
Requirements for Approval of Farm Pond Dams Constructed Before 2005

Dam Safety Section

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1.0 INTRODUCTION

The requirements included herein are applicable to farm pond dams constructed prior to September 4, 2005, and not previously approved by the Department. Unapproved farm pond dams are required to meet the following structural, condition, and application requirements to receive Department approval.

Farm pond dams are defined as dams with (a) either a minimal or low hazard potential classification, (b) a product of effective storage times effective height less than or equal to 3,000 acre-feet², and (c) a dam height less than or equal to 35 feet. See “Nebraska Department of Natural Resources, Classification of Dams” for more information regarding the size and hazard potential classification of dams.

Dam height is defined as the difference in elevation in feet between the natural bed of the stream or watercourse measured at the downstream toe (or from the lowest elevation of the outside limit of the barrier if it is not across stream) to the top of the dam embankment.

The effective height of a dam is defined as the difference in elevation in feet between the natural bed of the stream or watercourse measured at the downstream toe (or from the lowest elevation of the outside limit of the barrier if it is not across stream) to the emergency spillway crest. If the dam does not have an emergency spillway, the effective height is the same as the dam height.

The effective storage is defined as the total storage volume in acre-feet in the reservoir below the elevation of the crest of the emergency spillway. If the dam does not have an emergency spillway, the effective storage is measured at the top of dam elevation.

1.1 Breached Dams

The requirements included herein are not applicable to dams that have breached due to either natural causes or human intervention. Breached dams that are reconstructed must meet the same criteria as a new dam.

1.2 Future Development

Any dam located in close proximity to a city or village as detailed in Table 1 must meet the requirements for a high hazard potential structure. The requirements can be adjusted if development in the downstream breach inundation area is sufficiently curtailed due to zoning restrictions, easements, deed restrictions, or other methods of acceptable restriction.

Table 1 High Hazard Potential Based on Proximity to City or Village

Incorporated Class	Population	Located within or within given distance of jurisdictional limits of City or Village
Metropolitan Class	$\geq 300,000$	3 miles
Primary Class	> 100,000 up to 300,000	3 miles
First Class	> 5,000 up to 100,000	2 miles
Second Class	> 800 up to 5,000	1 mile
Village	100 up to 800	1 mile

2.0 STRUCTURE CRITERIA

This section includes the minimum structure criteria for an existing farm pond dam. Dam owners and engineers are encouraged to consider the cost and benefits of exceeding these criteria where possible. If any feature or component of the dam fails to meet the minimum structure criteria listed below, the feature or component will generally need to be upgraded to meet the design criteria of “*Natural Resources Conservation Service, Conservation Practice Standard, Pond Code 378 for Nebraska*” (*NE-NRCS Pond 378*). In addition, all new/proposed conduits passing through the dam must meet the minimum requirements of *NE-NRCS Pond 378*.

2.1 Criteria for Minimal Hazard Potential Dams

The earthen embankment for minimal hazard potential dams shall have a minimum top width of six (6) feet. The upstream and downstream side slopes of the embankment shall not be less than 1.5:1. At a minimum, the dam shall have either a principal spillway or an earthen emergency spillway. Earthen emergency spillways must be located away from and direct outflow away from the dam embankment.

2.2 Criteria for Low Hazard Potential Dams

The following are the minimum criteria for the earthen embankment, principal spillway, and emergency spillway for a low hazard potential dam.

2.21 Earthen Embankment

The earthen embankment for low hazard potential dams shall have a minimum top width of eight (8) feet. The upstream and downstream side slopes of the embankment shall not be less than 2:1.

2.22 Principal Spillway

A principal spillway is required when (a) the classification of the emergency spillway according to the emergency and principal spillway proportioning guide (Table 2) so requires, or (b) when there is baseflow flowing into the reservoir. The size of the principal spillway, if required, shall be determined based on Table 2. The minimum conduit diameter to fulfill the principal spillway requirement is four (4) inches. If present, the minimum riser diameter to fulfill the principal spillway requirement is eight (8) inches.

The crest of the principal spillway must be below the crest of the emergency spillway. The outlet of the principal spillway must not be submerged by a downstream obstruction during normal (non-flooding) flow conditions.

Anti-vortex devices and trash racks are recommended, but not required. Wire mesh covering the inlet to the principal spillway will not be allowed if the openings in the mesh are less than four (4) inches in diameter.

2.23 Emergency Spillway

An emergency spillway must be provided for a dam unless the principal spillway is large enough to pass the routed design hydrograph without overtopping the dam. The minimum principal spillway size for dams without an emergency spillway is a conduit with a cross-sectional area of three (3) square feet. Dams that do not have an emergency spillway, must also have a principal spillway with a trash rack, an anti-vortex device, an inlet which will not clog, and an elbow designed to facilitate the passage of trash.

The emergency spillway, or the combined emergency and principal spillway, must have the capacity to pass the runoff resulting from a 25-year, 24-hour storm without the dam overtopping. If the principal spillway is to be taken into consideration in hydraulic computations for the 25-year, 24-hour storm, the principal spillway must meet the minimum size requirements of *NE-NRCS Pond 378*.

For additional emergency spillway requirements, see Table 2.

2.24 Reservoir Routing

Flow through the emergency spillway shall be determined by accepted reservoir routing procedures. The routing shall start with the water surface at the elevation of the crest of the principal spillway or at the water surface after ten (10) days of drawdown, whichever is higher.

The 10-day drawdown shall be computed with the reservoir starting at the crest of the emergency spillway or from the elevation that would be attained had the entire design storm been impounded, whichever is lower. In regions with high infiltration rates, infiltration losses from the reservoir may be taken into consideration when calculating the 10-day drawdown; however, the infiltration rates must be supported with documentation. The effect of sedimentation with fine-grained soils on the infiltration rates must be evaluated and reflected in the drawdown computations.

The final design flow depth in the exit channel shall not exceed the assumed depth used in Table 2. The exit channel must direct flow away from the dam embankment. A wing dike shall be provided if needed to prevent the spillway flow from coming in contact with the downstream slope of the dam.

2.3 Summary of Structure Criteria

A summary of all the structure criteria for existing farm pond dams is provided in Table 3.

TABLE 2 - EMERGENCY AND PRINCIPAL SPILLWAY PROPORTIONING GUIDE FOR EXISTING DAMS¹

NUMERICAL RATING	CRITERIA 1			CRITERIA 2 CONDITION AT RE-ENTRANCE TO MAIN CHANNEL ⁵	CRITERIA 3 VEGETATIVE COVER IN OUTLET CHANNEL
	SPILLWAY FLOW DEPTH ²	MAXIMUM SPILLWAY GRADES			
		EASILY ERODED ³	RESISTS EROSION ⁴		
5	0.5' 1.0' 1.5' 2.0' 2.5'	8% 5% 2%	11% 8% 5% 3% 2%	No "Drop Off" within 200' of auxiliary spillway crest	Dense, well established stand of grass and sod throughout
4	0.5' 1.0' 1.5' 2.0'	9% 6% 3%	14% 10% 6% 4%		
3	0.5' 1.0' 1.5'	10% 7% 4%	17% 12% 7%		
2	0.5' 1.0' 1.5'	12% 8% 5%	20% 14% 8%		
1	0.5' 1.0' 1.5'	15% 9% 8%	25% 16% 9%		
0*	0.5' 1.0' 1.5' 2.0' >2.5'	>15% >9% >8%	>25% >16% >9% >4%	"Drop Off" within 75' of auxiliary spillway crest	

SPILLWAY CLASS RATING		PRINCIPAL SPILLWAY MINIMUM DESIGN REQUIREMENTS ⁶		EXAMPLE
ADJECTIVE	TOTAL NUMERICAL RATING	WITHOUT STORAGE - PIPE CAPACITY, % OF 25-YR, 24-HR PEAK	WITH STORAGE CONSIDERED - STORM FREQ. TO BE ROUTED BELOW THE EMERGENCY SPILLWAY	
Excellent	11 - 15	Principal spillway only required to pass baseflow.		Criteria 1: Max. flow depth 1.2', easily eroded soil, 5% grade = 2 Criteria 2: Drop off 190' from spillway crest = 4
Very Good	9 - 10	25%	2-YR, 24-HR	
Good	8	35%	2-YR, 24-HR	Criteria 3: Well established grasses, no bare areas > 2' in length = 4
Fair	6 - 7	50%	5-YR, 24-HR	
Poor	4 - 5	75%	10-YR, 24-HR	
Very Poor	0 - 3	100%	25-YR, 24-HR	Total Numerical Rating: 10 Adjective Rating: Very Good

¹This table is only applicable to existing dams built prior to 2005 with a low hazard potential classification and a product of effective storage times the effective height of less than 3,000. This table is not to be used for the design of new spillways for existing dams.

²The calculated spillway flow depth shall be rounded up to the nearest half foot increment.

³Easily eroded soil has a plasticity index less than 10 or greater than 40.

⁴Soil that resists erosion has a plasticity index from 10 to 40.

⁵"Drop Off" is defined as a gully, headcut, steep hillside, bank, or escarpment in the auxiliary spillway outlet flow path with a depth of more than 2 feet.

⁶Minimum combined capacity of the principal and emergency spillways must safely pass the 25-year, 24-hour storm. The left column indicates the percentage of the peak inflow that must be passed by the principal spillway if reservoir routings are not conducted. The right column indicates the design storm for the principal spillway when the reservoir routings are conducted.

* A zero numerical rating for either Criteria 1 or Criteria 2 results in a spillway class rating of very poor.

Table 3 - SUMMARY OF STRUCTURE CRITERIA FOR EXISTING FARM POND DAMS¹

	Low Hazard	Mimimal Hazard
Hydraulic Requirement	Pass 25-year, 24-Hour Runoff Without Overtopping	Have Either Principal or Emergency Spillway
Principal Spillway Capacity	See Table 2	No Requirement
Principal Spillway Conduit Minimum Size	4-inch	No Requirement
Principal Spillway Riser Minimum Size	8-inch	No Requirement
Principal Spillway Elevation	Below Emergency Spillway Crest	No Requirement
Principal Spillway Outlet	Unsubmerged	No Requirement
Emergency Spillway	Generally Required (See Section 2.23)	No Requirement
Emergency Spillway Profile	See Table 2	No Requirement
Emergency Spillway Bottom Width	No Minimum	No Minimum
Auxiliary Spillway Side Slopes	No Requirement	No Requirement
Auxiliary Spillway Configuration	Directed Away from Dam	Directed Away from Dam
Embankment Minimum Top Width	8 feet	6 feet
Embankment Side Slopes	2:1	1.5:1
Antiseep Collars	Recommended, but Not Required	No Requirement
Antivortex Device	Required if No Emergency Spillway, Otherwise Recommended, but Not Required	No Requirement
Trash Guard	Required if No Emergency Spillway, Otherwise Recommended, but Not Required	No Requirement

¹This table is only applicable to existing dams built prior to 2005 with a low or minimal hazard potential classification and a product of effective storage times the effective height of less than 3,000. This table is not to be used for the design of new features for an existing dam.

3.0 CONDITION CRITERIA

An existing farm pond dam must meet the following condition criteria in order to be approved by the Department. If other less severe deficiencies are found, dam owners and engineers are encouraged to consider the cost and benefits of taking corrective action. If any feature or component of the dam fails to meet the condition criteria listed below, corrective action must be taken to address the deficiency before an approval to operate will be issued by the Department.

3.1 Criteria for Minimal Hazard Potential Dams

The Department of Natural Resources may make an inspection of the dam prior to issuing the approval to operate. If the Department finds the dam poses an imminent danger to downstream property, the Department may require additional work or modifications.

3.2 Criteria for Low Hazard Potential Dams

Low hazard potential dams must be inspected by a civil engineer with dam-related experience or someone working directly under his/her supervision with adequate training and at least four years of relevant experience. The dam must meet the following condition criteria at the time of inspection:

1. No flowing seepage or evidence of flowing seepage next to any conduit that passes through the dam.
2. No flowing seepage or evidence of flowing seepage anywhere along the downstream slope of the embankment.
3. No flowing seepage or known history of seepage within 25 feet of the downstream toe of the dam embankment in excess of five (5) gallons per minute.
4. No cloudy seepage or known history of cloudy seepage emerging anywhere on the dam or within 25 feet of the downstream toe.
5. No boils or known history of boils within 25 feet of the downstream toe of the dam embankment.
6. No heavy, dense tree and brush growth on the dam embankment so as to make visual inspection of sections of the dam difficult.
7. No sloughing or obvious signs of embankment instability.
8. No transverse cracks more than ten (10) feet in length on the dam embankment or any crack extending through the crest of the embankment.
9. No cracks in the dam embankment extending either continuously or intermittently in the same general direction for more than 50 feet.
10. No sinkholes more than 12 inches in diameter on the dam embankment.

11. No ruts, dips, trails, settlements, holes, or other observable deficiencies in the dam embankment that would result in flow through or over the earthen dam embankment during passage of the 25-year, 24-hour storm design storm.
12. Widespread, extensive rodent activity on the dam embankment must not be present. (More than one rodent hole per 100 feet of dam length would be considered extensive activity.)
13. No obvious sign of rodent burrows extending through the dam embankment.
14. The principal spillway must not be more than 20% blocked by debris, trash, sediment or any other observable obstruction.
15. No wire mesh covering the inlet to the principal spillway with an opening size less than four (4) inches in diameter.
16. Leakage into or out of any conduit passing through the dam embankment must not be greater than 0.25 gallons per minute.
17. There must be no observable holes in any conduit passing through the dam embankment which could lead to erosion of any portion of the earthen embankment. (Full-length, internal inspection of conduits less than 30-inches in diameter is not required.)
18. No significant erosion around or under a principal spillway conduit or chute which threatens the stability or integrity of the spillway or embankment.
19. If the dam includes a concrete spillway chute, there must be no significant deterioration of the spillway present such that the deterioration could lead or has led to substantial erosion of the dam embankment.
20. No escarpments due to erosion or sloughing extending into the crest of the dam.
21. No escarpments with a height greater than half the top width of the dam.
22. No buildings, vehicles, or equipment located in the crest section or outlet flow path of the emergency spillway.
23. No other obvious deficiencies that would result in probable dam failure during the occurrence of the 25-year, 24-hour storm.

4.0 APPLICATION REQUIREMENTS

Every owner of a dam subject to the Safety of Dams and Reservoirs Act that was constructed prior to September 4, 2005, and not previously approved by the Department shall file an Application for Approval of Plans for Dams with the Department for approval of such dam. A separate application is required for each dam. The application shall be accompanied by the appropriate fee, plans and other required documentation.

The application form must be signed by all the owners of the dam and reservoir. If the owner of the dam is not the landowner of the land where the dam and reservoir are located, the application shall be accompanied by documentary evidence describing the relationship and responsibilities of the owner of the dam and the landowner. Acceptable documentary evidence includes, but is not limited to, leases, contracts, memoranda of agreement, or easements.

If a surface water appropriation is required for the storage reservoir in accordance with *Neb. Rev. Stat. § 46-241*, the plans, specifications, and application for approval shall be submitted at the same time as the Application For a Permit to Impound Water. See *Department of Natural Resources Rules of Practice and Procedure, Title 457 Neb. Admin. Code, Rules for Surface Water* for more information.

The Department will return applications that are incomplete or incorrectly filled out to the applicant. The corrected or completed application must be returned to the Department within ninety days. Failure to refile within 90 days will result in the forfeiture of the fees and dismissal of the application. If applicable, the application for an associated surface water storage appropriation will also be dismissed.

4.1 Filing Fees

The filing fee for an Application for Approval Plans for Dams shall be determined by measuring the height of the dam from the natural bed of the stream or watercourse at the downstream toe of the barrier, or from the lowest elevation of the outside limit of the barrier, if it is not across a stream channel or watercourse, to the top of dam elevation. The fee shall be one-hundred and fifty dollars (\$150.00) for dams less than twenty-five feet in height. The fee shall be two-hundred and fifty dollars (\$250.00) for dams twenty-five feet in height to not more than thirty-five feet in height.

4.2 Outlet Works

In order to protect the rights of persons downstream and to facilitate compliance with interstate compacts, decrees and agreements, all dams are required to have an outlet works. The Department may waive the requirement for an outlet works if the owner of the dam has an acceptable alternative method for passing water when ordered to do so.

For the Department to consider a waiver, a Petition for Waiver of Outlet Works (form available from the Department) and ten-dollar (\$10.00) filing fee must be submitted to the Department. The petition must describe why an outlet works is not necessary, and how the owner of the dam will pass water downstream when required by the Department. The Department will not allow waivers for dams associated with public roadways.

4.3 Plan and Documentation Requirements

The plans and documentation shall include the information described below based on the hazard potential classification for the dam.

4.31 Requirements for Minimal Hazard Potential Dams

Plans and documentation for minimal hazard potential dams shall include the following:

1. Name of the dam.
2. Location of dam including quarter section, section, township, range, and county.
3. Topographic map(s) of the dam site, reservoir area up to reservoir water line at the maximum storage elevation, and the return area to the natural channel from all conduits and spillway(s). The map must be derived from on-site or LiDAR survey and show two-foot contour intervals or less. It is not necessary to show contours below the reservoir water surface at the time of the survey. The map shall also include:
 - a. The reservoir water line at the normal storage elevation.
 - b. The government subdivisions lines in which the dam and reservoir are located.
 - c. The location of all existing and/or proposed conduits and spillways passing through, over, or around the dam.
 - d. The location of any pump or diversion facility used to provide water to the reservoir, if applicable.
4. The following information must be prepared by a professional civil engineer currently licensed in Nebraska:
 - a. A statement certifying the minimal hazard potential classification for the dam.
 - b. The topographic map(s) if derived from on-site survey.
 - c. A table showing the incremental and cumulative reservoir surface area and reservoir storage at two-foot elevation intervals and at the crest elevation of the drawdown, the principal and emergency spillways, other outlets and the top of dam elevation. Reasonable estimates can be made for elevations below the water surface at the time of survey.

- d. A cross section of each existing or proposed conduit/spillway/drawdown that passes or will pass through the dam embankment. The cross section shall detail the elevations, dimensions, and materials of each component of the spillway(s) and whether the spillway(s) is (are) existing or proposed.

4.32 Requirements for Low Hazard Potential Dams

Plans and documentation for low hazard potential dams shall include the following:

1. Name of the dam.
2. Location of dam including quarter section, section, township, range, and county.
3. A topographic map(s) of the dam site, reservoir area up to reservoir water line at the maximum storage elevation, and the return area to the natural channel from all conduits and spillway(s). The map must be derived from on-site or LiDAR survey and show two-foot contour intervals or less. It is not necessary to show contours below the reservoir water surface at the time of the survey. The map shall also include:
 - a. The reservoir water line at the normal storage elevation.
 - b. The government subdivisions lines in which the dam and reservoir are located.
 - c. The location of all existing and/or proposed conduits and spillways passing through, over, or around the dam.
 - d. The location of any pump or diversion facility used to provide water to the reservoir, if applicable.
4. The following information must be prepared by a professional civil engineer currently licensed in Nebraska:
 - a. A statement certifying the low hazard potential classification for the dam.
 - b. A statement certifying that the dam meets or will meet (after proposed modifications) the structure and condition requirements for an existing low hazard potential farm pond constructed prior to 2005.
 - c. The topographic map(s) if derived from on-site survey.
 - d. A table showing the incremental and cumulative reservoir surface area and reservoir storage at two-foot elevation intervals and at the crest elevation of the drawdown, the principal and emergency spillways, other outlets and the top of dam elevation. Reasonable estimates can be made for elevations below the water surface at the time of survey.
 - e. A cross section of each existing or proposed conduit/spillway/drawdown that passes or will pass through the dam embankment. The cross section shall detail the elevations, dimensions, and materials of each component of the spillway and whether the spillway is existing or proposed.
 - f. A cross section at the crest of the emergency spillway(s).
 - g. A profile of the emergency spillway(s).

- h. Pertinent hydrologic and hydraulic data for each design storm:
 - i. Drainage area,
 - ii. Runoff curve number,
 - iii. Time of concentration,
 - iv. Rainfall amount,
 - v. Runoff amount,
 - vi. Recurrence interval,
 - vii. Peak inflow into the reservoir,
 - viii. The maximum discharge for each spillway,
 - ix. The peak reservoir elevation, and
 - x. Flow depth in emergency spillway outlet channel.