NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

POND, (NUMBER)

Code 378

DEFINITION

A water impoundment made by constructing a dam, an embankment or by excavating a pit or dugout.

In this standard, ponds constructed by the first method are referred to as embankment ponds, and those constructed by the second method are referred to as excavated ponds. Ponds constructed by both the excavation and the embankment methods are classified as embankment ponds if the depth of water impounded against the embankment at the auxiliary spillway elevation is 3 feet or more.

PURPOSE

To provide water for livestock, fish and wildlife, recreation, fire control, and other related uses, and to maintain or improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

Site conditions shall be such that runoff from the design storm (see Table 2) can be safely passed through (1) a natural or constructed vegetated earth spillway, (2) a combination of a principal spillway and an auxiliary spillway, or (3) a principal spillway.

CRITERIA

General Criteria. The drainage area above the pond must be protected against erosion to the extent that expected sedimentation will not shorten the planned effective life of the structure. The drainage area shall be large enough so that surface runoff and groundwater flow will maintain an adequate supply of water in the pond.

Runoff water from barnyards, feedlots, septic tanks, barn drains, or other sources of contamination shall be diverted so as not to flow into ponds to be used for drinking water supply, livestock water supply, fish and wildlife, or recreation. The quality shall be suitable for the water's intended use.

Reservoir Area. The topography and soils of the site shall permit storage of water at a depth and volume that ensure a dependable supply, considering beneficial use, sedimentation, season of use, and evaporation and seepage losses. If surface runoff is the primary source of water for a pond the soils shall be impervious enough to prevent excessive seepage losses or shall be of a type that sealing is practicable.

It is generally recommended that the permanent pool volume not exceed the estimated annual runoff. Figure 1 may be used to estimate annual runoff.

Minimum surface area of ponds to be used for fish production shall be 0.5 acre. The pond must provide at least 8 feet of water under at least 25% of the surface area at principal spillway elevation except in the northern 2 tiers of counties where the minimum depth under at least 25% of the surface area shall be 10 feet.

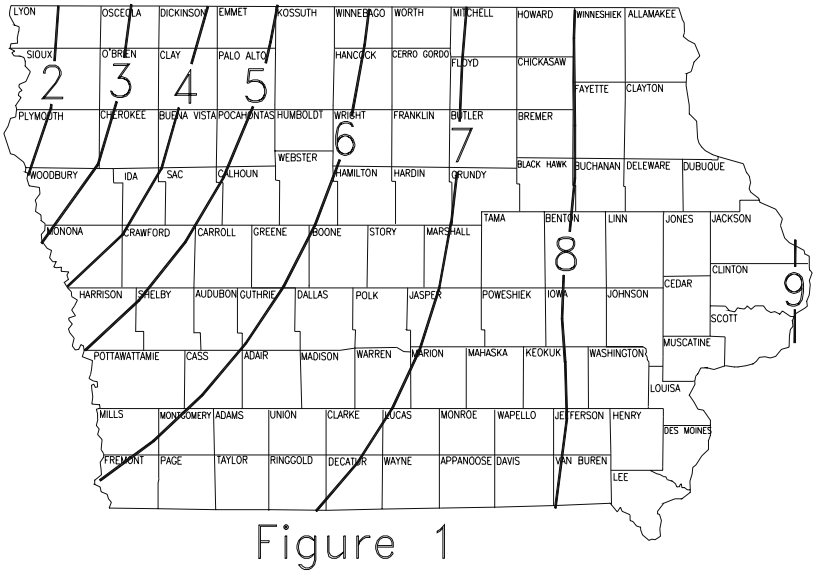

Figure 1

Average Annual Runoff in Inches
(Based on 1951–1980 data)

Legal. The landowner or operator must be advised that it is their responsibility to secure easements and necessary permits to comply with applicable federal and state laws and regulations. Farm ponds are not regulated by Federal Section 404 Clean Water Act (33CFR 323.4(a)(3)). A permit must be obtained from the Iowa Department of Natural Resources (IDNR) for construction, operation, and maintenance of dams and impounding structures in the following instances:

1. Any dam designed to provide a sum of permanent and temporary storage exceeding 50 acre-feet at the top of dam elevation or 25 acre-feet if the dam does not have an auxiliary spillway and which has a height of 5 feet or more. Height of dam means the vertical distance from the top of the dam to the natural bed of the stream or watercourse measured at the downstream toe of the dam or to the lowest elevation of the outside limit of the dam if it is not across a watercourse.
2. Any dam designed to provide permanent storage in excess of 18 acre-feet.
3. Any dam across a stream draining more than 10 square miles.
4. Any dam located within 1 mile of an incorporated municipality, if the dam has a height of 10 feet or more, stores 10 acre-feet or more at the top of dam elevation, and is situated such that the discharge from the dam will flow through the incorporated area.

Inventory. The following ponds are to be included in the national inventory of NRCS assisted dams and are considered as NRCS inventory dams:

1. Dams with more than 6 feet in overall embankment height and with a storage capacity of 50 acre-feet or more.
2. Dams with an overall embankment height of 25 feet or more and a storage capacity of more than 15 acre-feet.

The inventory is in accordance with §520.21(f), National Engineering Manual (NEM). The dams shall be recorded on Form IA-ENG-40.

DESIGN CRITERIA FOR EMBANKMENT PONDS

This standard establishes the minimum acceptable criteria for the design and construction of embankment ponds if:

1. Failure of the dam will not result in loss of life; in damage to homes, commercial or industrial buildings, main highways, or railroads; or in interruption of the use or service of public utilities.

2. The product of the storage times the effective height of the dam is less than 3,000. Storage is the volume, in acre-feet, in the reservoir below the elevation of the crest of the auxiliary spillway. The effective height of the dam is the difference in elevation, in feet, between the auxiliary spillway crest and the lowest point in the cross-section taken along the centerline of the dam. If there is no auxiliary spillway the top of the dam is the upper limit.

3. The effective height of the dam is 35 feet or less and the dam is hazard class (a). See §520.21, National Engineering Manual (NEM) for definition of dam classes.

Foundation Cutoff. A cutoff of relatively impervious material shall be provided under the dam if necessary. The cutoff shall be located at or upstream from the centerline of the dam. It shall extend up the abutments to normal reservoir level and be deep enough to extend into a relatively impervious layer or provide for a stable dam when combined with seepage control. The cutoff trench shall be excavated to a base material suitable to the engineer.

The cutoff trench shall have a bottom width adequate to accommodate the equipment used for excavation, backfill, and compaction operations, but not less than 8 feet. Side slopes shall not be steeper than 1½:1.

Seepage Control. Seepage control is to be included if (1) pervious layers are not intercepted by the cutoff, (2) seepage creates swamping downstream, (3) such control is needed to insure a stable embankment, or (4) special problems require drainage for a stable dam. Seepage may be controlled by (1) foundation, abutment, or embankment drains, (2) reservoir blanketing, or (3) a combination of these measures. See Chapter 11, Engineering Field Handbook (EFH) (Part 650 of the National Engineering Handbook (NEH) Series) for foundation drainage requirements.

Earth Embankment. The minimum top width for a dam is shown in Table 1. If the embankment top is to be used as a public road the minimum width shall be 26 feet. Guardrails or other safety measures shall be used where necessary and shall meet the requirements of the responsible road authority.

Constructed embankment side slopes shall not be steeper than 3 horizontal to 1 vertical (3:1) on both the upstream and downstream sides, except for embankments built entirely of glacial till soil on foundations of glacial till soil, which may have side slopes not steeper than 2½:1. This general criteria shall apply unless a flatter slope ratio is indicated by slope stability analysis.

Table 1. Minimum Top Width For Dams

Total Height Of Embankment (Feet)	Top Width (Feet)
Up to 15	10
15.1 – 25	12
25.1 – 35	14
35.1 or more	See TR-60

If needed to protect the slopes of the dam, special measures such as berms, rock riprap, sand-gravel, soil cement, or special vegetation shall be provided (TR-56 and TR-69). Rock riprap or other structural measures shall be used for dams where vegetation will not provide effective protection, for multiple-purpose dams, and for dams with fluctuating normal water levels. Rock riprap shall extend at least 1 foot above the maximum wave height and at least 3 feet below normal pool elevation.

A berm not less than 8 feet in width shall be provided at the normal pool elevation to dampen out wave action. It shall extend across the earthfill to the abutments. It need not be continuous across the face of the fill when the surface area of the pond is 2 acres or less but must extend around the inlet for a distance of not less than 10 feet. The berm may be omitted entirely when the surface area of the pond is 1 acre or less and the principal spillway

diameter is less than 10 inches. The berm may be constructed as much as 6 inches above permanent pool level to provide for settlement. A sloping berm designed in accordance with TR-56 may also be used.

A berm may be needed on the downstream slope for slope stability, as an erosion control measure, or as a crossing. It shall be not less than 10 feet in width (measured on the horizontal projection). Downstream slopes may be flattened in lieu of berms. Berms may be built level or drain back towards the fill and laterally to safe outlets.

The minimum elevation of the top of the settled embankment shall be 1 foot above the water surface in the reservoir with the auxiliary spillway flowing at design depth. The minimum difference in elevation between the crest of the auxiliary spillway and the settled top of the dam shall be 2 feet.

The design height of the dam shall be increased by the amount needed to insure that after settlement the height of the dam equals or exceeds the design height. This increase shall not be less than 5%, except where detailed soil testing and laboratory analyses show that a lesser amount is adequate.

Borrow area within 6 feet of the permanent water elevation shall have a minimum side slope of 2½:1. All other borrow areas below crest shall have a minimum side slope of 1½:1.

Principal Spillway. A pipe conduit, with needed appurtenances, shall be placed under or through the dam except where rock, concrete, or other types of mechanical spillways are used, or where the rate and duration of flow can be safely handled by a vegetated or earth spillway. A mechanical spillway shall be provided for all ponds with drainage areas of 20 acres or more.

The crest elevation shall be no less than 1.0 foot below the crest of the auxiliary spillway. When design discharge of the principal spillway is considered in calculating peak outflow through the auxiliary spillway, the crest elevation of the inlet shall be such that the full flow will be generated in the conduit before there is discharge through the auxiliary spillway. The inlets and outlets shall be designed to function satisfactorily for the full range of flow and hydraulic head anticipated.

The capacity of the pipe conduit shall be adequate to discharge long-duration, continuous, or frequent flows without flow through the auxiliary spillways. The diameter of the pipe shall not be less than 4 inches.

See Table 2 for additional limits on pipe diameter. If the pipe conduit diameter is 10 inches or greater its design discharge may be considered when calculating the peak outflow rate through the auxiliary spillway.

Pipe conduits under or through the dam shall meet the following requirements:

1. The pipe shall be capable of withstanding external loading without yielding, buckling, or cracking.
2. Pipe strength shall not be less than that of the grades indicated in Table 3 for plastic pipe and in Table 4 for corrugated aluminum and galvanized steel pipe.
3. The inlets and outlets shall be structurally sound and made of materials compatible with those of the pipe.
4. All pipe joints shall be made watertight by the use of couplings, gaskets, caulking, or by welding.

Table 2. Minimum Spillway Capacity For Ponds And Other Storage Type Structures

Drainage Area (Acres)	Minimum Pipe Diameter (Inches)	Effective Fill Height[1] (Feet)	Storage[1] (Acre-Feet)	Minimum Design Frequency (24-Hour Duration Storm)[2] Principal Spillway Year	Auxiliary Spillway Year
0 – 20	4	0 – 20	Less than 50	-------	10
0 – 20	4	20 – 35	Less than 50	2	25
20 – 80	6	0 – 20	Less than 50	5	25
20 – 80	6	20 – 35	Less than 50	5	50
80 – 250	10	0 – 20	Less than 50	10	25
80 – 250	10	20 – 35	Less than 50	10	50
All Others	15	0 – 35	----------	25	50

[1] As defined under “Design Criteria for Embankment Ponds.”

[2] If structure requires an IDNR permit, more restrictive criteria may apply. See IDNR Technical Bulletin 16.

Table 3. Acceptable PVC Pipe For Use In Earth Dams[1]

Nominal Pipe Size	Pipe Material	Maximum Depth Of Fill Over Pipe
4, 6, 8, 10, 12	ASTM D2241 SDR 32.5	8
4. 6. 8. 10, 12	ASTM D2241 SDR 26	13
4, 6, 8, 10, 12	ASTM D2241 SDR 21	17
4, 6, 8, 10, 12	ASTM D2241 SDR 17	24
10, 12	ASTM D1785 Schedule 40	8
6, 8	ASTM D1785 Schedule 40	13
4	ASTM D1785 Schedule 40	20
10, 12	ASTM D1785 Schedule 80	20
6, 8	ASTM D1785 Schedule 80	24
4	ASTM D1785 Schedule 80	25
4, 6, 8, 10, 12	AWWA C900 Class 100	13
4, 6, 8, 10, 12	AWWA C900 Class 150	18
4, 6, 8, 10, 12	AWWA C900 Class 200	25

[1] Class 12454-A, 12454-B, or 12454-C polyvinyl chloride pipe (ASTM D1784).

Table 4. Minimum Gage For Corrugated Metal Pipe

{2 2/3 inch x ½ inch corrugations}[1]

Fill Height Above Pipe (Feet)	Minimum Gage For Steel Pipe With Diameter (in) of _____						Minimum Gage Of Aluminum Pipe[2] With Diameter (in) of _____			
	< 21	24	30	36	42	48	< 21	24	30	36
1 – 15	16	16	16	14	12	10	16	16	14	14
15 – 20	16	16	16	14	12	10	16	16	12	12
20 – 25	16	16	14	12	10	10	16	12	10	------[3]

{3 inch x 1 inch corrugations}[4]

Fill Height Above Pipe (Feet)	Minimum Gage For Steel Pipe With Diameter (in) of _____										
	36	42	48	54	60	66	72	78	84	90	96
1 – 15	16	16	16	16	16	16	16	14	12	12	10
15 – 20	16	16	16	16	14	14	14	12	10	8	----[3]
20 – 25	16	16	14	12	10	8	8	8	----[3]	---[3]	----[3]

[1] Pipe with 6, 8, and 10 inch diameters has 1½ x ¼ inch corrugations.
[2] Riveted or helical fabrication.
[3] Not permitted.
[4] n = 0.027

For dams 20 feet or less in effective height, acceptable pipe materials are cast-iron, steel, corrugated steel or aluminum, asbestos-cement, concrete, plastic, vitrified clay with rubber gaskets and cast-in-place reinforced concrete. Asbestos-cement, concrete, and vitrified clay pipe shall be laid in a concrete bedding. Plastic pipe that will be exposed to direct sunlight shall be made of ultraviolet-resistant materials and protected by coating or shielding or provisions for replacement should be made as necessary. Connections of plastic pipe to less flexible pipe or structures must be designed to avoid stress concentrations that could rupture the plastic.

For dams more than 20 feet in effective height, conduits shall be plastic, reinforced concrete, cast-in-place reinforced concrete, corrugated steel or aluminum, or welded steel pipe. The maximum height of fill over any steel, aluminum, or plastic pipes must not exceed 25 feet. Pipe shall be watertight. The joints between sections of pipe shall be designed to remain watertight after joint elongation caused by foundation consolidation. Concrete pipe shall have concrete bedding or a concrete cradle.

Cathodic protection shall be provided for welded steel and corrugated steel pipe if the need and importance of the structure warrant. Cathodic protection should normally be provided for corrugated steel pipe if the saturated soil resistivity is less than 4,000 ohms-cm or the pH is lower than 5. See Chapter 6, Engineering Field Handbook (EFH) for additional criteria for cathodic protection of welded steel pipe.

Cantilever propped pipe outlets may be used. The invert of the pipe at the outlet end shall be a minimum of 1 foot above a constructed channel or gully bottom. In situations where sediment accumulation in outlet channels could be a problem the outlet shall be raised or a chute or slotted flume outlet used. Where downstream channel conditions are stable the prop may be omitted. The outlet section shall be a minimum of 20 feet long with a minimum of 8 feet overhang downstream from the centerline of prop or from the intersection of the flow line of the pipe and design fill slope when no prop is used. The pipe shall project beyond the toe of the fill in all cases. The slope of the propped outlet should be within the limits shown in Table 5.

Chute outlets should be used when downstream sedimentation is expected, downstream gully banks may be sloped at a later date, or outlet submergence may occur from downstream works of improvement.

Table 5. Slope Of Cantilever Outlet

Diameter	Minimum	Maximum
4” – 15”	2%	20%
16” – 24”	2%	12%
26” – 48”	2%	7%
Over 48”	2%	4%

A slotted flume may be used on corrugated metal pipe conduits. Chute outlets for concrete pipe conduits will be constructed of reinforced concrete and shall meet the requirements for outlets for chute spillways.

Chute outlets for monolithic conduits will meet the same criteria as outlined for chute spillways in Grade Stabilization Structure (410).

Piping And Seepage Control. Seepage control shall be provided with a pipe conduit spillway if any of the following conditions exist:

1. The effective height of dam is greater than 15 feet.
2. The conduit is of smooth pipe larger than 8 inches in diameter.
3. The conduit is of corrugated pipe larger than 12 inches in diameter.

Seepage along pipes extending through the embankment shall be controlled by use of a filter and drainage diaphragm unless it is determined that anti-seep collars will adequately serve the purpose.

The filter is to consist of sand meeting fine concrete aggregate requirements (at least 15% passing the No. 40 sieve but no more than 10% passing the No. 100 sieve). If unusual soil conditions exist a special design analysis shall be made.

The filter shall be a minimum of 2 feet thick and extend vertically upward and horizontally at least 3 times the pipe diameter and vertically downward at least 2 feet beneath the conduit invert. The minimum earth cover for the filter

shall be 4 feet. The drainage diaphragm shall be located immediately downstream of the cutoff trench, approximately parallel to the centerline of the dam.

The filter shall be outletted at the embankment downstream toe, preferably using a drain backfill envelope continuously along the pipe to where it exits the embankment. Protecting drain fill from surface erosion will be necessary.

When anti-seep collars are used in lieu of a drainage diaphragm, they shall have a watertight connection to the pipe. Maximum spacing shall be approximately 14 times the minimum projection of the collar measured perpendicular to the pipe. Collar material shall be compatible with pipe materials.

The number of anti-seep collars can be determined by the formula:

$$N = \frac{L}{7(V - D)}$$

Where: L = The length of pipe lying within the saturated zone in feet.

V = The vertical height of the anti-seep collar in feet.

D = The outside diameter of the principal spillway conduit or outside height of monolithic conduit in feet.

The length of pipe lying within the saturated zone (L) is interpreted as follows:

MLRA 107: The distance from the inlet or downstream face of the riser to the centerline of the embankment drainage system or to the downstream toe if no embankment drainage system is planned.

Remainder of State: The distance from the inlet or the downstream face of the riser to the downstream edge of the top plus 60% of the distance from the downstream edge of the top to the downstream toe.

When the normal dam template has been changed for reasons other than stability (i.e. increased top width for roadway or addition of beaching slopes for wave protection), the number of anti-seep collars on conduits may be determined on the basis of a normal embankment template.

Closed conduit spillways designed for pressure flow must have adequate antivortex devices.

If needed to prevent clogging of the conduit, an appropriate trash guard shall be installed at the inlet or riser.

A pipe with a suitable valve shall be provided to drain the pool area if needed for proper pond management. The principal spillway conduit may be used as a pond drain if it is located where it can perform this function.

Supply pipes through the dam to watering troughs and other appurtenances shall have an inside diameter of not less than 1¼ inches. See Chapter 11, Engineering Field Handbook (EFH) for minimum design requirements for water supply pipes.

Auxiliary Spillways. Auxiliary spillways convey large flood flows safely past earth embankments.

An auxiliary spillway must be provided for each dam unless the principal spillway is large enough to pass the peak discharge from the routed design hydrograph and the trash that comes to it without overtopping the dam. The following are minimum criteria for acceptable use of a closed conduit principal spillway without an auxiliary spillway:

1. a conduit with a cross-sectional area of 3 feet^2 or more,
2. an inlet that will not clog, and
3. an elbow designed to facilitate the passage of trash. If an auxiliary spillway cannot be provided design the principal spillway and any associated temporary storage for 50-year–24-hour runoff and provide at least 2.0 feet of freeboard. This requires approval of the state conservation engineer.

The minimum capacity of a natural or constructed auxiliary spillway shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in Table 2, less any reduction creditable to conduit discharge and detention storage.

The auxiliary spillway shall safely pass the peak flow or the storm runoff shall be routed through

the reservoir. The routing shall start either with the water surface at the elevation of the crest of the principal spillway or at the water surface after 10 days drawdown, whichever is higher. The 10-day drawdown shall be computed from the crest of the auxiliary spillway or from the elevation that would be attained if the entire principal design storm were impounded, whichever is lower. Auxiliary spillways shall provide for passing the design flow at a safe velocity to a point downstream where the dam will not be endangered.

Constructed spillways shall be trapezoidal and shall be located in undisturbed or compacted earth. The side slopes shall be stable for the material in which the spillway is to be constructed. The auxiliary spillway shall have a bottom width of not less than 10 feet.

Constructed spillways are open channels and usually consist of an inlet channel, a control section, and an exit channel.

Upstream from the control section, the inlet channel shall be level for a minimum distance of 30 feet. The inlet channel may be curved to fit existing topography. The grade of the exit channel of a constructed auxiliary spillway shall fall within the range of 1% to 10% unless a routing of the auxiliary spillway storm satisfies discharge and velocity requirements.

No curvature will be allowed in the exit channel upstream of a point opposite the toe of the main fill. Where necessary a dike will be constructed along the exit channel. The dike shall have a minimum top width of 8 feet, side slopes no steeper than 2½:1, and sufficient height throughout the length of the dike. The dike and exit channel shall extend a sufficient distance downstream to prevent spillway discharge from damaging the main fill. The maximum permissible velocities for auxiliary spillways can be found in Table 6.

Structural Auxiliary Spillways. If chute or drop spillways are used for principal spillways or auxiliary spillways, they shall be designed according to the principles set forth in the Engineering Field Handbook (EFH) for Conservation Practices and the National Engineering Handbook (NEH) Section 5, Hydraulics; Section 11, Drop Spillways; and Section 14, Chute Spillways. The minimum capacity of a structural spillway shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in Table 2, less any reduction creditable to conduit discharge and detention storage.

Table 6. Permissible Velocities For Vegetated Spillways

Vegetation	Permissible Velocity (Feet/Second)			
	Erosion Resistant Soils[1]		Easily Erodible Soils[2]	
	Slope of Exit Channel		Slope of Exit Channel	
	0 – 5%	5 – 10%	0 – 5%	5 – 10%
Smooth bromegrass	8.75	7.5	6.25	5
Tall fescue	8.75	7.5	6.25	5
Reed canarygrass	8.75	7.5	6.25	5
Sod-forming grass-legume mix	6.25	5	5	3.75
Native grass mixtures	4.3	4.3	3.1	3.1

[1] Erodibility will be determined by the texture of the soil horizon that is exposed after construction. Erosion resistant soil textures are loam, sandy loam, loamy sand, clay loam, sandy clay loam, and clay.

[2] Easily erodible soil textures are silt, silt loam, fine sandy loam, loamy fine sand, silty clay loam, and silty clay.

Visual Resource Design. The visual design of ponds shall be carefully considered in areas of high public visibility and those associated with recreation. The underlying criterion for all visual design is appropriateness. The shape and form of ponds, excavated material, and plantings are to relate visually to their surroundings and to their function.

The embankment may be shaped to blend with the natural topography. The edge of the pond may be shaped so that it is generally curvilinear rather than rectangular. Excavated material can be shaped so that the final form is smooth, flowing, and fitting to the adjacent landscape rather than angular geometric mounds. If feasible, islands may be added for visual interest and to attract wildlife.

DESIGN CRITERIA FOR EXCAVATED PONDS

Site Selection. Sufficient soil borings will be taken to determine if the soil is impervious enough to hold water for surface-fed ponds or to establish the presence of adequate groundwater for groundwater-fed ponds. If the soils are shallow and are underlain by gravel or sand the seepage rates may be excessive and another site should be selected.

Capacity and Size Requirements. If used for livestock water, the pit shall be large enough to supply the needs for the average number of livestock to be supplied or for a pit which is to distribute grazing; the practical limit would be the grazing potential of the pasture area.

The bottom width shall be 10 feet or more and the length 40 feet or more. The minimum bottom area shall be 500 square feet at the designed depth.

Runoff. Provisions shall be made for a pipe and auxiliary spillway if necessary. Runoff flow patterns shall be considered when locating the pit and placing the spoil. See Table 2 for spillway capacity requirements.

Side Slopes. Side slopes of excavated ponds shall be stable and shall not be steeper than 1½:1 nor flatter than 3:1 except where livestock water directly from the pond. If livestock will water directly from the pond a watering ramp at least 10 feet wide shall be provided. The ramp shall extend to the anticipated low water elevation at a slope no steeper than 4 horizontal to 1 vertical (4:1).

Perimeter Form. If the structures are to be used for recreation or are highly visible to the public the perimeter or edge should be curvilinear.

Inlet Protection. If surface water enters the pond in a natural or excavated channel the side slope of the pond shall be protected against erosion.

Excavated Material. The material excavated from the pond shall be placed so that its weight will not endanger the stability of the pond side slopes and so that it will not be washed back into the pond by rainfall. It shall be disposed of in one of the following ways:

1. Uniformly spread to a height that does not exceed 3 feet with a front slope not steeper than 3:1 and with the top graded to a continuous slope away from the pond.
2. Uniformly placed or shaped reasonably well with side slopes assuming a natural angle of repose. The excavated material will be placed at a distance equal to the depth of the pond but not less than 12 feet from the edge of the pond.
3. Shaped to a designed form that blends visually with the landscape.
4. Used for low embankment and leveling.
5. Hauled away.

Fencing. Where an adjacent area is used for grazing or is open to livestock the pit and spoil areas shall be fenced. Where livestock are permitted to water directly from the pits the fencing will be placed in a manner that will permit livestock to utilize the approach ramp as a means of access to the water.

CONSIDERATIONS

In highly visible, public areas and those associated with recreation, careful considerations should be given to landscape 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. Site selection can be used to reduce adverse impacts or create desirable focal points.

Consider conservation and stabilization of archaeological and historic sites when designing this practice. This practice has the potential of positively and/or negatively affecting National Register listed or eligible (significant) cultural resources. Follow NRCS state policy for considering cultural resources during planning, construction, and maintenance.

Fencing should be utilized in areas when necessary to control access by animals or people.

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

PLANS AND SPECIFICATIONS

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

The following list of Construction Specifications is intended as a guide to selecting the appropriate specifications for each specific project. The list includes most but may not contain all of the specifications that are needed for a specific project:

IA-1 Site Preparation
IA-3 Structure Removal
IA-5 Pollution Control
IA-6 Seeding and Mulching for Protective Cover
IA-11 Removal of Water
IA-21 Excavation
IA-23 Earthfill
IA-24 Drainfill
IA-26 Salvaging and Spreading Topsoil
IA-31 Concrete
IA-45 Plastic (PVC, PE) Pipe
IA-51 Corrugated Metal Pipe Conduits
IA-52 Steel Pipe Conduits
IA-81 Metal Fabrication and Installation

IA-83 Timber Fabrication and Installation
IA-92 Fences
IA-99 Cathodic Protection for Buried Metal Structures

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be prepared for use by the owner or others responsible for operating and maintaining the system. The plan shall provide specific instructions for operating and maintaining the system to ensure that it functions properly. It shall also provide for periodic inspections and prompt repair or replacement of damaged components.