ROLES and RESPONSIBILITIES for ENGINEERING TECHNICAL ASSISTANCE to USDA PROGRAM PARTICIPANTS (SOURCE 4)

USDA PROGRAM PARTICIPANT HIRES A NON-NRCS ENGINEER AND PAYS FOR THE SERVICES WITH THEIR OWN FUNDS

USDA Program Participant hires a NON-NRCS engineer and pays the services with their own funds.

Policy: National Engineering Manual, Part 505, Non-NRCS Engineering Services

USDA Farm Bill Program Participant

1. Identify in writing to NRCS the name of the NON-NRCS engineer that will be providing technical assistance. Authorize in writing that NRCS staff may disclose and discuss, with the NON-NRCS engineer, records in the case file, including design information, related to the practice(s) for which the NON-NRCS engineer will be providing technical assistance. The NON-NRCS identification and authorization may be documented on the Release of Records Authorization form below or in another format chosen by the USDA program participant that includes their signature and the date signed.

To: _____ *(name)*
District Conservationist
USDA-NRCS

_____ *(USDA Service Center address)*

_____*, Michigan*

Subject: Disclose and discuss case file records with the NON-NRCS engineer

_____ *(name) is the NON-NRCS engineer I have chosen to provide engineering technical assistance for the following practice(s) included in my USDA program contract:*

_____

_____

_____

NRCS may disclose and discuss, with the NON-NRCS engineer, records in my case file related to the practice(s) listed. The NON-NRCS engineer may submit design calculations, construction drawings, specifications, "As-Built" drawings, and related information for the practice(s) listed directly to NRCS for review and acceptance.

Please file this letter in my case file for future reference. This authorization expires on

_____ *(date).*

Sincerely,

_____*(Signature)* *Date:*_____
USDA Program Participant

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USDA Farm Bill Program Participant (cont.)

2. Participate, before design begins, in a meeting with NON-NRCS engineer and NRCS representative to review the USDA program contract requirements and roles and responsibilities for each party. Where practical, this meeting will be conducted on site.
3. Allow access to the site by NRCS-contracted archaeologist and NRCS staff.
4. The design will be based on the size and location information for the practice included in the Conservation Plan, Comprehensive Nutrient Management Plan, Wetlands Reserve Plan of Operations, or other planning document upon which the USDA program contract was based. These plans reflect decisions made by the USDA program participant. All changes to the planned practice will be cost effective and consistent with the conservation program goals and objectives of the USDA program contract. If there are changes to the planned practice, the program participant is responsible to ensure that the planning document is updated for consistency.
5. Accept full responsibility to negotiate and reach agreement on cost and terms of assistance with the NON-NRCS engineer.
6. Accept full responsibility for payment to the NON-NRCS engineer.
7. Agree that construction will not begin until the NON-NRCS engineer approves final design/construction drawings and NRCS reviews and accepts those drawings.
8. Provide copies of approved construction drawings, specifications, and operation and maintenance plan(s) to servicing NRCS office. May elect to have the NON-NRCS engineer provide these records directly to servicing NRCS office.
9. Obtain and comply with all permits.
10. Hire a construction contractor to install the practice(s) in accordance with the approved construction drawings and specifications.
11. Provide anticipated construction dates to the NON-NRCS engineer and servicing NRCS office.
12. Participate in the pre-construction meeting with the NON-NRCS engineer and construction contractor.
13. Provide servicing NRCS office with a copy of the "As Built" drawings, a copy of the applicable documentation required in the applicable NRCS statements of work, and a copy of the construction documentation required in the inspection (quality assurance) plan prepared by the NON-NRCS engineer providing engineering technical assistance. May elect to have the NON-NRCS engineer provide these records directly to servicing NRCS office.
14. Ensure corrective measures are taken if deficiencies are noted during functional or quality assurance reviews performed by NRCS.
15. Sign block 28 “Certification by Participant” on the CCC-1245, Practice Approval & Payment Application form.
16. Follow the operation and maintenance plans for the practices included in the USDA program contract.

ROLES and RESPONSIBILITIES for ENGINEERING TECHNICAL ASSISTANCE to USDA PROGRAM PARTICIPANTS (SOURCE 4)

USDA PROGRAM PARTICIPANT HIRES A NON-NRCS ENGINEER AND PAYS FOR THE SERVICES WITH THEIR OWN FUNDS

NON-NRCS Engineer (does NOT need to be a certified TSP through TechReg)

DESIGN

1. Participate, before design begins, in meeting with program participant and NRCS representative to review the USDA program contract requirements, and roles and responsibilities for each party. Where practical, this meeting will be conducted on site.
2. Conduct surveys and investigations necessary to develop the design and construction drawings.
3. Inform the NRCS field office if the size, type, or location of the planned practice needs to be changed during the design process. NRCS will determine if the change is in accordance with the USDA program contract or if a contract modification is required. NRCS will complete a new cultural resources review, if necessary.
4. Prepare the design in accordance with the applicable NRCS practice standards and specifications. Document the design in accordance with the applicable NRCS statements of work. Designate on the drawings all items that are not part of the USDA program contract.
5. Include the following statement on the cover sheet of construction drawings along with a list of the applicable NRCS standards:

   To the best of my professional knowledge, judgment and belief, the design, construction drawings and specifications meet applicable NRCS standards and specifications.

   _____ _____

   (name), P.E. *Date*
6. Include the following statement on the cover sheet of the construction drawings for NRCS to sign when the pre-construction functional review shows the design/construction drawings are acceptable:

   NRCS is accepting these construction drawings and specifications on the basis that they have been signed and sealed by a registered professional engineer. Based on the information provided by the professional engineer, the construction drawings and specifications appear to meet applicable NRCS standards and specifications. Any deficiencies in the design, construction drawings or specifications are the responsibility of the professional engineer whose seal appears on the construction drawings.

   _____ _____

   NRCS Representative *Date*
7. Develop an engineer's cost estimate for the project and provide it to NRCS and the program participant.
8. Develop a site-specific operation and maintenance plan for the practice(s) included in the construction drawings.
9. Prepare an inspection plan describing the inspection items, documentation requirements, and the skills needed to perform the required inspection.
10. Provide design, construction drawings, specifications, and other documentation to USDA program participant for NRCS pre-construction functional review of the practice (Professional Engineer signature and seal on the cover sheet of construction drawings. Drawings may be marked "Review."). May also be directed by USDA program participant to provide these records to servicing NRCS office. The functional review will not guarantee acceptance of the practice for payment at the completion of construction, but may find errors in the design that are easier to fix before construction is commenced.
11. After receiving review comments from NRCS, and making appropriate changes, approve (Professional Engineer signature and seal on the cover sheet) the construction drawings.
12. Provide technical information needed by the USDA program participant to acquire practice-related permits.

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USDA PROGRAM PARTICIPANT HIRES A NON-NRCS ENGINEER AND PAYS FOR THE SERVICES WITH THEIR OWN FUNDS

NON-NRCS Engineer (Continued)

CONSTRUCTION and CHECKOUT

1. Conduct pre-construction meeting with USDA program participant and construction contractor (and Certified Stormwater Operator, where the area disturbed during construction exceeds one acre and the Stormwater Phase II permit-by-rule applies).
2. Implement the inspection plan including layout survey, maintenance of construction documentation, approval of changes during construction, and checkout survey.

DOCUMENTATION

1. Prepare and submit to the USDA program participant "As Built" drawings, a copy of the documentation required in the applicable NRCS statements of work and a copy of the construction documentation required in the inspection plan. May also be directed by USDA program participant to provide these records to servicing NRCS office.
2. Include the following either on the cover sheet of the "As Built" drawings or in a letter attached to the "As Built" drawings:

   To the best of my professional knowledge, judgment and belief, these practices are installed in accordance with the construction drawings and specifications and meet NRCS standards. The technical services rendered: (1) comply with all applicable Federal, State, Tribal, and local laws and requirements; (2) meet applicable USDA standards, specifications, and program requirement;, (3) are consistent with the particular conservation program goals and objectives for which the program contract was entered into by USDA and the program participant; and (4) incorporate, where appropriate, alternatives that are both cost effective and appropriate to address the resource issues.

   _____ _____

   (Name), P.E. *Date*

ROLES and RESPONSIBILITIES for ENGINEERING TECHNICAL ASSISTANCE to USDA PROGRAM PARTICIPANTS (SOURCE 4)

USDA PROGRAM PARTICIPANT HIRES A NON-NRCS ENGINEER AND PAYS FOR THE SERVICES WITH THEIR OWN FUNDS

NRCS

DESIGN

1. Provide a copy of this roles and responsibilities document to the USDA program participant as soon as possible after the USDA program participant informs NRCS that they intend to hire a NON-NRCS engineer.
2. Participate, before design begins, in meeting with program participant and NON-NRCS engineer to review the USDA program contract requirements, and roles and responsibilities for each party. Where practical, this meeting will be conducted on site.
3. Recognize that NRCS only has a contractual relationship with the USDA program participant. Therefore, NRCS will not direct the work of the NON-NRCS engineer.
4. Maintain Assistance Notes or CONS-6 notes through design, construction, and checkout.
5. Provide the USDA program participant and the NON-NRCS engineer included in the Release of Records Authorization interpretative information related to the Conservation Plan, Comprehensive Nutrient Management Plan, Wetlands Reserve Plan of Operations, or other planning document upon which the USDA Program contract is based.
6. Provide the USDA program participant and the NON-NRCS engineer included in the Release of Records Authorization copies of any existing case file records relevant to the engineering technical assistance being provided by the NON-NRCS engineer.
7. Provide the USDA program participant and/or NON-NRCS engineer access to copies of NRCS standards, specifications, standard drawings, software and other design aids used by NRCS. Costs for reproduction of these materials are the responsibility of person making the request.
8. Complete the initial cultural resources review. Complete an additional cultural resources review, where required, after notification from the NON-NRCS engineer of a changed site location.
9. Determine if design changes in size, type, or location of the planned practice are in accordance with the USDA program contract or if a contract modification is required.
10. NRCS will NOT participate in the surveys, investigations, design, layout, construction inspection, checkout, or certification except as required in this document.
11. Determine the engineering job class of the practice(s).
12. The NRCS area engineering staff will perform a pre-construction functional review of the design, construction drawings, specifications, and other documentation**.** NRCS acceptance of the construction drawings and specifications will be by engineering staff with NRCS-Michigan engineering job approval authority for design of the practice. The state office staff will assist in the review as needed. Functional review is defined in NEM Part 505.03(b)(3). Sign the following statement on the construction drawings when the pre-construction functional review shows the design/construction drawings are acceptable:

    NRCS is accepting these construction drawings and specifications on the basis that they have been signed and sealed by a registered professional engineer. Based on the information provided by the professional engineer, the construction drawings and specifications appear to meet applicable NRCS standards and specifications. Any deficiencies in the design, construction drawings or specifications are the responsibility of the professional engineer whose seal appears on the construction drawings.

    _____ _____

    NRCS Representative *Date*

NRCS (cont.)

CONSTRUCTION

1. Conduct on site visits during construction as determined necessary to ensure that the requirements of the USDA program contract are met.

DOCUMENTATION

1. The documentation provided by the NON-NRCS for the practice installed shall be reviewed. Ensure that all the documentation required in the applicable NRCS statements of work and a copy of the construction documentation required in the inspection plan are received from the NON-NRCS engineer. The site should be visited to verify the as-built drawings represent the constructed practice. The area engineering staff shall perform a post-construction functional review of the practice.
2. Certify installation for USDA Program cost share. Sign block 16 "Technician's Signature" and block 25 "Payment Approved" on the CCC-1245, Practice Approval & Payment Application form, **after** functional review shows construction appears to meet practice standards and "As-Built" drawings are acceptable. Do not sign the CCC-1245 until the post-construction functional review is completed **and** any items found in the review that do not meet standards are corrected**.**

QUALITY ASSURANCE

1. The area engineering staff will conduct quality assurance reviews of the technical services provided by the NON-NRCS engineer as part of regular field office quality assurance reviews. The area engineering staff may request assistance from the state office engineering, as necessary.

EXPLANATION OF FUNCTIONAL REVIEWS

1. The purpose of Functional Reviews is to ensure the financial investments from the USDA program participant and USDA for the contracted practice(s) will result in the intended environmental benefits for the anticipated life span.
2. The Functional Review will minimize the potential for problems that could become apparent during and/or after construction if there are inadvertent errors or omissions in the NON-NRCS engineer's design documentation. In a Functional Review, NRCS will conduct an overview comparison between the NON-NRCS engineer's design documentation and the applicable NRCS practice standard. NRCS will also check to make sure the practices included in the construction drawings are in the USDA program participant's USDA program contract.
3. If the Functional Review indicates the NON-NRCS engineer's design documentation is consistent with the requirements of the applicable NRCS practice standard and USDA program contract, NRCS will return the documentation and the USDA program participant may proceed with construction.
4. If the Functional Review indicates the NON-NRCS engineer's design documentation is not consistent with the requirements of the applicable NRCS practice standard or the USDA program contract, NRCS will return the documentation with a list of the inconsistencies.
5. The Functional Review does not displace the NON-NRCS engineer as the engineer in responsible charge for the design and does not remove any of their liability or their professional engineering responsibilities to the USDA program participant. It also does not remove the USDA program participant's responsibility to install the contracted practice(s) in accordance with the applicable NRCS practice standard as required by the USDA program contract.

Fish Passage (No.) 396

DEFINITION

Modification or removal of barriers that restrict or prevent movement or migration of fish.

PURPOSES

Allow upstream and downstream movement of fish past barriers where feasible or desirable.

CONDITIONS WHERE PRACTICE APPLIES

All rivers, streams, and outlets of ponds or lakes where barriers impede desired fish passage.

CRITERIA

General Criteria Applicable To All Purposes

Actions taken to provide fish passage shall seek to avoid adverse effects to endangered, threatened, and candidate species and their habitats, as well as state species of concern, whenever possible. Refer to General Manual 190 ECS - Part 410.22 for actions affecting listed species.

Fish passage measures shall be designed so fish will not suffer excessive energy deficits or undue physical stress when swimming through a fish passage structure or site.

Fish passage shall be designed so that fish shall not be excessively delayed during passage at the structure or site unless modification or removal of a barrier, such as a tidegate, could result in undesirable effects to other resources.

Minimum and maximum flows through fish passage structures or sites must be adequate to attract target fish to the structure or site.

Location and overall design of fish passage structures, or fish passage features, shall accommodate watershed conditions such as variations in stream flow and bedload movement.

Location and overall design of fish passage structures or features shall accommodate all aquatic species and life stages to the extent practical.

Location and overall design of fish passage structures or features shall be compatible with local conditions and stream geomorphology.

Materials selected for constructing fish passage structures will be non-toxic to fish and other aquatic life.

Modifications to dams to provide fish passage must be in accordance with existing laws and engineering specifications for dams.

All planned work shall comply with all federal, state, tribal, and local laws and regulations.

Criteria Applicable To Bridges And Culverts

Applicable to Both Structures:

- Refer to the Drainage Criteria in Conservation Practice Standard 560 Access Road for drainage capacity requirements.
- Align structure with channel sinuosity. If the structure directs channel flow toward the bank or terrace, channel realignment should be considered. Realign stream channel with as much of the natural channel length as possible.
- The width of the structure should be equal to the bankfull stream width as measured at the narrowest point outside of the impacts of the road crossing and within 600 feet of the crossing.

Bridges:

Open span bottomless bridges shall be at least the stream bankfull width. This is preferable to culverts for fish passage when practical.

Culverts:

Culverts are an option for road crossings for fish passage provided they meet the following design requirements.

- Culvert slope equal to stream slope.
- Culvert length sufficient to extend beyond toe of fill.
- Average discharge flow velocity of 3 FPS or less for 2-year flow event.
- Bury culverts about 1/6 the culvert height below the bottom of the streambed with approximately 1/2 of culvert height above the bankfull level.
- When using multiple culverts, use the fewest and largest culverts possible, and offset multiple culverts vertically by 1 foot so low culvert carries low flow.

Criteria Applicable To Fish Ladders

Fish ladders will be designed on a site-specific basis by an engineer and biologist experienced in fish ladder requirements.

CONSIDERATIONS

Native game and non-game fish species and amphibians as well as endangered, threatened, and candidate, rare and other sensitive species shall be carefully considered when designing and implementing fish passage features.

Consider a stream simulation design for culverts at road crossings that incorporates natural streambed substrates.

Consider removal of the barrier or fish passage before installing a fish ladder.

If replacement of an in-channel structure will cause degradation or aggradation of the channel upstream, installation of bed controls appropriate for the geomorphic conditions of the site and fish passage needs should be considered (see Conservation Practice Standards 584 Channel Stabilization and 410 Grade Stabilization Structure).

Consider potential negative effects of providing passage for invasive or non-native species that may hybridize with, compete with, or spread disease to native fish or other aquatic species above a barrier.

Consider other aquatic and terrestrial species, including endangered and threatened species that have established habitat in areas where barriers currently exist or in upstream and downstream areas that would be directly affected by the action.

Consider the amount of habitat both upstream and downstream of a barrier and the potential for connectivity of important habitats for fish species of concern.

Consider seasonal variations in headwater and tailwater levels and how these may impact passage hydraulics for the life history stages of the fish for which the structure is being designed.

Consider the need to prevent entrainment of fish, particularly juveniles, in irrigation diversions by installing screens.

Consider the need to design for strategic resting places for target species facing passages greater than 100 feet long.

Consider historical structures when planning. This practice may affect cultural resources and should comply with General Manual 420, Part 401, during planning, prior to installation, and during maintenance of fish passage structures.

Consider the need to balance fish passage with other water management objectives.

To the extent possible, fish passage structures should be designed to minimize excessive predation on fish entering or exiting the structure.

Removal of a fish passage barrier should take into consideration effects on wetlands, flooding potential, existing infrastructure, and social impacts.

When an in-channel structure is impassable due to downstream channel incision and there is evidence of historical channels near the incised channel, consider bypassing the barrier by restoring historical channels.

PLANS AND SPECIFICATIONS

Specifications for this practice shall be prepared for each site. Plans and specifications shall be in keeping with this practice and shall describe the details adequately to apply the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed for all applications. The plan shall provide for periodic inspection and prompt repair should fish passage become impaired or inoperable at the structure or site.

Channel Stabilization (Ft.) 584

DEFINITION

Measure(s) used to stabilize the bed or bottom of a channel.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following:

- Maintain or alter channel bed elevation or gradient.
- Modify sediment transport or deposition.
- Manage surface water and ground water levels in floodplains, riparian areas, and wetlands.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to the beds of existing or newly constructed channels, alluvial or non-alluvial, undergoing damaging aggradation or degradation that cannot be feasibly controlled by clearing or snagging, by the establishment of vegetative protection, by the installation of bank protection, or by the installation of upstream water control measures.

CRITERIA

Channel Stabilization shall be planned, designed, and installed to meet all federal, state, local, and tribal laws and regulations.

Measures shall be designed and installed according to a site-specific plan.

Measures to be applied shall be compatible with improvements planned or being carried out by others.

Sufficient depth shall be maintained to provide adequate outlets for subsurface drains, tributary streams or ditches, or other channels.

Effect of channel work on existing structures such as culverts, bridges, buried cables, pipelines, and irrigation flumes shall be evaluated to determine impact on their intended functions.

Measures shall be designed for flow duration, depth of inundation, buoyancy, uplift, scour, angle of attack, and stream velocity.

Measures shall be compatible with the bank or shoreline materials, water chemistry, channel hydraulics, and slope characteristics, both above and below the water line.

Measures shall be designed for anticipated ice action, debris impact, and fluctuating water levels.

Spoil material from clearing, grubbing, and channel excavation shall be disposed of in a manner that will not interfere with the function of the channel and in accordance with all local, state, and federal laws and regulations.

All disturbed areas around measures shall be protected from erosion. Vegetation shall be selected that is best suited for the anticipated site conditions.

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to the Field Office Technical Guide, Section II, Invasive Plant Species for plant materials identified as invasive species.

Measures applied shall seek to avoid adverse effects to endangered, threatened, and candidate species and their habitats, whenever possible.

Measures applied shall seek to avoid adverse effects to archeological, historic, structural, and traditional cultural properties, whenever possible.

Channel clearing to remove stumps, fallen trees, debris, and bars shall only be done when they are causing or could cause detrimental bank erosion or structural failure. Habitat forming elements that provide cover, food, pools, and water turbulence shall be retained or replaced to the extent possible.

Measures shall be functional for the design flow and sustainable for higher flow conditions based on acceptable risk.

Measures shall be designed to maintain the appropriate sediment transport regime in order to avoid detrimental erosion or sedimentation upstream and downstream.

Measures shall not impair the floodplain function.

Measures shall not result in adverse affects on the function of the stream or the stream corridor.

When water surface elevations are a concern, the effects of protective measures shall not cause detrimental changes in water surface elevations.

The quantity and character of the sediments entering the reach of channel under consideration shall be analyzed on the basis of both present conditions and projected conditions caused by changes in land use or land treatment and upstream improvements or structural measures.

CONSIDERATIONS

Consider the potential effects of installation and operation of channel stabilization on the cultural, archeological, historic, and economic resources.

Consider area-wide planning for proper design, function, and management of protective measures where the design reach involves multiple stakeholders.

An assessment of channel stabilization needs should be considered in sufficient detail to identify the causes contributing to the instability (e.g., watershed alterations resulting in significant modifications of discharge or sediment production). Due to the complexity of such an assessment, use of an interdisciplinary team should be considered.

When designing protective measures, consider the changes that may occur in the watershed hydrology and sedimentation over the design life of the measure.

Consider utilizing woody debris removed during construction in the overall practice design.

Measures should consider habitat and migration needs of aquatic species.

Consider maintaining or improving the habitat value for fish and wildlife, which includes lowering or moderating water temperature and improving water quality.

Consider opportunities to improve habitat for threatened, endangered, and other species of concern, where applicable.

Consider maximizing adjacent wetland functions and values with the project design and minimizing adverse effects to existing wetland functions and values.

Consider protecting side channel inlets and outlets from erosion or sedimentation.

Consider the type of human use and the social and safety aspects when designing the protective measures. Use construction materials, grading practices, vegetation, and other site development elements that enhance aesthetics, recreational use, and maintain or complement existing landscape uses such as pedestrian paths, climate controls, and buffers. Avoid excessive disturbance and compaction of the site during installation.

Measures should be designed to minimize safety hazards to boaters, swimmers, or people using the channel.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

Support data documentation requirements are as follows:

- Inventory and evaluation records
  - Assistance notes or special report
- Survey notes, where applicable
  - Design survey
  - Construction layout survey
  - Construction check survey
- Design records
  - Physical data, functional requirements and site constraints, where applicable
  - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
  - Location map

  - "Designed by" and "Checked by" names or initials
  - Approval signature
  - Job class designation
  - Initials from preconstruction conference
  - As-built notes
- Construction inspection records
  - Assistance notes or separate inspection records
  - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

Grade Stabilization Structure (No.) 410

DEFINITION

A structure used to control the channel grade in natural or constructed watercourses.

PURPOSES

To stabilize grade, reduce gully erosion in natural or constructed watercourses, prevent the formation or advance of gullies and to improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

Where the concentration and flow velocity of water require structures to stabilize the grade in channels or to control gully erosion.

CRITERIA

General Criteria

Grade stabilization structures shall be planned, designed, and installed to meet all federal, state, local and tribal laws and regulations.

The structure must be designed for stability after installation. The crest of the inlet must be set at an elevation that will stabilize the channel and prevent upstream head cutting.

Grade stabilization structures shall be designed according to the principles set forth in the National Engineering Handbook, Part 650, Engineering Field Handbook, or other applicable NRCS publications and reports.

Earth embankments and auxiliary spillways of structures must be stable for all anticipated conditions. If earth spillways are used, they must be designed to handle the total capacity flow without overtopping the embankment. The foundation preparation, compaction, top width, and side slopes must ensure a stable embankment for anticipated flow conditions. Discharge from the structure shall be controlled to minimize crop damage resulting from flow detention.

Structures installed in natural channels shall be compatible with the fluvial geomorphic conditions at the site to ensure the stability of the structure**.**

Sediment storage capacity must equal the expected life of the structure, unless a provision is made for periodic cleanout.

Grade stabilization structures are potentially hazardous and precautions shall be taken to prevent serious injury or loss of life. Protective guardrails, warning signs, fences, or lifesaving equipment shall be installed as needed.

Fence shall be installed, as needed, to control access and exclude livestock and other traffic that may damage the structure.

The exposed surfaces of the embankment, earth spillway, borrow area, and other areas disturbed during construction shall be seeded, sodded or otherwise protected as necessary to prevent erosion.

All areas disturbed by the construction shall be re-vegetated according to Critical Area Planting, NRCS Conservation Practice Standard Code 342.

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to the Field Office Technical Guide, Section II, Invasive Plant Species, for plant materials identified as invasive species.

General Criteria for Embankments

The minimum sum of the upstream and downstream side slopes of the settled embankment shall not be less than five horizontal to one vertical with neither slope steeper than 2H:1V. Slopes shall be designed to be stable in all cases.

The fill height shall be increased by a minimum of 5% for mineral foundation soil and 33% for organic foundation soil to allow for settlement, except where detailed soil testing and laboratory analysis show a lesser amount is adequate.

The minimum top width for embankments is shown in Table 1.

TABLE 1	
Minimum Top Width Requirements for Embankments	
Fill Height	Effective Top Width
ft	*ft*
0-5	3
5-10	6
10-15	8

General Criteria for Pipe Conduits

The diameter of the pipe shall not be less than 8 inches.

The following pipe materials are acceptable: cast-iron, steel, corrugated steel or aluminum, concrete, plastic, and cast-in-place reinforced concrete. Plastic pipe that will be exposed to direct sunlight shall be made of ultraviolet resistant materials or protected by coating or shielding.

Inlets and outlets shall be structurally sound and made from materials compatible with the pipe.

Drainage diaphragms meeting the requirements stated in Pond, NRCS Conservation Practice Standard Code 378, shall be used to prevent piping unless all of the following conditions exist:

1. The conduit is corrugated pipe and has a diameter of 18 inches or less.

2. The maximum hydraulic head on the pipe is 6 feet or less.

3. The soils used for backfilling have good to excellent piping resistance. (Ref., National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 4.)

4. The designer has evidence that pipes in similar soil and site conditions have functioned satisfactorily without drainage diaphragms.

Watertight coupling bands are required for all pipes designed for pressure flow. Inlets of closed conduit spillways designed for pressure flow are to have an anti-vortex device.

An appropriate trash guard shall be installed at the inlet, as necessary, to prevent clogging of the conduit.
Pipe strength shall not be less than that of the grades indicated in Table 2 for plastic pipe and Table 3 for corrugated aluminum and steel pipe.

TABLE 2		
Acceptable PVC and PE Pipe for use in Grade Stabilization Structures [1/] [2/]		
Nominal Pipe Size	Material and Schedule or Wall Type	Maximum Depth of Fill Over Pipe
in		*ft*
8–12	PVC 40	10
8–12	PVC 80	15
8-24	PE single	20
8-60	PE double	20

[1/] Polyvinyl chloride (PVC) pipe, PVC 1120 or PVC 1220, conforming to ASTM D 1785

[2/] Polyethylene (PE) pipe will conform to one or more of the following standards: ASTM F 405, ASTM F 667, AASHTO M 252 or AASHTO M 294.

TABLE 3		
Gage or Thickness Required: Corrugated Metal Pipe for Fill Heights above Pipe not to Exceed 15 feet		
Pipe Diameter	Steel [1/]	Aluminum [2/]
	Minimum gage	Minimum thickness
in		*in*
12-24	16	0.06
30	14	0.075
36	14	0.075
42	14	XXX
48	14	XXX

[1/] For steel CMP:
- a. Maximum pipe diameter is 48 in.
- b. 2 2/3 X 1/2 corrugations except 3X1 corrugations for over 36 in. in diameter.

[2/] For aluminum CMP with 2 2/3X1/2 corrugations:
- a. Pipe may be riveted or helical fabrication.
- b. Pipe shall not be placed in soils having a pH less than 4 nor greater than 9.
- c. Max. allowed pipe diam. is 36 in.

General Criteria for Auxiliary Spillways

An auxiliary spillway must be provided for all closed conduit structures except as allowed for embankment dams and for drop boxes to road culverts. Full flow open structures such as chute or drop spillway structures do not require an auxiliary spillway if the principal spillway can safely pass the minimum total capacity design storm peak flow.

Constructed spillways shall be trapezoidal and will be located in undisturbed or compacted earth. The side slopes shall be 2 1/2H:1V or flatter. The auxiliary spillway shall have a minimum bottom width of 8 ft. and a minimum depth of 1.0 ft. The minimum elevation of the settled fill shall be 0.5 ft. above the water surface with the auxiliary spillway flowing at design depth.

The exit channel shall provide for passage of the design flow at a safe velocity to a point downstream of where the embankment will not be endangered. For further information, see the National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 11, pages 11-17 through 11-22.

Additional Criteria for Embankment Dams

Embankment dams are defined as earth fills greater than 3 feet in height that have a permanent pool or which are designed to pass the design storm peak inflow through the principal and auxiliary spillways with reduction for storage. Embankment dams this practice applies to are low hazard (class a) dams that have a product of storage times the effective height of the dam of less than 3,000 ac-ft^2 and an effective height of 35 feet or less. The effective height of the dam is the difference in elevation between the auxiliary spillway crest and the lowest point in the cross section along the centerline of the dam. If there is no auxiliary spillway, the top of the dam is the upper limit.

Embankment dams with a settled fill height of less than 15 ft and 10-year frequency, 24-hour storm runoff less than 10 ac-ft, shall be designed to control a minimum of the 10-year frequency, 24-hour storm without overtopping. The mechanical spillway, regardless of size, may be considered in design and an auxiliary spillway is not required if the combination of storage and mechanical spillway discharge will handle the design storm. The embankment will be designed to meet the requirements for Water and Sediment Control Basin, NRCS Conservation Practice Standard Code 638.

Other embankment dams shall meet or exceed the requirements specified for Pond, NRCS Conservation Practice Standard Code 378.

Additional Criteria for Full-Flow Open Structures

Full-flow open structures are those which are designed to pass the design storm peak inflow through the principal and auxiliary spillways without reduction for storage. Examples are drop, chute, and box inlet spillways. The minimum capacity shall be the 24-hour duration design storm of the frequency shown in Table 4**.** Structures must not create unstable conditions upstream or downstream. Provisions must be made to ensure safe reentry of bypassed storm flows.

Toe wall drop structures can be used if the vertical drop is 4 ft or less, flows are intermittent, downstream grades are stable, and tail water depth at design flow is equal to or greater than one-third of the height of the overfall.

The ratio of the capacity of drop boxes to road culverts shall be 1.25 times the capacity required by the responsible drain or road authority, the existing culvert capacity or as specified in Table 4, as applicable, less any reduction because of detention storage.

TABLE 4

Full-flow Open Structure Design Criteria [1/] [2/]

Maximum Drainage Area	Maximum Vertical Drop	Frequency of Minimum Design, 24-hour Duration Storm	
		Principal Spillway Capacity	Total Capacity
acres	*ft*	*year*	*year*
20	All	2	10
100	All	5	25
450	5	5	10
900	10	10	25

[1/] If site conditions exceed those shown in Table 4, the minimum design 24-hour storm frequencies are 25 years for the principal spillway and 100 years for the total capacity.

[2/] For geosynthetic chutes with a maximum 10-year, 24-hour frequency design storm of 80 cfs and a maximum drop of 15 ft, the minimum design for total capacity shall be for a 10-year frequency, 24-hour duration storm.

Additional Criteria for Island-Type Structures

Island-type structures are a special case of the full-flow structure. For island-type structures, out of bank flooding can be tolerated. The minimum capacity of the principal spillway of an island-type structure shall equal the capacity of the downstream channel. In no case shall it be less than the 2-year, 24-hour storm or the design drainage curve runoff. The minimum auxiliary spillway capacity shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in Table 4 for total capacity without overtopping the headwall extensions of the principal spillway. Provision must be made for safe reentry of bypassed flow as necessary.

Additional Criteria for Side-Inlet Drainage Structures

Side inlet drainage structures are used to lower surface water from field elevations or lateral channels into constructed drainage channels. The design criteria for minimum capacity of open-weir or pipe side inlet drainage structures are shown in Table 5.

TABLE 5

Side Inlet Structure Hydraulic Design Criteria [1/] [2/] [3/] [4/]

Maximum Drainage Area	Maximum Vertical Drop	Frequency of Minimum Design, 24-hour Duration Storm	
		Principal Spillway Capacity	Total Capacity
acres	*ft*	*year*	*year*
20	All	2	10
100	All	5	25
450	5	2	10
450	10	5	10
900	10	5	25

[1/] If site conditions exceed those shown in Table 5, the minimum design for total capacity shall be for a 50-year frequency, 24-hour duration storm.

[2/] If the entire structure drainage area has an average slope of less than 0.5%, and the drainage area within 500 ft of the structure has an average slope of less than 0.5%, side inlet principal spillways may be designed to pass a peak discharge of 0.17 cfs/ac of drainage area.

[3/] A 10 in minimum diameter principal spillway pipe with at least 1.5 ft stage may be used for watersheds less than 20 ac in size.

[4/] For geosynthetic chutes with a maximum 10-year, 24-hour frequency design storm of 80 cfs and a maximum drop of 15 ft., the minimum design for total capacity shall be for a 10-year frequency, 24-hour duration storm.

CONSIDERATIONS

Consider the potential effects of installation and operation of a grade stabilization structure on the cultural, archeological, historic and economic resources.

Landforms, structural materials, water elements, and plant materials should visually and functionally complement their surroundings. Excavated material

and cut slopes should be shaped to blend with the natural topography. Shorelines can be shaped and islands created to add visual interest and valuable wildlife habitat. Exposed concrete surfaces may be formed to add texture or finished to reduce reflection and to alter color contrast. Site selection can be used to reduce adverse impacts or create desirable focal points.

Consideration should be given to the effect a structure will have on the aquatic habitat of a channel. If the channel supports fish, the effect of a structure on the passage of fish should be considered. Consider maintaining or improving fish and wildlife habitat.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

Support data documentation requirements are as follows:

- Inventory and evaluation records
  - Assistance notes or special report
- Survey notes, where applicable
  - Design survey
  - Construction layout survey
  - Construction check survey
- Design records
  - Physical data, functional requirements and site constraints, where applicable
  - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
  - Location map
  - "Designed by" and "Checked by" names or initials
  - Approval signature
  - Job class designation
  - Initials from preconstruction conference
  - As-built notes
- Construction inspection records
  - Assistance notes or separate inspection records
  - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable.

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

REFERENCES

USDA-NRCS, National Engineering Handbook, Part 650, Engineering Field Handbook

USDA-NRCS, Technical Release No. 55, Urban Hydrology for Small Watersheds

Access Road (Feet) 560

DEFINITION

A travel-way for equipment and vehicles constructed as part of a conservation plan.

PURPOSES

To provide a fixed route for vehicular travel for resource activities involving the management of timber, livestock, agriculture, wildlife habitat, and other conservation enterprises while protecting the soil, water, air, fish, wildlife, and other adjacent natural resources.

CONDITIONS WHERE PRACTICE APPLIES

Where access is needed from a private or public road or highway to a land use enterprise or conservation measure, or where travel-ways are needed in a planned land use area.

Access roads range from seasonal use roads, designed for low speed and rough driving conditions, to all-weather roads heavily used by the public and designed with safety as a high priority. Some roads are only constructed for a single purpose; i.e., control of forest fires, logging and forest management activities, access to remote recreation areas, or access for maintenance of facilities.

CRITERIA

Access roads shall be designed to serve the enterprise or planned use with the expected vehicular or equipment traffic. The type of vehicle or equipment, speed, loads, soil, climatic, and other conditions under which vehicles and equipment are expected to operate need to be considered.

Access roads shall be planned, designed, and installed to meet all federal, state, local, and tribal laws and regulations.

Location. Roads shall be located to serve the purpose intended, to facilitate the control and disposal of surface and subsurface 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 shall be located where they can be maintained and where water management problems are not created. To reduce potential pollution, roads shall be located away from watercourses. Utilize buffers where possible to protect water bodies.

Alignment. The gradient and horizontal alignment shall be adapted to the intensity of use, mode of travel, the type of equipment and load weights, and the level of development.

Grades normally should not exceed 10 percent except for short lengths. Maximum grades of 18 percent should only be exceeded if necessary for special uses, such as logging roads, field access roads, fire protection roads, or other roads not accessible for use by the general public.

For stream crossings, the road should be aligned so that it crosses perpendicular to the channel as much as possible.

Width. The minimum width of the roadbed is 14 feet (4.2 m) for one-way traffic and 20 feet (6 m) for two-way traffic. The roadbed width includes a tread-width of 10 feet (3 m) for one-way traffic or 16 feet (4.9 m) for two-way traffic. Each type of road also requires 2 feet (0.6m) of shoulder width on each side. Single-lane logging or special-purpose roads can have a minimum width of 10 feet (3 m), with greater widths at curves and turnouts. The two-way traffic width shall be increased approximately 4 feet (1.2 m) for trailer traffic. The shoulder width may be either gravel or grass.

Turnouts shall be used on single lane roads where vehicles travel in both directions on a limited basis. Where turnouts are used, road width shall be increased to a minimum of 20 feet (6 m) for a distance of at least 30 feet (9 m).

Side Slopes. All cuts and fills shall be designed to have stable slopes of a minimum of 2 horizontal to 1 vertical on heights of less than 4 feet (1.2 m). For short lengths, rock areas, or very steep hillsides, steeper slopes may be permitted if soil conditions

warrant and special stabilization measures are installed.

Areas with geological conditions and soils subject to slides shall be avoided or treated to prevent slides.
Drainage. The type of drainage structure used will depend on the intended use and runoff conditions. Culverts, bridges, fords, 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. When a culvert or bridge is installed in a drainageway, its minimum capacity shall convey the design storm runoff without causing erosion or road overtopping. Table 1 lists minimum culvert or bridge design storm frequencies for various road types on streams or drains with a drainage area of less than 2 square miles.

TABLE 1

Road Type	Storm Frequency
Forest Access Roads, Farm Field Access Roads	2 Year - 24 Hour
Farm Driveways, Recreation Facility Access Roads	10 Year - 24 Hour
Public Access Roads, Campgrounds, Etc.	25 Year - 24 Hour

On streams or drains with a drainage area of 2 square miles (5.2 sq km) or more, a permit is required from the Michigan Department of Environmental Quality under the State's Floodplain Regulatory Authority found in Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. A hydraulic analysis must be provided with the application indicating that the proposed project will not cause a harmful interference with respect to the stage or discharge characteristics of a stream for a range of discharges up to and including the 100-year discharge. If the project causes an increase in upstream flood elevations when compared to existing conditions, then it must be determined to be non-harmful. A harmful flood elevation increase would be one that causes damage to property, threat to life, threat to personal injury or causes pollution, and impairment or destruction of the water or other natural resources. In addition, upstream property owners must be notified if the increase in flood elevations extends on their property.

An erosion-resistant low point or overflow area may be constructed across the access road to supplement culvert capacity on non-public use roads. Culverts, bridges, fords, and hardened overflow areas should be installed so the road crossing does not significantly impact fish migration.
Roadside ditches shall be adequate to provide surface drainage for the roadway and deep enough, as needed, to serve as outlets for subsurface drainage. At a minimum, the roadside ditch shall be 1.0 foot (0.3 m) below the top of road surface to provide internal drainage. Ditch channels shall be designed to be on stable grades or protected with structures or linings for stability.

Water-breaks or water-bars may be used to control surface runoff on low-intensity use forest, ranch, or similar roads. On steep grades where runoff and erosion is anticipated, water bars should be considered. Water bars must be constructed of materials that are compatible with the use and maintenance of the road surface. Water bar discharge areas must be well vegetated or have other erosion resistant materials. See Figure 1, Recommended Spacing of Relief Culverts and Water Bars Based on Soil Type.

Surface crowning can also help direct road runoff into the side drainage ditches. Unobstructed flow into the ditches must be maintained to prevent flows from causing roadside erosion. Provide a turnaround at the end of dead end roads. In some areas, turnarounds may also be desirable for stream, lake, recreation, or other access purposes.

Provide parking space as needed to keep vehicles off the road or from being parked in undesirable locations.

Surfacing. Access roads shall be given a wearing course or surface treatment if required by traffic needs, soil, climate, erosion control, or particulate matter emission control. The type of treatment, if needed, 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.

Toxic and 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 after considering potential impacts on stabilizing vegetation.

Utilize additional conservation practices to reduce the potential for generation and transport of particulate matter emissions.

Construction Operations. Construction operations should be carried out in such a manner that erosion and air and water pollution are minimized and held within legal limits. Measures must be in place to limit the generation of dust during construction.

Subgrade. The subgrade or roadbed shall be suitable for the anticipated loads. A geotextile material specifically designed for road stabilization applications may be used to distribute loads over the subgrade material. Trees, stumps, roots, brush, weeds, and other unsuitable material shall be removed from the subgrade area. Grading, subgrade preparation, and compaction shall be done as needed.

Traffic Safety. Passing lanes, turnouts, guardrails, signs, and other facilities, as 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 not be less than 300 feet (90 m) or as required by local regulations.

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. Vegetate the site in accordance with NRCS conservation practice standard Critical Area Planting (342).

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to the Field Office Technical Guide, Section II, Invasive Plant Species, for plant materials identified as invasive species.

If the use of vegetation is precluded and protection against erosion is needed, protection shall be provided by non-vegetative materials, such as gravel or other organic or inorganic material (see NRCS conservation practice standard Mulching (484)), or in accordance with local regulations.

Roadside channels, cross drains, and drainage structure inlets and outlets shall be designed to be stable (see NRCS conservation practice standard Structure for Water Control (587)). If protection is needed, riprap or other similar materials shall be used.

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

CONSIDERATIONS

Consider the potential effects of installation and operation of access roads on the cultural, archeological, historic, and economic resources.

Consider visual resources and environmental values during the planning and designing of the road system.

When available and appropriate, consider using organic bio-degradable materials as a surface treatment.

Consider additional shoulder width along the road or at turnouts to accommodate snow plowing on roads where vehicular use is anticipated during the winter.

Consider controlled access to unsurfaced roads to prevent damage or hazardous conditions during adverse climatic conditions.

Access roads should be located where minimal adverse impacts will affect wetlands, water bodies, wildlife habitat, and air quality. Consideration should be given to the following:

- Effects on downstream flows or aquifers that would affect other water uses or users.
- Effects on the volume and timing of downstream flow to prohibit undesirable environmental, social, or economic effects.

- Short-term and construction-related effects of this practice on the quality of on-site downstream water courses.
- Effects on wetlands and water-related wildlife habitats that would be associated with the practice.
- Limiting the number of vehicles and vehicle speed will reduce the potential for generation of particulate matter and decrease safety and air quality concerns.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

Support data documentation requirements are as follows:

- Inventory and evaluation records
  - Assistance notes or special report
- Survey notes, where applicable
  - Design survey
  - Construction layout survey
  - Construction check survey
- Design records
  - Physical data, functional requirements, and site constraints, where applicable
  - Soils/subsurface investigation report, where applicable
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- Construction drawings/specifications with:
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  - "Designed by" and "Checked by" names or initials
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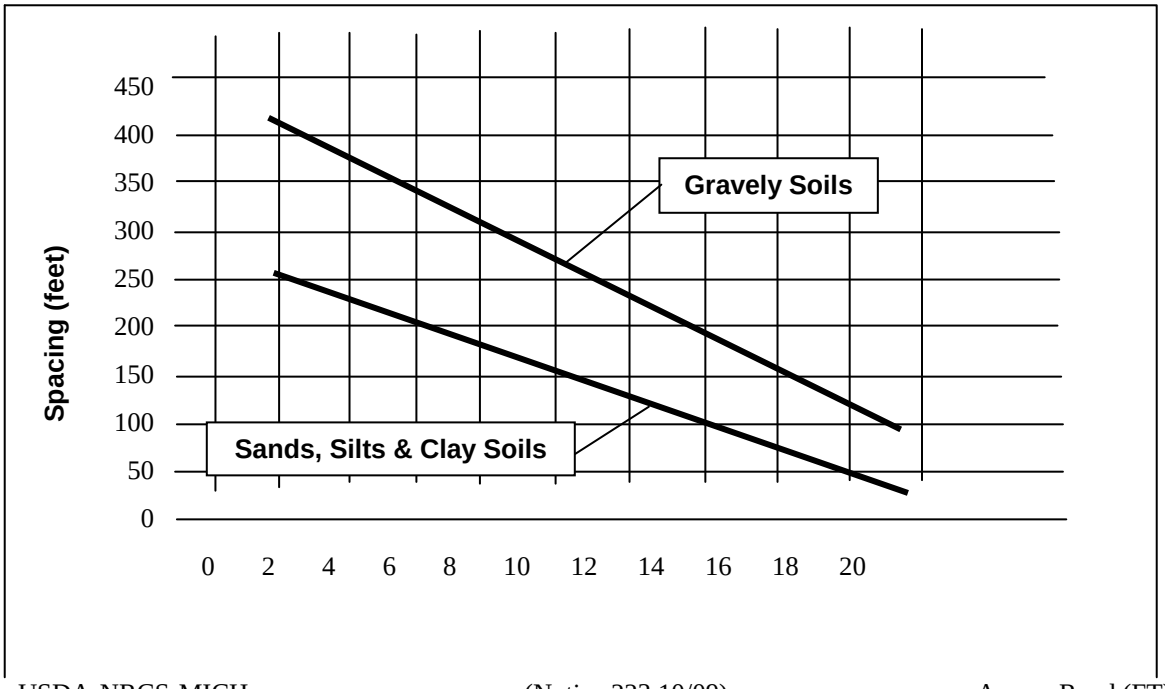
  - Job class designation
  - Initials from preconstruction conference
  - As-built notes
- Construction inspection records
  - Assistance notes or separate inspection records
  - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

FIGURE 1
Recommended Spacing of Relief Culverts and Water Bars Based on Soil Types



Road Grade (%)