

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

ACCESS ROAD

(Ft)

CODE 560

**DEFINITION**

A roadway constructed as part of a conservation plan.

**PURPOSE**

To provide a fixed route of travel for moving livestock, produce, equipment, and supplies; and to provide access for proper operation, maintenance, and management of livestock or conservation enterprises while controlling runoff to prevent erosion or improve water quality.

**CONDITIONS WHERE PRACTICE APPLIES**

Where access is needed from a private or public road or farmstead to a conservation enterprise or measure, or where roadways are needed in a planned land use or livestock management area.

**CRITERIA**

**General criteria.** Watercourses and water quality shall be protected during and after construction by erosion-control facilities and maintenance. Filter strips, sediment and water control basins, and other conservation practices shall be used and maintained as needed.

Dead end roads shall be provided with a turnaround. In some areas turnarounds may also be desirable for stream, lake, recreation, or other access purposes.

Parking space as needed shall be provided to keep vehicles off the road or from being parked in unsafe or undesirable locations.

Access roads shall be designed to serve the enterprise or planned use with the expected vehicular, livestock or equipment traffic. The type of vehicle or equipment, frequency of usage, speed, loads, climatic, and other conditions under which vehicles and equipment are expected to operate need to be considered. Where roads are built primarily for livestock travelways or feeding access, all weather usage is normally required. Decisions regarding planned road usage will be documented in the design folder.

Visual resources and environmental values shall be considered in planning and designing the road system.

Access roads range from seldom used trails to all-weather roads heavily used by the public and built to very high standards. Some trails facilitate control of forest fires, are used for logging, serve as access to remote areas for recreation, or are used for maintenance of facilities.

Where general public use is anticipated, roads shall be designed to meet applicable Federal, State, or local criteria.

If applicable, County or Township regulations regarding roadways on private land, shall be met.

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Sound engineering practices shall be followed to insure that the road safely meets the requirements of its intended use and that maintenance requirements are in line with operating budgets.

**Location.** Roads shall be located to serve the purpose intended, to facilitate the control and disposal of water, to control or reduce erosion, to make the best use of topographic features, and to include scenic vistas where possible. The roads should generally follow natural contours and slopes to minimize disturbance of drainage patterns. Roads should be located where they can be maintained and so water management problems are not created. To reduce pollution, roads should be located as far away from watercourses as possible.

**Alignment.** The gradient and vertical and horizontal alignment shall be adapted to the intensity of use, mode of travel, and the level of road development.

Grades normally should not exceed 10 percent except for short lengths, but maximum grades of 20 percent or more may be used if necessary for special uses.

For recreational enterprises, the minimum horizontal radius of curvature along the road centerline will be:

- 40 ft. for recreational vehicles
- 50 ft. for vehicles with trailers 30 ft. long or less
- 80 ft. for vehicles with trailers longer than 30 ft.

Vertical curves will be used to avoid abrupt changes in grade. For recreational enterprises or other purposes designed for two-wheel drive vehicles, the minimum curve length will be:

Change in Grade (Percent)	Minimum Length (Feet)
5 or less	35
5.1 - 10	70
10.1 - 15	105
15.1 - 20	140
20.1 - 24	175

**Width.** The minimum design roadbed and surfaced widths are shown in the table below.

**Minimum Design Width**

Roadway Purpose	Surfaced Width	Shoulder Width (each side)	Increased surfaced width to accommodate trailer traffic
1 Way Vehicular Traffic	10 ft	2 ft	4 ft
2 Way Vehicular Traffic	16 ft	2 ft	4 ft
Single Lane Farm Equipment or Logging.	10 ft. Min, or travel equip. outside tread width plus 3 ft	2 ft	
Livestock Travelways	8 ft	None	

Where turnouts are used, the one way paved width shall be increased to a minimum of 20 ft. for a distance of 30 ft.

The clear travel width and alignment of roadways designed for agricultural or logging operations must be planned to accommodate the use of travel equipment attachments, such as combine grain heads.

Curve Widening. Widening of the traveled way is required on some curves to provide for the offtracking of tractor-trailer vehicles and for some light vehicle-trailer combinations. Curve widening to accommodate the design vehicle is considered a part of the traveled way.

**Side slopes.** All cuts and fills shall have side slopes designed to be stable for the particular site conditions. Slopes are not to be graded steeper than 2 horizontal to 1 vertical.

Areas with geological conditions and soils subject to slides shall be avoided or treated to prevent slides. In questionable soils, the road will be located in a manner to minimize cuts and fills.

**Earthfill** required to build the road base will be compacted to these minimum requirements:

- Fill will be placed in uniform horizontal layers at a maximum thickness of 9" prior to compaction.
- The moisture content of the fill prior to compaction must be suitable to form a hand held ball that does not break apart.
- Each layer of fill will be uniformly tracked by a minimum of 4 passes of rubber tired equipment with a minimum wheel load of 4000 lb. Additional compactive effort or soil stabilization may be necessary for terraced fills.

**Drainage.** Roadway surfaces are to be crowned or sloped to remove surface water from the wearing surface. The amount of crown or slope should be between 1 and 4 %. If the cross slope is too flat, water remains on the road surface for a longer period of time and may penetrate into the base course and subgrade. A large buildup of moisture below the surface may cause instability and severely reduce the road's load-carrying capabilities.

Roads built along or benched into a hillside may be insloped (graded toward the cut) or outsloped (graded down the hillside) depending on the resistance of the soil to erosion and based on the benefits of dispersing water.

Outsloping can be hazardous when roads become slippery. The cross grades of roads should not exceed 4 percent because slow moving vehicles, have a tendency to slip sideways when they lose their momentum on slippery surfaces. This is particularly troublesome on horizontal curves.

Water breaks or bars may be used to control surface runoff on low-intensity use roads. These structures must be spaced at intervals to prevent the combination of water volume and velocity from beginning to displace the surface materials.

The type of drainage structure used will depend on the type of enterprise and runoff conditions. Culverts, or grade dips for water management shall be provided at all natural drainageways. The capacity and design shall be consistent with sound engineering principles and shall be adequate for the class of vehicle, type of road, development, or use. As a minimum, drainage systems shall be designed to safely convey runoff from the 2-year frequency storm. The minimum culvert diameter is 12 inches. Vehicle safety must be considered in the planning and design of drainageways within or adjacent to the roadway.

Roadside ditches shall be adequate to provide surface drainage for the roadway and deep enough, as needed to serve as outlets for subsurface drainage. Ditches shall be designed to be on stable grades or protected with structures or linings for stability.

**Surfacing.** Access roads shall be given a wearing course or surface treatment if required by traffic needs, travel frequency, climate, erosion control, or dust control. The type of treatment depends on local conditions, available materials, and the existing road base. If these factors or the volume of traffic is not a problem, no special treatment of the surface is required.

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Unsurfaced roads will require controlled access to prevent damage or hazardous conditions during adverse climatic conditions. Where access cannot be controlled during these conditions, then surfacing is required.

Toxic or acid-forming materials shall not be used on roads. This should not be construed to prohibit use of chemicals for dust control and snow and ice removal.

Roads planned to be paved with asphalt or concrete shall have a designed base of crushed aggregate or other approved material. Paving shall be in accordance with good highway practice for the area.

**Aggregate Roadways.** Aggregate roadways consist of aggregate base material, overlain with surface material.

The design criteria must consider whether the roadway subgrade will be “wet” or “dry” during roadway usage.

A “dry subgrade” design must meet the following criteria and be documented in the design folder:

- The soil must be mapped as “well drained” or be in hydrologic soil group A or B
- The site topography must be such that water will not pond on the planned roadway
- The planned roadway usage does not require access by livestock or vehicles during periods when the subgrade is likely to be saturated. For winter feeding access, the planned roadway usage is during dry periods or on frozen soil.

All installations not meeting “dry subgrade” criteria are to meet “wet subgrade” design criteria.

Where roadways are planned in areas where the roadway subgrade is likely to be saturated (wet subgrade) during road usage, geotextile underlayment is required.

Geotextile Fabric Minimum Average Roll Values (MARV):

- Minimum tensile strength (ASTM D 4632) – 120 lb
- Elongation at failure (ASTM D 4632) -- < 50% for woven; ≥ 50% for non-woven
- Minimum burst strength (ASTM D 3786) – 210 psi
- Minimum puncture strength (ASTM D 4833) – 60 lb
- Apparent opening size (ASTM D 4751)  
    ≤ # 40 U.S. Standard Sieve (AOS) ≥ # 100 U.S. Standard Sieve (≤0.42mm (AOS) ≥ 0.149mm)
- Permittivity (ASTM D 4491) ≥ 0.03 sec<sup>-1</sup> , ≤ 0.70 sec<sup>-1</sup>
- Minimum ultraviolet light protection (% residual tensile strength, ASTM D4355) – 70%

Non woven geotextile is preferred over woven geotextile for this application because of improved drainage and less tendency for the granular material to slide on the geotextile surface during construction.

The minimum finished thickness of the crushed aggregate base, designed primarily for all weather livestock access, is 6 inches. Where the roadway is designed for all weather vehicular traffic, an 8 inch finished base thickness is required.

The minimum thickness for crushed aggregate screenings or sand placed on top of the base, for use as a surface for livestock travel, is 3 inches. This 3-inch layer is considered only as a sacrificial wear surface and not part of the structural base.

The following tables can be used to configure aggregate roadways using alternate base and surface materials.

Roadway Material Configurations for <b>Wet Subgrade</b> (minimum finished compacted thickness)						
Roadway Material	Livestock only			Livestock & Vehicular Traffic (or vehicular traffic only)		
	A	B	C	A	B	C
AASHTO M 43 # 1 or 2	4"	4"		6"	4"	
AASHTO M 43 # 57 or 67	2"			2"		
<u>2/</u> ODOT 304.02 or 411.02		2"	6"		4"	8"
<u>3/</u> Screenings (roadway surface)	3"	3"	3"	3"	3"	3"

Roadway Material Configurations for <b>Dry Subgrade <u>4/</u></b> (minimum finished compacted thickness)		
Roadway Material	Livestock & Vehicular Traffic	
	A	B
<u>1/</u> AASHTO M 43 # 1 or 2	4"	
<u>2/</u> ODOT 304.02 or 411.02		4"
<u>3/</u> Screenings (roadway surface)	3"	3"

1/ The voids between the stone are to be choked with fines (57s', 67s', 304s' or 411s') to create a smooth surface.

2/ Compaction is required for roadway materials containing fines (e.g. 304's & 311's). Compact by tracking the entire surface with a minimum of 4 passes of a drum roller, or vibratory drum roller. Rubber tired equipment having a 4000 lb minimum wheel load may be used when the entire road surface can be uniformly tracked. Addition of water may be necessary to obtain maximum compaction. The moisture content should be sufficient that a hand held ball can be formed, and material will stain the hands.

3/ Screenings are an optional surface material that can be used where livestock travel the roadway. Select screening materials appropriate to the type of livestock that will travel the roadway. Screenings are not considered part of the structural roadway thickness.

4/ Geotextile underlayment is required for separation of the subgrade and aggregate material when the finished structural roadway thickness is less than 6"

**Traffic safety.** Passing lanes, turnouts, guardrails, signs, and other facilities needed for safe traffic flow shall be provided. Traffic safety shall be a prime factor in selecting the angle and grade of the intersection with public highways. Preferably, the angles shall be not less than 85 degrees. The public highway shall be entered either at the top of a hill or far enough from the top or a curve to provide visibility and a safe sight distance. The clear sight distance to each side shall be at least 300 feet, if site conditions permit.

**Erosion control.** If soil and climatic conditions are favorable, roadbanks and disturbed areas shall be vegetated as soon as possible and skid trails, landings, logging, and similar roads shall be vegetated after harvesting or seasonal use is completed. If the use of vegetation is precluded and protection against erosion is needed, protection shall be provided by nonvegetative materials, such as crushed aggregate or other mulches.

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Roadside channels, cross drains, and drainage structure inlets and outlets shall be designed to be either stable without protection, or if protection is needed, riprap or other similar materials shall be used.

**Stream Crossings.** When a roadway necessitates a stream crossing the following criteria will be used:

**Low-water ford-type crossings** consist of a base material surfaced with fines, and will meet the following criteria:

- The crossing base material will consist of crushed rock or riprap meeting the following criteria:
- The material will be stable when the channel is flowing at the top of bank. The design folder shall contain documentation showing how the size of the base material was selected.
- The minimum thickness of AASHTO # 1's when used as a crossing base, is 9 inches.
- The minimum thickness of ODOT 601 Type "D" riprap when used as a crossing base, is 12 inches.
- The need for bedding material or geotextile fabric underlayment between the base material and subgrade must be evaluated. Geotextile material must be designed and placed so it does not become exposed during channel flow or subjected to excessive hydraulic uplift. Where geotextile material is used, a keyway shall be designed the upstream end and is recommended on the downstream end of the crossing. Geotextile material shall not be placed in flowing water. Placement must occur when the streambed is dry, or the stream must be temporarily dammed & the flow diverted.
- The crossing surface will consist of filling the voids of the base material with fines such as ODOT 304.02 or AASHTO # 57's as appropriate to make a suitable walking surface. Where high stream velocity could displace the fines, a smooth grouted riprap surface should be considered.
- The crossing bottom width is not to exceed 10 feet when the crossing is only for livestock usage. If the crossing is also to be used by farm equipment the bottom width may be increased to 20 feet.
- The entrance slope into the stream bottom is to be no steeper than 5 horizontal to 1 vertical. The crossing cut slopes into the channel banks are to be no steeper than 2 horizontal to 1 vertical.
- Livestock will be prevented from migrating from the crossing into the stream by use of appropriate fencing or extending base material a minimum of 5 feet into the stream bottom both upstream and downstream of the crossing width. AASHTO # 1's is the minimum size needed to prevent cattle from migrating out of the crossing and into the channel. Planning and O&M needs must account for the potential that this rock can be clogged by sediment carried as stream bedload.
- Fencing shall not be placed across navigable streams.
- The finished top of crossing will not protrude above the natural stream bottom, unless the crossing is specifically designed as a rock sill to enhance aquatic habitat.
- The preferred crossing alignment is perpendicular to the stream flow. Where the crossing alignment is skewed to the stream, the design folder will contain documentation that the planned alignment will not cause streambank erosion or sedimentation.
- Crossings are to be placed where the existing stream bottom and banks are in a stable stream reach. The design folder will include documentation that the stream is stable a minimum of 100 feet upstream and downstream of the planned crossing location.
- Crossings are not to be located where concentrated surface water flows enter the stream, or these flows need to be diverted to enter the stream downstream (preferred) or upstream of the crossing.

Low water fords are the preferred stream crossing to be constructed under this standard. Culverts should generally considered for small drainageways, where a ford crossing would result in undesirable access road slopes.

**Culvert crossings** are to meet the following criteria:

- The minimum top width of the crossing designed for one way travel is of 16 ft., or the outside tread width of the design travel equipment plus 5 feet.
- Crossing fill slopes shall not be steeper than 2 horizontal to 1 vertical, and the culvert shall be long enough to span the design fill cross section.
- An auxiliary spillway will be provided to protect the crossing from overtopping during bankfull channel flow. The auxiliary spillway will be a minimum of 1 ft. below the top of the roadway at the culvert location.
- As a minimum, culverts shall be designed to safely pass the runoff from a 2-year frequency, 24-hour rainfall event. The culvert shall be sized to convey bankfull flow without appreciably altering the stream flow characteristics.
- The minimum culvert diameter to be used under an access road is 12 inches.
- Acceptable culvert material and installation methods shall meet the criteria stated in Conservation Practice Standard 587, Structure for Water Control
- Where culverts are placed in streams (except ephemeral streams) at least 10% of the culvert bottom shall be buried below the existing stream grade. Hydraulic capacity shall be based upon the remaining open area of the culvert.

These crossings will generally fall within Corps of Engineers, Nationwide 404 Permit 14. However, if the crossing is placed within a special aquatic site, such as wetlands or riffle & pool complexes, Corps of Engineers notification is required. The NRCS State Biologist is to be consulted during planning, where these conditions exist.

#### **PLANS AND SPECIFICATIONS**

Plans and specifications for constructing access roads shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

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### **CONSTRUCTION SPECIFICATIONS**

Construction operations shall be carried out in such a manner that erosion and air and water pollution are minimized and held within legal limits. The completed job shall present a workmanlike finish. Construction shall be according to the following requirements as specified for the job:

- Roads shall be planned and laid out according to good landscape management principles
- Trees, stumps, roots, brush, weeds, and other objectionable material shall be removed from the work area.
- Unsuitable material shall be removed from the roadbed area.
- Grading, subgrade preparation, and compaction shall be done as required.
- The subgrade below geotextile material must be firm enough to support the weight of workers prior to geotextile placement. Otherwise the subgrade must be improved with granular material.
- Surfacing shall be done as needed.
- The finished surface must be crowned or graded as needed to direct surface water from the roadway to its intended outlet.

### **OPERATION AND MAINTENANCE**

The landowner shall be provided with an Operation and Maintenance plan that as a minimum addresses the following:

- The designed assess road usage with respect to loading and subgrade conditions
- Inspection and applicable repair to the roadway and drainage structures following major rainfall events
- Resurfacing as necessary to maintain the design thickness

### **REFERENCES**

OSU Extension, 1997, AEX-304-97, *Using Geotextile Fabric in Livestock Operations*, The Ohio State University, Columbus, Ohio

USDA Forest Service, *Forest Service Handbook, 7700 - Transportation System*

US Army Corps of Engineers, June 1999, *Geotextile Reinforcement of Low-Bearing-Capacity Soils, Comparison of Two Design Methods Applicable to Thawing Soils*

Departments of The Army and The Air Force, July 20, 1995, Army TM 5-818-8, Air Force AFMAN 32-1030, *Engineering Use of Geotextiles*