engineering Handbook (NEH), Part 637 - Environmental Engineering
	<ul style="list-style-type: none"> • Waste Storage - solid manure 	4		
	<ul style="list-style-type: none"> • Waste Storage - semi-solid and liquid manure 	4		
	<ul style="list-style-type: none"> • Lot Runoff 	4		
	<ul style="list-style-type: none"> • Milkhouse and Milk Parlor Wastewater 	4		
	<ul style="list-style-type: none"> • Silage Leachate and Bunk Silo Runoff 	4		
	<ul style="list-style-type: none"> • Comprehensive Nutrient Management Plans (CNMP) • Composting Manure and Mortality 	3		
H. Engineering Practice Support Data Documentation	Ability to develop and/or compile a complete record of planning, design, installation, and maintenance to ensure an effective practice. Record elements include the following:		<ul style="list-style-type: none"> • Conservation Boot Camp • Basic Conservation Assistance - Michigan • Michigan Conservation Training Modules for appropriate engineering practices • AutoCAD training videos • AutoCAD/MAP training CDs • Eagle Point training WebEx CDs • ARC View or ARC GIS on-line training • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • National Engineering Manual Part 501 - Authorizations, Part 511 - Design, Part 541 - Drafting and Drawing • FOTG Section IV – Conservation Practice Standards • FOTG Section IV – Statement of Work (SOW) for each conservation practice • Engineering Field Handbook (NEH Part 650), Chapter 5 – Preparation of Engineering Plans • Michigan CO-01 Construction Specifications • Michigan Engineering Standard Drawings • Midwest Region, NRCS, Computer Aided Design and Drafting (CADD) Standards and Guidelines
	<ul style="list-style-type: none"> • Inventory and Evaluation records 	4		
	<ul style="list-style-type: none"> • Design records (survey notes, calculations, design assumptions, etc.) 	4		
	<ul style="list-style-type: none"> • Construction drawings – Standard drawings and special designs 	4		
	<ul style="list-style-type: none"> • AutoCAD/MAP and Eagle Point 	4		
	<ul style="list-style-type: none"> • ARC View/ARC GIS 	3		
	<ul style="list-style-type: none"> • Specifications – CO-01 	4		
	<ul style="list-style-type: none"> • Specifications - NEH Part 642 - Specifications for Construction Contracting; Items of Work and Construction Details 	2		
	<ul style="list-style-type: none"> • Cost estimates 	4		
<ul style="list-style-type: none"> • Reviews and approvals (design and construction) 	4			

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Subject	Elements	Full Performance KSA Level	Available Training Methods	References
I. Soil Erosion & Sedimentation	Knowledge of soil erosion/sedimentation and sediment delivery principles and the factors that affect these processes. Knowledge of the methods for estimating soil erosion/sedimentation and sediment delivery.	2	<ul style="list-style-type: none"> • Conservation Boot Camp • Basic Conservation Assistance - Michigan • Michigan Conservation Training Modules • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • FOTG Sec. I, Erosion Prediction
J. Soil Science	Knowledge of soil science principles including soil morphology and the USDA Soil Classification system. Knowledge of the use of soil surveys in the planning, design, and installation of conservation practices.	2	<ul style="list-style-type: none"> • Conservation Boot Camp • Basic Conservation Assistance - Michigan • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • County Soil Surveys
K. Soil Mechanics and Geology	Knowledge of and ability to appropriately apply soil mechanics and geology in the planning, design, and installation of conservation practices.		<ul style="list-style-type: none"> • Conservation Boot Camp • Michigan Conservation Training Modules for appropriate engineering practices • Soil Mechanics Training Series (Self-Paced Modules) - NEDC • New Professional Engineers, Geologists, and Landscape Architects - NEDC • Soil Compaction and Field Control - NEDC • Liner Design for Animal Waste Containment - NEDC • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • National Engineering Manual Part 531 - Geology, Part 533 - Soils Engineering • Engineering Field Handbook (NEH Part 650), Chapter 4 – Elementary Soils Engineering • Engineering Field Handbook (NEH Part 650), Chapter 12 - Springs and Wells • Agricultural Waste Management Field Handbook (NEH Part 651), Chapter 7 - Geologic and Ground Water Considerations • National Engineering Handbook (NEH), Part 631 - Geology • County Soil Surveys
	<ul style="list-style-type: none"> • Engineering Properties of Soils 	3		
	<ul style="list-style-type: none"> • Unified Soil Classification System 	3		
	<ul style="list-style-type: none"> • On-site Subsurface Investigations 	3		
	<ul style="list-style-type: none"> • Ground Water 	2		

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L. Conservation Practices	<p>Ability to identify need for and appropriate implementation of conservation engineering practices to solve natural resource problems. Includes ability to appropriately execute Inventory & Evaluation, Design, and Construction elements of practice implementation for the practices listed.</p> <p>Consider the following aspects for each practice:</p> <ul style="list-style-type: none"> - Inventory & Evaluation (I&E) - Survey - Design - Construction Drawings and Specifications - Layout - Construction Inspection - As-Built Drawings - Operation & Maintenance (O&M) 		<ul style="list-style-type: none"> • Conservation Boot Camp • Basic Conservation Assistance - Michigan • Michigan Conservation Training Modules for appropriate engineering practices • OJT (including state and area workshops) 	<ul style="list-style-type: none"> • FOTG Section IV – Conservation Practice Standards • FOTG Section IV – Statement of Work (SOW) for each conservation practice • Engineering Field Handbook (NEH Part 650) • Agricultural Waste Management Field Handbook (NEH Part 651) • Michigan CO-01 Construction Specifications • Field Office Technical Reference Center – Technical Reference Materials • Engineering Software, e.g. Ohio Engineering Software, Agricultural Waste Management Software, etc. • Stream Corridor Restoration: Principles, Processes, and Practices (NEH Part 653) • Michigan Engineering Standard Drawings • National Operation and Maintenance Manual
	Access Road (560)	4		
	Agrichemical Containment Facility (702)	4		
	Animal Trails and Walkways (575)	4		
	Diversion (362)	4		
	Fence (382)	4		
	Grade Stabilization Structure (410) <ul style="list-style-type: none"> - Pipes - Straight drops - Chutes - rock/block - Chutes - geotextile reinforced vegetated 	4		
	Grassed Waterway (412)	4		
	Heavy Use Area Protection (561)	4		
	Lined Waterway (468)	3		
	Manure Transfer (634)	4		

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L. Conservation Practices (cont.)	Pipeline (516)	3		
	Pond (378) - Excavated - Embankment	4		
	Pumping Plant (533)	3		
	Roof Runoff Management (558)	4		
	Streambank and Shoreline Protection (580) - Structural (including Bioengineering) - Vegetative	3		
	Stream Crossing (578)	4		
	Subsurface Drain (606)	4		
	Surface Drain – Field Ditch, Main or Lateral (607, 608)	3		
	Underground Outlet (620)	4		
	Use Exclusion (472)	4		
	Waste Facility Cover (367)	3		
	Waste Storage Facility (313) - Pond - Structure – Solid stacking - Structure – Concrete tank	4		
	Wastewater Treatment Strip (635)	3		
	Water and Sediment Control Basin (638)			
	Watering Facility (614)	3		
	Water Well (642)	3		
	Well Decommissioning (351)	3		
	Wetland Restoration (657)	4		

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1/10/2006 (rev.)

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Subject	Elements	Source	References
M. Courses	The following is a summary of the training courses identified in the previous Subject areas.		Each course will identify individual references for the course.
Little Experience (<1 year)	Conservation Boot Camp	NEDC	
	Introduction to NRCS	NEDC	
	Introduction to NRCS-Michigan	NRCS-Michigan	
	Basic Field Conservation	NRCS-Michigan	
	New Professional Engineers, Geologists, and Landscape Architects	NEDC	
	Hydrology Training Series	NEDC	
	Introduction to the Field Office Technical Guide	NEDC	
	Conservation Training Module - Basic Engineering Surveys for Conservation Practices	Michigan	
Some Experience (1-4 years)	Construction Inspection	NEDC	
	Conservation Planning for Non-Planners	NRCS-Michigan	
	Agricultural Waste Management – Primer	NEDC	
	Agricultural Waste Management – Level 2	NEDC	
	Concrete Fundamentals	NEDC	
	Contract Administration for Construction Contracts	NEDC	
	Managing for Excellence	NEDC	
	Soil Mechanics Training Series	NEDC	
	Conservation Training Module - Concrete Construction	Michigan	
	Conservation Training Module - Grade Stabilization Structures	Michigan	
	Conservation Training Module - Grassed Waterway and Diversion Planning, Design, and Construction	Michigan	
	Conservation Training Module - Agrichemical Containment Facility	Michigan	
	Conservation Training Module - Watering Systems for Livestock	Michigan	
Experienced (>4 years)	Contracting Officer’s Technical Representative (COTR)	Vendor	
	Soil Compaction and Field Control	NEDC	
	Liner Design for Animal Waste Containment	NEDC	
	Soil Bioengineering	NEDC	
	AutoCAD training videos	Vendor	
	AutoCAD/MAP training CDs	Vendor	
	Eagle Point training WebEx CDs	Vendor	
	Effective Presentations	NEDC	
Specialized	Introduction to Watershed and Floodplain Modeling	NEDC	
	Hydrology Tools for Wetland Restoration and Determination	NEDC	
	Army Corps of Engineers Reg. IV (Wetlands)	COE	
	Wetland Restoration and Enhancement	NEDC	
	Introduction to Water Surface Profiles (in development stage)	NEDC	