

Virginia Soil and Water Conservation Board
Impounding Structure (Dam Safety) Regulations Technical Advisory Committee (TAC)
Thursday, July 13, 2006, 9:00 a.m. – 4:00 p.m.
North Anna Nuclear Information Center
Mineral, Virginia

Technical Advisory Committee Members Present

Sara Bell, Dominion Generation
William G. Browning, Department of Conservation and Recreation
Scott Cahill, Watershed Services
David B. Campbell, Schnabel Engineering
Paul D. Castle, Lakefront Royal Property Owners Association
Douglas L. Davis, Waynesboro Police Department
Donald R. Demetrius, Watershed Projects Evaluation Branch, Fairfax County
J. Michael Flagg, Department of Public Works, Hanover County
Connie Houston
Richard Jacobs, Culpeper Soil and Water Conservation District
David Krisnitski, Virginia Game and Inland Fisheries
Mathew J. Lyons, Natural Resources Conservation Service
Daniel J. Mahoney, Federal Energy Regulatory Commission
Joseph H. Maroon, Department of Conservation and Recreation
Duncan C. McGregor
Timothy A. Mitchell, City of Lynchburg
Mishelle R. Noble-Blair, City of Manassas
David E. Ogle, Virginia Department of Transportation
John W. Peterson, KEMPS Consulting, Inc.
Dr. Peter Rainey
David S. Rosenthal, City of Norfolk
Ray Scher

Technical Advisory Committee Members Not Present

Connie Bennett, Department of Environmental Services, York County
Steve Billcheck, Virginia Department of Emergency Management
Jeff W. Booth, Western Virginia Water Authority
Jay Day, Mountain Castles Soil and Water Conservation District
Joseph S. Haugh
John W. Jones, Virginia Sheriffs Association

Facilitator

Barbara Hulburt, Director of Facilitation & Training, The McCammon Group

Department of Conservation and Recreation Staff Present

David C. Dowling, Director of Policy, Planning and Budget
Christine Watlington, Policy, Planning and Budget Analyst
Jim Robinson, Dam Safety Program Manager
Tom Roberts, Dam Safety Engineer
Michael R. Fletcher, Director of Development
Ken Turner, District Dam Engineer
David Conniff, Dam Safety Engineer
Rob VanLier, Dam Safety Engineer

Observers Present

Chie McCaughey, Virginia Commonwealth University
John S. Bailey, Lake of the Woods Association
Neil Buttimer, Lake of the Woods Association

Opening remarks

Ms. Hulbert welcomed attendees to the meeting. She expressed appreciation to Sara Bell and to Dominion Power for the use of the facility.

Review of June 13th minutes

One correction was noted on the minutes. On Page 5 should say “loss of property” not “loss of life and property.”

How Virginia Regulations Affect the Values of One PMF – Peter Rainey

Dr. Peter Rainey gave a Powerpoint presentation entitled “How Virginia Regulations Affect the Values of One PMF”. The presentation may be viewed at:
<http://www.state.va.us/dcr/lawregs.htm>.

A key element of Dr. Rainey’s presentation is captured in the following slide.

DRAINAGE BASIN CHARACTERISTICS
Proposed Draft

4VAC50-20-240C

“The drainage area shall be determined. Present and planned land-use conditions shall be considered in determining the runoff characteristics of the drainage area. The most severe of these conditions shall be included in the design calculations which shall be submitted as part of the design report.”

Ms. Hulburt noted that in accordance with Dr. Rainey’s presentation, that changes proposed by the subcommittee related to drainage basin characteristics would bring Virginia into conformance at the national level as well as with neighboring states.

A member noted that hydrology is not an exact science. The duration can have a huge effect on the peak rainfall.

A member said that there is a great deal of responsibility for an engineer to sign off on a plan. The regulations do not need to get into intensive methodology.

A member said he would like to see a qualification process for engineers in the state. It was noted that FERC and other states have that requirement. Engineers must submit credentials for working on dams.

A member asked if this could be addressed in the regulations.

Mr. Maroon said that would have to be a change in the statute. The requirement would affect the ability of someone to function in their profession.

Got rain? – Dave Campbell

Mr. Campbell gave a Powerpoint presentation entitled “Got Rain?”. The presentation may be viewed at: <http://www.state.va.us/dcr/lawregs.htm>.

The summary points to Mr. Campbell’s presentation are as follows:

Conclusions

- Several point rainfall events in eastern US have exceeded the PMP estimates as defined by HMR 51 (10 mi² values)
- Many events greater than 50% PMP have occurred
- Latitude (summer jet-stream) appears to play a significant role in extreme rainfalls
- Virginia is a hotspot for intense rain events
- For small areas, thunderstorm phenomena would be the most likely cause of a PMF
- For large areas, hurricanes or other tropical storms are the most likely source of a PMF

Note: Looping of storms can significantly increase total rainfall depths

A member noted that some of the considerations were policy issues more than the science. For example should the TAC consider the non-quantitative factors in reducing spillway design flow. If there is a dam in Madison County and nothing has happened during major storms, should that be taken into consideration by the Board.

A member said the rainfall is only one half of the picture. The watershed drainage is another issue. Augusta County was given as an example. All of the dams are designed for the same rainfall event, but the pressure builds up differently.

It was noted that many of the discussions about the full PMF should actually be considered for a half PMF. Many of the dams are designed to a 100-year storm and half PMF. This puts the owners in an awkward position of determining whether to build to the greater event or the full PMF.

It was also noted that half PMF rainfalls are fairly common. Situations like a hurricane could potentially create a half PMF over a very large area.

Mr. Maroon said that Virginia had to be careful in comparisons to other states. It was noted that in states further south – South Carolina, Georgia, and Florida – there were fewer extreme flood events. Storm systems tend to blow through and do not get hung up as they do in Virginia.

A member asked why Virginia should be compared to other states at all.

Mr. Maroon said that for any regulatory or legislative discussion that the tendency was to compare with other states. Whether or not those state conditions are relevant to Virginia is the point.

Ms. Hulburt suggested that a greater awareness of what other states do with varying conditions is a separate question from the policy decisions. In other words, it is helpful to look at how other states address policy questions as opposed to comparing the rainfall and flood conditions.

It was noted that the National Weather Service established a 6 and 12 hour PMP for the country in the 70s and 80s. However, the PMP in central Virginia is much higher than a state like Iowa or even Georgia. There is not one PMP value for the country.

It was also noted that PMP values are location specific and drainage area specific. There are different PMP values for larger areas than for small areas. Time, area and locale all have to be brought in to play.

A member noted that the issue is also engineering specific. Three engineers could address the same issue and provide three solutions, all of which would be correct.

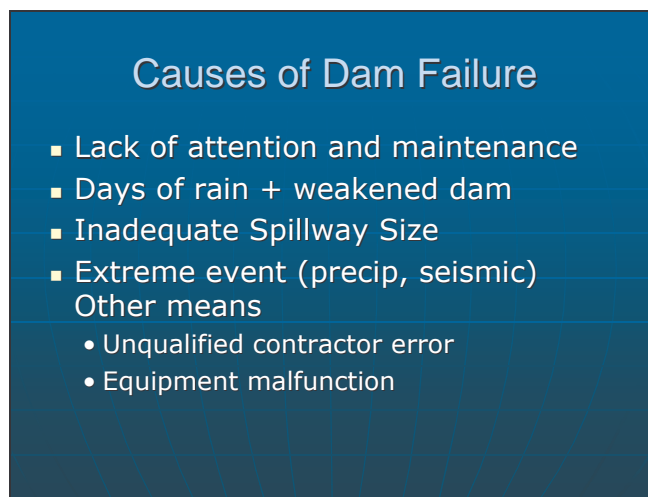
It was noted that some engineers would consider planned future development and factor that into the analysis.

A member noted that the subcommittee addressed the wording with regard to future development.

Virginia Dams: A status report – Lisa Cahill

Ms. Lisa Cahill gave a Powerpoint presentation entitled “Virginia’s Dams; A Status Report”. The presentation may be viewed at: <http://www.state.va.us/dcr/lawregs.htm>.

Ms. Cahill’s presentation focused on causes of dam failures, outlined severe maintenance issues related to Virginia dams, and discussed the probability of certain flood events being realized.



Causes of Dam Failure

- Lack of attention and maintenance
- Days of rain + weakened dam
- Inadequate Spillway Size
- Extreme event (precip, seismic)
- Other means
 - Unqualified contractor error
 - Equipment malfunction

Maintenance Issues

- Pipes and Valves
 - Age and Deterioration
 - About 80% of dams in Virginia have non-working valves
- Internal Erosion
 - Leaks
 - Parallel Ports
 - Voids
 - Sinkholes
- Plants and Animals
- Unqualified Contractors or Engineers

In A Dam's Life...

1 in 5 dams will experience a 1,000 year flood or greater (20% chance)

1 in 50 dams will experience a 10,000 year flood or greater (2% chance)

We have perhaps 3,000 dams in Virginia

A member noted that for clarification, the lifespan of the dam is primarily due to the dam pool itself filling up, not just the design in the dam.

It was noted that once the normal pool is full there is no longer sediment control, however the flood control capacity is retained. The need for maintenance should be emphasized.

A member said that one concern was that owners have stopped maintenance to wait and see what happens with regard to the regulatory changes.

A member expressed a concern with regard to roadways on top of dams that have not been regulated. For example trees on dams have caused some roadways to be closed until the owner addressed the repairs.

It was noted that some of the dams in the state are old millpond dams. The mill is gone, but the pond and the roadway remain. Owners mistakenly believe that because there is a road the state is responsible for the maintenance and repair of the dam.

The question was asked with regard to a proposal for an educational process for the public at large relative to dam safety issues.

Ms. Cahill noted that, for example, Ohio and New Hampshire have excellent materials for dam owners. They include a brochure regarding plant and animal penetration of dams. Publications and website materials would be beneficial to the dam safety engineers.

A member noted that in addition to the need for public education, that the other key issues are the lack of a capital funding program and the need for an active enforcement program.

Discussion of Table 1 Subcommittee recommendations

Mr. Dowling presented draft regulatory language developed based on discussions of the Table 1 subcommittee members at their July 6 meeting. A copy of this discussion draft is attached as attachment #1.

Minutes from the subcommittee meeting were provided to TAC members and are available on the DCR website.

Mr. Dowling reviewed the changes made as a result of the subcommittee discussion. He noted that this was a working draft and that all areas remained open for discussion.

He noted that the hazard classification definitions on lines 161 through 171 have been relocated to lines 208 through 219. Additionally, the definition of a regulated impounding structure and the exemptions were placed on lines 182 through 195.

He noted that one of the significant changes occurred on line 198. The word “new” was removed. The intention is that Table I will now apply to all dams unless otherwise exempted.

He pointed out that the hazard classifications of the dam had been changed from Class I through IV to High, Significant, and Low.

Mr. Dowling noted that the hazard potential column was stricken from the Table as the definitions have moved into table one on Page 6, line 207. He noted that there had been confusion between the explanatory summary language in Table 1 related to hazard potential and the actual definitions of hazard potential provided below Table 1.

With regard to the utilization of a new definition called “impounding height”, a member said it appeared the draft was confusing the issue. Another member explained that if the dam was measured from the downstream toe to the top that did not give a clear indication of the amount of

water impounded if the dam was built in an area of high relief. However, it was noted that dams are not normally built on a slope foundation.

A member noted that a reservoir that had silted in would not hold as much water. Concern was also noted if a lake owner dredges the lake. The upstream height and impounding capacity would change.

A member said that as the law currently reads, an impounding structure can retain water, silt or material. The engineered impounding capacity of the dam does not change with siltation. The impounding height also would not change. It was noted that although the impounding height could be measured even where siltation had obscured the upstream toe of the dam that it would be difficult for an Agency engineer to verify this measurement.

A member said that height is more important than the impounding capacity. The height used is the hydraulic height.

A member suggested it would be helpful to have a geologic engineer review this concept.

It was noted that having two criteria in the table (height and impounding capacity) would it be appropriate for the dam owner only to meet the lesser of the two.

Mr. Maroon noted a concern of creating more confusion with a different definition than what is standard practice and that additionally there could be confusion with regard to the statute. Because this may only apply to a small number of dams he suggested perhaps it was better addressed as an exception or a case determination basis rather than as a standard in the regulation.

A member asked that if at some other time the TAC could address the issue of siltation. Consensus was to address that at a later date or to have the subcommittee address the issue.

It was also tasked to the subcommittee to address the issue of exceptions to the standard.

Other key changes noted by Mr. Dowling were related to proportionalizing where SDF ranges were presented in Table 1 (lines 226 through 230), approximated crosswalk values between 50 year and 100 year flood values and PMF (lines 251 and 258), dam hazard classification based on roads (lines 261 through 266), movement of the dam break inundation zone mapping requirement language (lines 273 through 302), the incremental damage assessment process (lines 304 through 314), placeholder for alternative procedures if developed (lines 316 through 320), local government notifications (lines 322 through 327), and grandfathering language (lines 615 through 644).

At this time the committee recessed for lunch.

Discussion of future meeting dates

Mr. Dowling explained that DCR has requested an extension that would take the regulatory process into November. The next meeting of the TAC will be Thursday, July 27, 2006 at:

Virginia Commonwealth University
University Student Commons
Richmond Salons - 2nd Floor
907 Floyd Avenue
Richmond, Virginia 23284

Additional TAC meetings are currently scheduled for September 6 and October 11. A subcommittee meeting for August 28th to discuss alternative procedures was also proposed. Locations will be determined at a later date.

Members were asked to inform DCR staff if they were interested in participating in a subcommittee to look at alternative procedures.

Mr. Dowling returned to a discussion of the Table 1 associated language.

A member noted concern with the grandfathering provision. He suggested that the assumption of liability by the dam owner should be the driving point in the design criteria. This is an issue of downstream hazard potential. The public safety issues exist regardless of the age of the dam.

It was noted that the grandfathering clause as drafted may prevent the state from moving a great number of dams into the conditional certified area because of the move from half PMF to a full PMF in the regulation. Dam owners with a current conditional certificate would lose their certificate without the grandfathering provision.

Mr. Maroon said that for clarification of the regulatory permitting process, the state would not typically go back and revisit existing permits. He said that it is likely that a 6-year permit would remain in that condition until the expiration date of that permit unless there were structural issues that required a change.

It was suggested that current dams could be grandfathered until their permits expired. At the time a new permit was sought those issues would be addressed. Another member suggested that dams be allowed a full 6-year certification cycle. This would prevent the requirement for an immediate change with a dramatic financial affect. If a dam has a current valid certificate, that could be renewed for 6 years. That would mean that a dam would have a minimum of 6 years and a maximum of 11 to come into compliance with the one PMF requirement.

It was also suggested that rather than following the certificate cycles that dams be given five or six years from the effective date of the regulation to come into compliance.

There was not a consensus with regard to the issue of grandfathering.

Mr. Maroon suggested that grandfathering might not be the right term. He noted that it was not uncommon for regulations to have an effective date as they apply to a change in circumstances.

It was noted that this continued to be an issue of public safety and that the regulations should be developed with regard to what is right for public safety.

It was suggested the grandfathering language be removed and the conditional permit be used as the mechanism to address the necessary changes.

Mr. Maroon said that DCR was not comfortable with not considering some delayed effective date for change in circumstances that is not the result of the failure of the dam owner. He noted that some dam owners have been complying and that they should not be put into the position of being out of compliance just because of a change in the regulations. They should be given a reasonable amount of time.

Consensus of the committee was that DCR staff would work on language to address a delayed effective date for future consideration by the TAC.

Following a break, the TAC continued discussion of Table 1.

Discussion began on the appropriate SDF value(s) for the low hazard dams.

A member noted that raised the question of being consistent with federal guidelines. It was noted that the federal guideline for low hazard dams is the 100 year-flood.

Ms. Hulburt said the question was with regard to dams classified as significant small and whether there was increased risk based on capacity.

It was noted that the capacity volume would be an indicator of the inundation zone downstream. The height determines the flow rate and the initial velocity. Damage incurred would be dependent upon those two factors.

The question was raised as to whether the matter could be left to the owner's engineer and the secondary parameters could be eliminated.

Concern was expressed with regard to dam owners being able to afford to bring in an engineer.

Ms. Hulbert clarified that the discussion was to do away with height and impoundment size for a low hazard dam and have the standard be the 100-year flood.

A member asked if height and impoundment were used for any other reason than classification.

Staff determined that it was used for the determination of the spillway design flood and for inclusion in the database. Further taking out those ranges might remove important information. The height and capacity give the dam owner a range of where they are.

Ms. Hulburt asked if there was a consensus to go with the 100-year flood.

Mr. Maroon said that the stormwater management requirement is for the 100-year flood. He noted that DCR would prefer not to have conflicting regulations.

It was suggested that applying one spillway requirement for a hazard class of dam would make sense.

A member felt it was bad policy for the state to presume to classify a dam in a certain classification because of a future need to upgrade. There is no practical way for dam owner to effectively maintain hazard rating of the dam by restricting development. A low hazard dam of today could turn into a high hazard downstream.

A member asked if existing dams with a 50-year design flood could be grandfathered in with the remainder being required to go to the 100-year design.

Consensus was that small dams would be classified by the 50 year- flood design while the remainder would be required to address the 100-year flood design.

A member said that it would save dam owners money if the committee could accept that the 6-hour storm applies to a basin that is less than 10 square miles and only require the 6, 12 and 24 for the larger drainage areas.

It was noted that for small watersheds, 6-hours may be adequate. However it depends on the storage volume as well as spillway capacity. With longer storms there is more volume.

A member asked what process should be followed for a hazard classification. Additionally what is the breach scenario?

It was noted that the hazard classification is defined by the worse case emergency.

It was noted that a sunny day breach would never rely on an EAP.

DCR will draft language to deal with the sunny day scenario.

The TAC also discussed the language relative to hazard classification based on road proximity (lines 261 through 266). It was noted that this language required addition refinement and the Department was directed to consider revisions.

Members were encouraged to send additional comments to DCR staff. The meeting concluded at 4:00 p.m.

Attachment #1

1 **Version: Wednesday, July 12, 2006**

2 **VIRGINIA IMPOUNDING STRUCTURE REGULATIONS (§ 4 VAC 50-20)**

3
4 **Part I: General**

5
6 **4VAC50-20-10. Authority.**

7 This chapter is promulgated by the Virginia Soil and Water Conservation Board in
8 accordance with the provisions of the Dam Safety Act, Article 2, Chapter 6, Title 10.1 (§10.1-
9 604 et seq.), of the Code of Virginia.

10
11 Statutory Authority: §10.1-605 of the Code of Virginia.

12 Historical Notes: Derived from VR625-01-00 §1.1, eff. February 1, 1989.

13
14 **4VAC50-20-20. General provisions.**

15 A. This chapter provides for the proper and safe design, construction, operation and
16 maintenance of impounding structures to protect public safety. This chapter shall not be
17 construed or interpreted to relieve the owner or operator of any impoundment or impounding
18 structure of any legal duties, obligations or liabilities incident to ownership, design, construction,
19 operation or maintenance.

20 B. Approval by the board of proposals for an impounding structure shall in no manner be
21 construed or interpreted as approval to capture or store waters. For information concerning
22 approval to capture or store waters, see Chapter 8 (§62.1-107) of Title 62.1 of the Code of
23 Virginia, and other provisions of law as may be applicable.

24 C. In promulgating this chapter, the board recognizes that no impounding structure can
25 ever be completely "fail-safe," because of incomplete understanding of or uncertainties
26 associated with natural (earthquakes and floods) and manmade (sabotage) destructive forces;
27 with material behavior and response to those forces; and with quality control during construction.

28 D. Any engineering analysis required by this chapter such as plans, specifications,
29 hydrology, hydraulics and inspections shall be conducted by and bear the seal of a professional
30 engineer licensed to practice in Virginia.

31 E. The official forms as called for by this chapter are available from the director.

32 [CHECK]

33
34 Statutory Authority: §10.1-605 of the Code of Virginia.

35 Historical Notes: Derived from VR625-01-00 §1.2, eff. February 1, 1989.

36
37 **4VAC50-20-30. Definitions.**

38 The following words and terms when used in this chapter shall have the following
39 meanings unless the context clearly indicates otherwise:

40 "Acre-foot" means a unit of volume equal to 43,560 cubic feet or 325,853 gallons (one
41 foot of depth over one acre of area).

42 "Agricultural purpose dams" means dams which are less than 25 feet in height or which
43 create a maximum impoundment smaller than 100 acre-feet, ~~and~~ are certified by the owner on

44 official forms as ~~constructed, maintained or~~ operated primarily for agricultural purposes, and are
45 approved by the Director.

46 “Alteration” means changes to an impounding structure that could alter or affect its
47 structural integrity. Alterations include, but are not limited to, changing the height or otherwise
48 enlarging the dam, increasing normal pool or principal spillway elevation or physical
49 dimensions, changing the elevation or physical dimensions of the emergency spillway,
50 conducting necessary repairs or structural maintenance, or removing the impounding structure.
51 Alterations do not include normal operation and maintenance.

52 "Alteration permit" means a permit required for ~~changes any alteration to an impounding~~
53 ~~structure that could alter or affect its structural integrity. Alterations requiring a permit include,~~
54 ~~but are not limited to: changing the height, increasing the normal pool or principal spillway~~
55 ~~elevation, changing the elevation or physical dimensions of the emergency spillway or removing~~
56 ~~the impounding structure.~~

57 "Board" means the Virginia Soil and Water Conservation Board.

58 "Conditional operation and maintenance certificate" means a certificate required for
59 impounding structures with deficiencies.

60 “Construction” means the construction of a new impounding structure.

61 "Construction permit" means a permit required for the construction of a new impounding
62 structure.

63 "Dam break inundation zone" means the area downstream of a dam that would be
64 inundated or otherwise directly affected by the failure of a dam.

65 “Department” means the Virginia Department of Conservation and Recreation.

66 "Design flood" means the calculated volume of runoff and the resulting peak discharge
67 utilized in the evaluation, design, construction, operation and maintenance of the impounding
68 structure.

69 "Design freeboard" means the vertical distance between the maximum elevation of the
70 design flood and the top of the impounding structure.

71 "Director" means the Director of the Department of Conservation and Recreation or his
72 designee.

73 “Drill” means a type of emergency action plan exercise that tests, develops, or maintains
74 skills in an emergency response procedure. During a drill, participants perform an in-house
75 exercise to verify telephone numbers and other means of communication along with the dam
76 owner’s response. A drill is considered a necessary part of ongoing training.

77 “Emergency Action Plan or EAP” means a formal document that identifies potential dam
78 emergency conditions and specifies preplanned actions to be followed to minimize loss of life
79 and property damage. The EAP specifies actions the dam owner must take to minimize or
80 alleviate safety issues at the dam. It contains procedures and information to assist the dam owner
81 in issuing early warning and notification messages to responsible emergency management
82 authorities. It shall also contain dam break inundation zone maps as required to show emergency
83 management authorities the critical areas for action in case of emergency.

84 “Emergency Action Plan Exercise” means an activity designed to promote emergency
85 preparedness; test or evaluate EAPs, procedures, or facilities; train personnel in emergency
86 management duties; and demonstrate operational capability. In response to a simulated event,
87 exercises consist of the performance of duties, tasks, or operations very similar to the way they

88 would be performed in a real emergency. An exercise may include but not be limited to drills
89 and tabletop exercises.

90 "Height" means the structural height of an impounding structure. If the impounding
91 structure spans a stream or watercourse, height means the vertical distance from the natural bed
92 of the stream or watercourse measured at the downstream toe of the impounding structure to the
93 top of the impounding structure. If the impounding structure does not span a stream or
94 watercourse, height means the vertical distance from the lowest elevation of the outside limit of
95 the barrier to the top of the impounding structure.

96 "Impounding structure" means a man-made ~~device~~ structure, whether a dam across a
97 watercourse or other structure outside a watercourse, used or to be used to retain or store waters
98 or other materials. The term includes: (i) all dams that are 25 feet or greater in height and that
99 create an impoundment capacity of 15 acre-feet or greater, and (ii) all dams that are six feet or
100 greater in height and that create an impoundment capacity of 50 acre-feet or greater. The term
101 "impounding structure" shall not include: (a) dams licensed by the State Corporation
102 Commission that are subject to a safety inspection program; (b) dams owned or licensed by the
103 United States government; (c) dams ~~constructed, maintained or~~ operated primarily for
104 agricultural purposes which are less than 25 feet in height or which create a maximum
105 impoundment capacity smaller than 100 acre-feet; (d) water or silt retaining dams approved
106 pursuant to §45.1-222 or §45.1-225.1 of the Code of Virginia; or (e) obstructions in a canal used
107 to raise or lower water.

108 "Impoundment" means a body of water or other materials the storage of which is caused
109 by any impounding structure.

110 ~~"Inundation zone" means an area that could be inundated as a result of impounding~~
111 ~~structure failure and that would not otherwise be inundated to that elevation.~~

112 "Life of the impounding structure" and "life of the project" mean that period of time for
113 which the impounding structure is designed and planned to perform effectively, including the
114 time required to remove the structure when it is no longer capable of functioning as planned and
115 designed.

116 "Maximum impounding capacity" means the volume in acre-feet that is capable of being
117 impounded at the top of the impounding structure.

118 "Maximum impounding height" means the maximum retention height of an impounding
119 structure. If the impounding structure spans a stream or watercourse, maximum impounding
120 height means the vertical distance from the natural bed of the stream or watercourse measured at
121 the upstream toe of the impounding structure to the top of the impounding structure. If the
122 impounding structure does not span a stream or watercourse, maximum impounding height
123 means the vertical distance from the lowest elevation of the inside limit of the barrier to the top
124 of the impounding structure.

125 "Normal impounding capacity" means the volume in acre-feet that is capable of being
126 impounded at the elevation of the crest of the lowest ungated outlet from the impoundment.

127 "Operation and maintenance certificate" means a certificate required for the operation and
128 maintenance of all impounding structures.

129 "Owner" means the owner of the land on which an impounding structure is situated, the
130 holder of an easement permitting the construction of an impounding structure and any person or
131 entity agreeing to maintain an impounding structure. The term "owner" includes the
132 Commonwealth or any of its political subdivisions, including but not limited to sanitation district

133 commissions and authorities. Also included are any public or private institutions, corporations,
134 associations, firms or companies organized or existing under the laws of this Commonwealth or
135 any other state or country, as well as any person or group of persons acting individually or as a
136 group.

137 “Tabletop Exercise” means a type of emergency action plan exercise that involves a
138 meeting of the dam owner and the state and local emergency management officials in a
139 conference room environment. The format is usually informal with minimum stress involved.
140 The exercise begins with the description of a simulated event and proceeds with discussions by
141 the participants to evaluate the EAP and response procedures and to resolve concerns regarding
142 coordination and responsibilities.

143 "Top of the impounding structure" means the lowest point of the nonoverflow section of
144 the impounding structure.

145 "Watercourse" means a natural channel having a well-defined bed and banks and in
146 which water flows when it normally does flow.

147
148 Statutory Authority: §10.1-605 of the Code of Virginia.
149 Historical Notes: Derived from VR625-01-00 §1.3, eff. February 1, 1989; Amended, Virginia Register Volume 18,
150 Issue 14, eff. July 1, 2002.
151 Effect of Amendment: The July 1, 2002 amendment revised the definitions for "director" and "impounding structure".

152

153 **4VAC50-20-40. Classes of impounding structures.**

154 A. Impounding structures shall be classified in one of ~~four~~ three categories according to
155 size and hazard potential, as defined in ~~subsection B of this section and~~ Table 1. ~~Size~~
156 ~~classification shall be determined either by maximum impounding capacity or height, whichever~~
157 ~~gives the larger size classification.~~

158 B. For the purpose of this chapter, hazards pertain to potential loss of human life or
159 property damage downstream from the impounding structure in event of failure or faulty
160 operation of the impounding structure or appurtenant facilities.

161 ~~1. Impounding structures in the Class I hazard potential category are located where~~
162 ~~failure will cause probable loss of life or serious damage to occupied building(s), industrial or~~
163 ~~commercial facilities, important public utilities, main highway(s) or railroad(s).~~

164 ~~2. Impounding structures in the Class II hazard potential category are located where~~
165 ~~failure could cause possible loss of life or damage to occupied building(s), industrial or~~
166 ~~commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service~~
167 ~~of relatively important public utilities.~~

168 ~~3. Impounding structures in Class III hazard potential category are located where failure~~
169 ~~may cause minimal property damage to others. No loss of life is expected.~~

170 ~~4. Impounding structures in Class IV hazard potential category are located where the failure of~~
171 ~~the impounding structure would cause no property damage to others. No loss of life is expected.~~

172 5 C. Such size and hazard potential classifications shall be proposed by the owner and
173 shall be subject to approval by the director. Present and ~~projected development of~~ planned land-
174 use in the dam break inundation zones downstream from the impounding structure shall be
175 considered in determining the classification.

176 6 D. Impounding structures shall be subject to reclassification by the Board as necessary.

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Statutory Authority: §10.1-605 of the Code of Virginia.
 Historical Notes: Derived from VR625-01-00 §1.4, eff. February 1, 1989.

181 **4VAC50-20-50. Performance standards required for impounding structures.**

182 A. 1. In accordance with the definitions provided by Virginia Code § 10.1-604 and
 183 4VAC50-20-30, an impounding structure shall be regulated if the dam is 25 feet or greater in
 184 height and creates a maximum impounding capacity of 15 acre-feet or greater, or the dam is six
 185 feet or greater in height and creates a maximum impounding capacity of 50 acre-feet or greater
 186 and is not otherwise exempt from regulation by the Code of Virginia. Impounding structures
 187 exempted are those that are:

- 188 a. licensed by the State Corporation Commission that are subject to a safety inspection
- 189 program;
- 190 b. owned or licensed by the United States government;
- 191 c. operated primarily for agricultural purposes which are less than 25 feet in height or
- 192 which create a maximum impoundment capacity smaller than 100 acre-feet;
- 193 d. water or silt retaining dams approved pursuant to §45.1-222 or §45.1-225.1 of the
- 194 Code of Virginia; or
- 195 e. obstructions in a canal used to raise or lower water.

196 Impounding structures of regulated size and not exempted shall be constructed, operated
 197 and maintained such that they perform in accordance with their design and purpose throughout
 198 the life of the project. For ~~new~~ impounding structures, the spillway(s) capacity shall perform at a
 199 minimum to safely pass the appropriate spillway design flood as determined in Table 1 unless
 200 otherwise grandfathered pursuant to 4 VAC 50-20-130. For the purposes of utilizing Table 1,
 201 Maximum Impounding Capacity and Maximum Impounding Height shall be determined in
 202 accordance with the definitions provided in 4 VAC 50-20-30.

203
 204
 205

TABLE 1--Impounding Structure Regulations

Hazard Class of Dam ²	Hazard Potential If Impounding Structure Fails	SIZE CLASSIFICATION		Spillway Design Flood (SDF) ^{b 4}
		Maximum Impounding Capacity (Ac-Ft) ^{a 3}	Maximum Impounding Height(Ft) ^{a 3}	
<u>HIGH</u> I	<u>Probable Loss of Life; Excessive Economic Loss</u>	<u>All¹</u>	<u>All¹</u>	<u>PMF⁵</u>
		<u>Large ≥ 50,000</u>	<u>≥ 100</u>	<u>PMF^e</u>
		<u>Medium ≥ 1,000 & < 50,000</u>	<u>≥ 40 & < 100</u>	<u>PMF</u>
		<u>Small ≥ 50 & < 1,000</u>	<u>≥ 25 & < 40</u>	<u>1/2 PMF to PMF</u>
<u>SIGNIFICANT</u> H	<u>Possible Loss of Life; Appreciable Economic Loss</u>	<u>Large ≥ 50,000</u>	<u>≥ 100</u>	<u>PMF</u>
		<u>Medium ≥ 1,000 & < 50,000</u>	<u>≥ 40 & < 100</u>	<u>1/2 .50 PMF to PMF</u>
		<u>Small ≥ 50 15 & < 1,000</u>	<u>≥ 25 & < 40¹</u>	<u>100-YR to 1/2 .50 PMF</u>
<u>LOW</u> HH	<u>No Loss of Life Expected; Minimal Economic Loss</u>	<u>Large ≥ 50,000</u>	<u>≥ 100</u>	<u>1/2 .50 PMF to PMF</u>
		<u>Medium ≥ 1,000 & < 50,000</u>	<u>≥ 40 & < 100</u>	<u>100-YR to 1/2 .50 PMF</u>
		<u>Small ≥ 50 15 & < 1,000</u>	<u>≥ 25 & < 40</u>	<u>50-YR^{d 6} to 100-YR^{e 7}</u>

IV	No Loss of Life Expected; No Economic Loss to Others	≥ 50 -(non-agricultural) ≥ 100 -(agricultural)	≥ 25 (both)	50-YR to 100-YR
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206

207 2. Hazard classes of dams are as follows:

208 High Hazard Potential is defined where an impounding structure (dam) failure will
 209 probably cause the loss of life or serious economic damage to occupied building(s), industrial or
 210 commercial facilities, primary public utilities, major public roadways, railroads or personal
 211 property.

212 Significant Hazard Potential is defined where an impounding structure (dam) failure may
 213 cause the loss of life or appreciable economic damage to occupied building(s), industrial or
 214 commercial facilities, secondary public utilities, secondary public roadways, railroads or
 215 personal property.

216 Low Hazard Potential is defined where an impounding structure (dam) failure would
 217 result in no probable loss of life and would cause no more than minimal economic damage to
 218 occupied building(s), industrial or commercial facilities, secondary public utilities, secondary
 219 public roadways, railroads or personal property.

220 ~~a 3. The factor determining the largest size classification shall govern. The appropriate~~
 221 ~~size classification is determined by the largest size associated with the maximum impounding~~
 222 ~~capacity and maximum impounding height of the impounding structure.~~

223 ~~b 4. The spillway design flood (SDF) represents the largest flood that need be considered~~
 224 ~~in the evaluation of the performance for a given project. The impounding structure shall perform~~
 225 ~~so as to safely pass the appropriate SDF. Where a range of SDF is indicated, the magnitude that~~
 226 ~~most closely relates to the involved risk should be selected. proportionalize the maximum~~
 227 ~~impounding height and maximum impounding capacity within the appropriate size classification~~
 228 ~~and apply the maximum proportion within the SDF range to determine the appropriate SDF.~~
 229 ~~Reductions in the established SDF may be evaluated through the use of incremental damage~~
 230 ~~assessment pursuant to 4 VAC 50-20-54. The establishment in this chapter of rigid design flood~~
 231 ~~criteria or standards is not intended. Safety must be evaluated in the light of peculiarities and~~
 232 ~~local conditions for each impounding structure and in recognition of the many factors involved,~~
 233 ~~some of which may not be precisely known. Such can only be done by competent, experienced~~
 234 ~~engineering judgment, which the values in Table 1 are intended to supplement, not supplant.~~

235 ~~e 5. PMF: Probable maximum flood. This means is~~ the flood that might be expected from
 236 the most severe combination of critical meteorologic and hydrologic conditions that are
 237 reasonably possible in the region. The PMF is derived from the current probable maximum
 238 precipitation (PMP) available from the National Weather Service, NOAA. ~~In some cases local~~
 239 ~~topography or meteorological conditions will cause changes from the generalized PMP values;~~
 240 ~~therefore, it is advisable to contact local, state or federal agencies to obtain the prevailing~~
 241 ~~practice in specific cases. Any deviation in the application of established developmental~~
 242 ~~procedures must be explained and justified by the owner's engineer. The owner's engineer must~~
 243 ~~run the PMF for 6, 12 and 24 hour durations, using the inflow hydrograph that creates the largest~~
 244 ~~peak inflow for non-failure and failure analyses. It is expected that generally the 6-hour storm~~

245 duration applies to small, less than 10 square mile, drainage basins. Present and planned land-
246 use conditions shall be considered in determining the runoff characteristics of the drainage area.

247 d 6. 50-Yr: 50-year flood. This means the flood magnitude expected to be equaled or
248 exceeded on the average of once in 50 years. It may also be expressed as an exceedence
249 probability with a 2.0% chance of being equaled or exceeded in any given year. For the
250 purposes of determining compliance of an impounding structure with the Spillway Design Flood
251 (SDF), it shall be acceptable to substitute 0.15 PMF for the 50-year flood value. Present and
252 planned land-use conditions shall be considered in determining the runoff characteristics of the
253 drainage area.

254 e 7. 100-Yr: 100-year flood. This means the flood magnitude expected to be equaled or
255 exceeded on the average of once in 100 years. It may also be expressed as an exceedence
256 probability with a 1.0% chance of being equaled or exceeded in any given year. For the
257 purposes of determining compliance of an impounding structure with the Spillway Design Flood
258 (SDF), it shall be acceptable to substitute 0.20 PMF for the 100-year flood value. Present and
259 planned land-use conditions shall be considered in determining the runoff characteristics of the
260 drainage area.

261 B. When there is a road across the dam or below the dam, the classification of the dam
262 shall take into account the following:

263 1. If the road is public, state maintained, or used by several families, then the dam is to be
264 classified at a minimum as a Significant (II) Hazard Class; and

265 2. If the road is private, not maintained by the state and only used by the owner, owner's
266 family and guests then the dam is to be classified at a minimum as a Low (III) Class.

267
268 Statutory Authority: §10.1-605 of the Code of Virginia.
269 Historical Notes: Derived from VR625-01-00 §1.5, eff. February 1, 1989; Amended, Virginia Register Volume 18,
270 Issue 14, eff. July 1, 2002.
271 Effect of Amendment: The July 1, 2002 amendment corrected the "greater than" and "equal than" signs in Table 1.

272

273 **4VAC50-20-52. Dam break inundation zone mapping.**

274 A. All dam owners must provide inundation maps representing the impacts that would
275 occur should their dam fail. High and Significant Hazard dams shall provide detailed dam break
276 inundation zone maps in accordance with the requirements setout in subsection B. Low Hazard
277 dams shall require a simple map demonstrating the general inundation that results from a dam
278 failure.

279 B. The requirements for a dam break inundation map for High and Significant Hazard
280 dams are as follows:

281 1. Maps shall be developed for both the sunny day failure condition and the Spillway
282 Design Flood failure condition to show the expected extremes in peak water surface elevations,
283 travel times of the front of the dam break flood wave to critical locations, and distances
284 downstream between the two scenarios. A sunny day failure must be modeled starting with the
285 reservoir at normal pool and assuming that the total failure will take between 0.5 and 3 hours
286 with a failure width of ½ to twice the height of the dam and side slopes of less than
287 Horizontal/Vertical and failure beginning when the reservoir is near the storm generated peak
288 reservoir elevation. Inundation mapping should extend downstream until the breach flood wave
289 would be non-damaging.

290 2. The map(s) shall be developed at a scale sufficient to graphically display downstream
291 inhabited areas and structures, roads, and other pertinent structures on the map within the
292 identified inundation area that may be subject to possible danger. To the maximum extent
293 practicable, the inundation maps should be supplemented with water surface profiles at critical
294 areas showing the water surface elevation prior to failure and the peak water surface elevation
295 after failure. The list of downstream residents with their telephone numbers should whenever
296 possible be plotted on the map for easy reference in the case of emergencies.

297 3. Since local officials are likely to use the maps for evacuation purposes, a note should
298 be included on the map to advise that, because of the method, procedures, and assumptions used
299 to develop the flooded areas, the limits of flooding shown and flood wave travel times are
300 approximate and should be used only as a guideline for establishing evacuation zones. Actual
301 areas inundated will depend on actual failure conditions and may differ from areas shown on the
302 maps.

303

304 **4VAC50-20-54. Incremental damage assessment.**

305 Once the owner's engineer has determined the required spillway design flood through
306 application of Table 1, further analysis may be performed to evaluate the incremental damage
307 assessment. This assessment may be used to lower the spillway design flood to the flood that
308 would not cause additional death or property damage due to a dam failure over that which would
309 occur without failure. This analysis will require detailed computer modeling that produces water
310 surface elevations at each structure that may be impacted downstream of the dam. Water depths
311 greater than two feet and overbank flow velocities greater than three feet per second shall be
312 used to determine impacts to persons or property. Water depth changes less than two feet and
313 overbank flow velocities less than three feet per second may be considered as ineffective to
314 structures downstream of the dam.

315

316 **4VAC50-20-56. Alternative procedures (decision matrix) assessment.**

317 NOIRA placeholder: "establish an alternative procedure (decision matrix) which
318 would allow for the evaluation of spillway design floods (SDF) less than the
319 probable maximum flood (PMF) where there would be no unreasonable or
320 significant increase in hazard to life and property"

321

322 **4VAC50-20-58. Local government notifications.**

323 For each certificate issued, the dam owner shall send to the appropriate local government
324 a copy of the certificate and a description and map showing the area that could be affected by the
325 breach. This notification would also serve to advise the locality that if development occurs in the
326 dam break inundation zone that this could adversely affect the classification of the dam and
327 require significant expenses to upgrade the dam.

328

329

329 **Part II: Permit Requirements**

330

331

331 **4VAC50-20-60. Required permits.**

332 A. No person or entity shall construct or begin to construct an impounding structure until
333 the board has issued a construction permit.

334 B. No person or entity shall alter or begin to alter an existing impounding structure ~~in a~~
335 ~~manner which would potentially affect its structural integrity~~ until the board has issued an
336 alteration permit, or in the case of an emergency, authorization is obtained from the director. The
337 permit requirement may be waived if the director determines that the alteration of improvement
338 will not substantially alter or affect the structural integrity of the impounding structure.
339 ~~Alteration does not mean normal operation and maintenance.~~

340 C. When the board receives an application for any permit to construct or alter an
341 impounding structure, the director shall inform the government of any jurisdiction which might
342 be affected by the permit application.

343 D. In evaluating construction and alteration permit applications the director shall use the
344 most current design criteria and standards referenced in 4VAC50-20-320 of this chapter.

345

346 Statutory Authority: §10.1-605 of the Code of Virginia.
347 Historical Notes: Derived from VR625-01-00 §2.1, eff. February 1, 1989.

348

349 **4VAC50-20-70. Construction permits.**

350 A. Prior to preparing the complete design report for a construction permit, applicants are
351 encouraged to seek approval of the project concept from the director. For this purpose the
352 applicant should submit a general description of subdivisions 1 through 4 of subsection B of this
353 section and subdivisions 1 and 2 of this subsection:

354 1. Proposed design criteria and a description of the size, ground cover conditions, extent
355 of current development of the watershed, jurisdictional comprehensive planning for development
356 of the watershed, and the geologic and the geotechnical engineering assumptions used to
357 determine the foundations and materials to be used.

358 2. Preliminary drawings of a general nature, including cross sections, plans and profiles
359 of the impounding structure, proposed pool levels and types of spillway(s).

360 B. An applicant for a construction permit shall submit a design report on official forms.
361 The design report shall be prepared in accordance with 4VAC50-20-240 and shall include the
362 following information:

363 1. A description of the impounding structure and appurtenances and a proposed
364 classification conforming with this chapter. The description shall include a statement of the
365 purposes for which the impoundment and impounding structure are to be used.

366 2. A description of properties located in the dam break inundation zone downstream from
367 the site of the proposed impounding structure, including the location and number of residential
368 structures, buildings, roads, utilities and other property that would be endangered should the
369 impounding structure fail.

370 3. A statement from the governing body of the local political subdivision or other
371 evidence confirming that body is aware of the proposal to build an impounding structure and of
372 the land use classifications applicable to the dam break inundation zone.

373 4. Maps showing the location of the proposed impounding structure that include: the
374 county or city in which the proposed impounding structure would be located, the location of

375 roads, access to the site and the outline of the impoundment. Existing aerial photographs or
376 existing topographic maps may be used for this purpose.

377 5. A report of the geotechnical investigations of the foundation soils or bedrock and of
378 the materials to be used to construct the impounding structure.

379 6. Design assumptions and analyses sufficient to indicate that the impounding structure
380 will be stable during its construction and during the life of the impounding structure under all
381 conditions of reservoir operations, including rapid filling and rapid drawdown of the
382 impoundment.

383 7. Evaluation of the stability of the reservoir rim area in order to safeguard against
384 reservoir rim slides of such magnitude as to create waves capable of overtopping the impounding
385 structure and confirmation of rim stability during seismic activity.

386 8. Design assumptions and analyses sufficient to indicate that seepage in, around, through
387 or under the impounding structure, foundation and abutments will be reasonably and practically
388 controlled so that internal or external forces or results thereof will not endanger the stability of
389 the impounding structure.

390 9. Calculations and assumptions relative to design of the spillway or spillways. Spillway
391 capacity shall conform to the criteria of Table 1.

392 10. Provisions to ensure that the impounding structure and appurtenances will be
393 protected against deterioration or erosion due to freezing and thawing, wind and rain or any
394 combination thereof.

395 11. Other pertinent design data, assumptions and analyses commensurate with the nature
396 of the particular impounding structure and specific site conditions, including when required by
397 ~~the director~~ this chapter, a plan and profile of the dam break inundation zones.

398 12. Erosion and sediment control plans to minimize soil erosion and sedimentation during
399 all phases of construction, operation and maintenance. Projects shall be in compliance with local
400 erosion and sediment control ordinances.

401 13. A description of the techniques to be used to divert stream flow during construction
402 so as to prevent hazard to life, health and property. Such diversion plans shall also be in
403 accordance with applicable environmental laws.

404 14. A plan of quality control testing to confirm that construction materials and methods
405 meet the design requirements set forth in the specifications.

406 15. A proposed schedule indicating construction sequence and time to completion.

407 16. Plans and specifications as required by 4VAC50-20-310.

408 17. An emergency action plan ~~on official forms~~ developed in accordance with 4VAC50-
409 20-175 and evidence that ~~a copy~~ the required copies of such plan ~~has~~ have been filed with the
410 Department, the local organization for emergency management and the State Department of
411 Emergency Management. The plan shall include a method of providing notification and warning
412 to persons downstream, other affected persons or property owners and local authorities in the
413 event of a flood hazard or the potential or impending failure of the impounding structure.

414 18. A proposed impoundment and impounding structure operation and maintenance plan
415 on official forms certified by a licensed professional engineer. This plan shall include a safety
416 inspection schedule and shall place particular emphasis on operating and maintaining the
417 impounding structure in keeping with the project design, so as to maintain its structural integrity
418 and safety during both normal and abnormal conditions which may reasonably be expected to
419 occur during its planned life.

420 19. Place holder for stormwater construction permit requirement language.

421 20. Placeholder for cultural and historic resources?????????

422 C. The director or the applicant may request a conference to facilitate review of the
423 applicant's proposal.

424 D. The owner shall certify in writing that the operation and maintenance plan as approved
425 by the board will be adhered to during the life of the project except in cases of unanticipated
426 emergency requiring departure therefrom in order to mitigate hazard to life and property. ~~At such~~
427 ~~time~~ In the case of an emergency, the owner's engineer, and the director, and other specified
428 contacts shall be notified in accordance with the emergency action plan developed in accordance
429 with 4VAC50-20-175.

430 E. If the submission is not acceptable, the director shall inform the applicant within 60
431 days and shall explain what changes are required for an acceptable submission.

432 F. Within 120 days of receipt of an acceptable design report the board shall act on the
433 application.

434 G. Prior to and during construction the owner shall notify the director of any proposed
435 changes from the approved design, plans, specifications, or operation and maintenance plan.
436 Approval shall be obtained from the director prior to the construction or installation of any
437 changes that will affect the stability of the impounding structure.

438 H. The construction permit shall be valid for the construction schedule specified in the
439 approved design report. The construction schedule may be amended by the director for good
440 cause at the request of the applicant.

441 I. Construction must commence within two years after the permit is issued. If
442 construction does not commence within two years after the permit is issued, the permit shall
443 expire, except that the applicant may petition the board for extension of the two-year period and
444 the board may extend such period for good cause.

445 J. The director may ~~revoke a construction permit~~ issue a temporary stop work order
446 pursuant to § 10.1-612.1 of the Code of Virginia and take any other action authorized by the
447 Dam Safety Act (§ 10.1-604 et seq. of the Code of Virginia) if any of the permit terms are
448 violated, or if construction is conducted in a manner hazardous to downstream life or property.
449 ~~The director may order the owner to eliminate such hazardous conditions within a period of time~~
450 ~~limited by the order. Such corrective measures shall be at the owner's expense. The applicant~~
451 ~~may petition the board to reissue the permit with such modifications as the board determines to~~
452 ~~be necessary.~~

453 K. The owner's licensed professional engineer shall advise the director when the
454 impounding structure may safely impound water. The director shall acknowledge this statement
455 within 10 days after which the impoundment may be filled under the engineer's supervision. The
456 director's acknowledgement shall act as a temporary operation and maintenance certificate until
457 an operation and maintenance certificate has been applied for and issued in accordance with
458 4VAC50-20-110.

459 Statutory Authority: §10.1-605 of the Code of Virginia.

461 Historical Notes: Derived from VR625-01-00 §2.2, eff. February 1, 1989; Amended, Virginia Register Volume 18,
462 Issue 14, eff. July 1, 2002.

463 Effect of Amendment: The July 1, 2002 amendment, in the second sentence of subsection A, changed "items" to
464 "subdivisions" twice, inserted "of this section" and "of this subsection", and deleted "below" after "1 and 2"; in
465 subsections B and K, and in paragraph B 16, deleted "of this chapter" after the VAC citation; and, in paragraph B 17,

466 inserted "organization for emergency management", inserted "the" before "State Department", and changed "Services"
467 to "Management" after "Emergency".

468

469 **4VAC50-20-80. Alterations permits.**

470 A. Application for a permit to alter an impounding structure in ways which would
471 potentially affect its structural integrity shall be made on official forms. The application shall
472 clearly describe the proposed work with appropriately detailed plans and specifications.

473 B. Alterations which would potentially affect the structural integrity of an impounding
474 structure include, but are not limited to, changing its the height or otherwise enlarging the dam,
475 increasing the normal pool or principal spillway elevation or physical dimensions, changing the
476 elevation or physical dimensions of the emergency spillway, conducting necessary repairs or
477 structural maintenance, or removing the impounding structure.

478 C. Where feasible an application for an alteration permit shall also include plans and
479 specifications for a device to allow for draining the impoundment if such does not exist.

480 D. If the submission is not acceptable, the director shall inform the applicant within 60
481 days and shall explain what changes are required for an acceptable submission.

482 E. Within 120 days of receipt of an acceptable application, the board shall act on the
483 application.

484 F. Each alteration permit shall contain an expiration date that shall not extend past two
485 years from the date of issuance.

486

487 Statutory Authority: §10.1-605 of the Code of Virginia.

488 Historical Notes: Derived from VR625-01-00 §2.3, eff. February 1, 1989.

489

490 **4VAC50-20-90. Transfer of permits.**

491 Prior to the transfer of ownership of a permitted impounding structure the permittee shall
492 notify the director in writing and the new owner shall file a transfer application on official forms.
493 The new owner shall amend the existing permit application as necessary and shall certify to the
494 director that he is aware of and will comply with all of the requirements and conditions of the
495 permit.

496

497 Statutory Authority: §10.1-605 of the Code of Virginia.

498 Historical Notes: Derived from VR625-01-00 §2.4, eff. February 1, 1989.

499

500 **Part III: Certificate Requirements**

501

502 **4VAC50-20-100. Operation and maintenance certificates.**

503 A. A Class I Operation and Maintenance Certificate is required for a Class I Hazard
504 potential impounding structure. The certificate shall be for a term of six years. It shall be updated
505 based upon the filing of a new reinspection report certified by a licensed professional engineer
506 every two years.

507 B. A Class II Operation and Maintenance Certificate is required for a Class II Hazard
508 potential impounding structure. The certificate shall be for a term of six years. It shall be updated
509 based upon the filing of a new reinspection report certified by a licensed professional engineer
510 every three years.

511 C. A Class III Operation and Maintenance Certificate is required for a Class III Hazard
512 potential impounding structure. The certificate shall be for a term of six years.

513 D. The owner of a Class I, II or III impounding structure shall provide the director an
514 annual owner's inspection report on official forms in years when no licensed professional
515 reinspection is required and may be done by the owner or his representative.

516 E. If an Operation and Maintenance Certificate is not updated as required, the board shall
517 take appropriate enforcement action.

518 F. The owner of a Class I, II or III impounding structure shall apply for the renewal of the
519 six year operation and maintenance certificate 90 days prior to its expiration in accordance with
520 4VAC50-20-120 of this chapter.

521 G. A Class IV impounding structure will not require an operation and maintenance
522 certificate. An inventory report is to be prepared as provided in 4VAC50-20-120 B and filed by
523 the owner on a six-year interval, and an owners inspection report filed annually.

524 H. The owner of any impounding structure, regardless of its hazard classification, shall
525 notify the board immediately of any change in either cultural features downstream from the
526 impounding structure or of any change in the use of the area downstream that would present
527 hazard to life or property in the event of failure.

528 I. The owner of any impounding structure shall meet the emergency action plan submittal
529 requirements setout in 4VAC50-20-175.

530

531 Statutory Authority: §10.1-605 of the Code of Virginia.

532 Historical Notes: Derived from VR625-01-00 §3.1, eff. February 1, 1989.

533

534 **4VAC50-20-110. Operation and maintenance certificate for newly constructed impounding**
535 **structures.**

536 A. Within 180 days after completion of the construction of an impounding structure, the
537 owner shall submit:

538 1. A complete set of as-built drawings certified by a licensed professional engineer and
539 an as-built report on official forms.

540 2. A copy of a certificate from the licensed professional engineer who has inspected the
541 impounding structure during construction certifying that, to the best of his judgment, knowledge
542 and belief, the impounding structure and its appurtenances were constructed in conformance with
543 the plans, specifications, drawings and other requirements approved by the board.

544 3. A copy of the operation and maintenance plan ~~and emergency action plan~~ submitted
545 with the design report including any changes required by the director. The emergency action
546 plan shall also be updated as necessary and resubmitted at this time.

547 B. If the director finds that the operation and maintenance plan or emergency action plan
548 developed in accordance with 4VAC50-20-175 is deficient, he shall return it to the owner within
549 60 days with suggestions for revision.

550 C. Within 60 days of receipt of the items listed in subsection A above, if the board finds
551 that adequate provision has been made for the safe operation and maintenance of the impounding
552 structure, the board shall issue an operation and maintenance certificate.

553
554 Statutory Authority: §10.1-605 of the Code of Virginia.
555 Historical Notes: Derived from VR625-01-00 §3.2, eff. February 1, 1989.
556

557 **4VAC50-20-120. Operation and maintenance certificates for existing impounding**
558 **structures.**

559 A. Any owner of an impounding structure other than a Class IV impounding structure
560 which has already filed an inventory report that does not have an operation and maintenance
561 certificate or any owner renewing an operation and maintenance certificate shall file an
562 application with the board.

563 B. The application for an operation and maintenance certificate shall be on official forms
564 and shall include:

565 1. A reinspection report for Class I and II impounding structures. The reinspection report
566 shall include an update of conditions of the impounding structure based on a previous safety
567 inspection as required by the board, a previous reinspection report or an as-built report.

568 2. An inventory report for Class III impounding structures. The inventory report shall
569 include:

570 a. The name and location of the impounding structure and the name of the owner.

571 b. The description and dimensions of the impounding structure, the spillways, the
572 reservoir and the drainage area.

573 c. The history of the impounding structure which shall include the design, construction,
574 repairs, inspections and whether the structure has ever been overtopped.

575 d. Observations of the condition of the impounding structure, reservoir, and upstream and
576 downstream areas.

577 e. Any changes in the impounding structure, reservoir, and upstream and downstream
578 areas.

579 f. Recommendations for remedial work.

580 3. An impoundment and impounding structure operation and maintenance plan certified
581 by a licensed professional engineer. This plan shall place particular emphasis on operating and
582 maintaining the impounding structure in keeping with the project design in such manner as to
583 maintain its structural integrity and safety during both normal and abnormal conditions which
584 may reasonably be expected to occur during its planned life. The safety inspection report
585 required by the board should be sufficient to serve as the basis for the operation and maintenance
586 plan for a Class I and Class II impounding structure. For a Class III impounding structure, the
587 operation and maintenance plan shall be based on the data provided in the inventory report.

588 4. An emergency action plan developed in accordance with 4VAC50-20-175 and
589 evidence that ~~a copy~~ the required copies of such plan ~~has~~ have been filed with the Department,
590 the local organization for emergency management and the State Department of Emergency
591 Management. The plan shall include a method of providing notification and warning to persons
592 downstream, other affected persons or property owners and local authorities in the event of a
593 flood hazard or the potential or impending failure of the impounding structure.

594 C. The owner shall certify in writing that the operation and maintenance plan approved
595 by the board will be adhered to during the life of the project except in cases of emergency
596 requiring departure therefrom in order to mitigate hazard to life and property, at which time the
597 owner's engineer, ~~and the director~~, and other specified contacts shall be notified in accordance
598 with the emergency action plan developed in accordance with 4VAC50-20-175.

599 D. If the director finds that the operation and maintenance plan or emergency action plan
600 developed in accordance with 4VAC50-20-175 is deficient, he shall return it to the owner within
601 60 days with suggestions for revision to meet the specified minimum requirements.

602 E. Within 60 days of receipt of an acceptable application if the board finds that adequate
603 provision has been made for the safe operation and maintenance of the impounding structure, the
604 board shall issue an operation and maintenance certificate.

605
606 Statutory Authority: §10.1-605 of the Code of Virginia.

607 Historical Notes: Derived from VR625-01-00 §3.3, eff. February 1, 1989; Amended, Virginia
608 Register Volume 18, Issue 14, eff. July 1, 2002.

609 Effect of Amendment: The July 1, 2002 amendment, in paragraph B 1, substituted "previous safety inspection as
610 required by the board" for "Phase I or Phase II inspection as established by the U.S. Army Corps of Engineers"; in the
611 third sentence of paragraph B 3, substituted "safety inspection report required by the board" for "Phase I Inspection
612 Report"; and, in paragraph B 4, substituted "local organization for emergency management and the State Department of
613 Emergency Management" for "local and State Department of Emergency Services".

614
615 **4VAC50-20-130. Existing impounding Grandfathering of certain impounding structures**
616 **constructed prior to July 1, 1982.**

617 A. High hazard dams that possess a valid operation and maintenance certificate and are
618 less than 40 feet in size and have a required SDF of less than a PMF shall not be required to
619 upgrade to a full PMF until such time as the impounding structure requires other alteration
620 related to the integrity of the structure.

621 B. For impounding structures where the state has prior determined a required SDF value
622 that is less than the higher value arrived at by proportionalizing the maximum impounding height
623 and maximum impounding capacity within the appropriate size classification, shall not be
624 required to upgrade to the proportionalized SDF value until such time as the impounding
625 structure requires other structural repairs.

626 A C. Many existing impoundment structures were designed and constructed prior to the
627 enactment of the Dam Safety Act, and may not satisfy current criteria for new construction. The
628 board may reissue an operation and maintenance certificate for ~~such~~ those structures
629 grandfathered pursuant to subsections A and B provided that:

630 1. Operation and maintenance is determined by the director to be satisfactory and up to
631 date;

632 2. The dam is not in need of other alteration related to the integrity of the structure;

633 3. Emergency Action Plan requirements set out in 4 VAC 50-20-175 have been satisfied;

634 2 4. Annual owner's inspection reports have been consistently filed with, and are
635 considered satisfactory, by the director;

636 3 5. The applicant proves in accordance with the current design procedures and
637 references of 4VAC50-20-320 to the satisfaction of the board that the impounding structure as
638 designed, constructed, operated and maintained does not pose an unreasonable hazard to life and
639 property; and

640 4 6. The owner satisfies all special requirements imposed by the board.

641 ~~B. When appropriate with existing impounding structures only, the spillway design flood~~
642 ~~requirement may be reduced by the board to the spillway discharge at which dam failure will not~~
643 ~~significantly increase the downstream hazard existing just prior to dam failure provided that the~~
644 ~~conditions of 4VAC50-20-130 A have been met.~~

645

646 Statutory Authority: §10.1-605 of the Code of Virginia.
647 Historical Notes: Derived from VR625-01-00 §3.4, eff. February 1, 1989.

648

649 ~~**4VAC50-20-140. Existing impounding structures constructed after July 1, 1982.**~~

650 ~~The board may issue an operation and maintenance certificate for an impounding~~
651 ~~structure having a construction permit issued after July 1, 1982, and shall not require upgrading~~
652 ~~to meet new more stringent criteria unless the board determines that the new criteria must be~~
653 ~~applied to prevent an unreasonable hazard to life or property.~~

654

655 Statutory Authority: §10.1-605 of the Code of Virginia.
656 Historical Notes: Derived from VR625-01-00 §3.5, eff. February 1, 1989.

657

658 **4VAC50-20-150. Conditional operation and maintenance certificate.**

659 A. During the review of any operation and maintenance application should the director
660 determine that the impounding structure has deficiencies of a nonimminent danger category, the
661 director may recommend that the board issue a conditional operation and maintenance
662 certificate.

663 B. The conditional operation and maintenance certificate for Class I, II and III
664 impounding structures shall be for a maximum term of two years. This certificate will allow the
665 owner to continue normal operation and maintenance of the impounding structure, and shall
666 require that the owner correct the deficiencies on a schedule determined by the director.

667 C. A conditional certificate may be renewed in accordance with the procedures of
668 4VAC50-20-120 provided that annual owner inspection reports are on file, and the board
669 determines that the owner is proceeding with the necessary corrective actions.

670 D. Once the deficiencies are corrected, the board shall issue an operation and
671 maintenance certificate based upon any required revisions to the original application.

672 E. The owner of any impounding structure, whether under conditional certificate or
673 otherwise, shall meet the emergency action plan requirements setout in 4VAC50-20-175.

674

675 Statutory Authority: §10.1-605 of the Code of Virginia.
676 Historical Notes: Derived from VR625-01-00 §3.6, eff. February 1, 1989.

677

678 **4VAC50-20-160. Additional operation and maintenance requirements.**

679 A. The owner of an impounding structure shall not, through action or inaction, cause or
680 allow such structure to impound water following receipt of a written report from the owner's
681 engineer that the impounding structure will not safely impound water.

682 B. In accordance with § 10.1-609.2 of the Code of Virginia, dam owners shall not permit
683 the growth of trees and other woody vegetation and shall remove any such vegetation from the

684 slopes and crest of embankments and the emergency spillway area, and within a distance of 25
685 feet from the toe of the embankment and abutments of the dam.

686

687 Statutory Authority: §10.1-605 of the Code of Virginia.
688 Historical Notes: Derived from VR625-01-00 §3.7, eff. February 1, 1989.

689

690 **4VAC50-20-170. Transfer of certificates.**

691 Prior to the transfer of ownership of an impounding structure the certificate holder shall
692 notify the director in writing and the new owner shall file a transfer application on official forms.
693 The new owner may elect to continue the current operation and maintenance certificate for the
694 remaining term or he may apply for a new certificate in accordance with 4VAC50-20-120. If the
695 owner elects to continue the existing certificate he shall amend the existing certificate application
696 as necessary and shall certify to the director that he is aware of and will comply with all of the
697 requirements and conditions of the certificate.

698

699 Statutory Authority: §10.1-605 of the Code of Virginia.
700 Historical Notes: Derived from VR625-01-00 §3.8, eff. February 1, 1989.

701

702 **4VAC50-20-175. Emergency Action Plans.**

703 A. In order to minimize the loss of life and property damage during potential emergency
704 conditions at a dam, and to ensure effective, timely action is taken should a dam emergency
705 occur, an EAP shall be required for each impounding structure. The emergency action plans
706 shall be coordinated with the Department of Emergency Management in accordance with §44-
707 146.18. The plans required by these regulations shall be incorporated into local and inter-
708 jurisdictional emergency plans pursuant to §44-146.19.

709 B. It is the dam owner's responsibility to develop, maintain, exercise, and implement a
710 site-specific EAP.

711 C. An EAP shall be submitted every six years. For a High, Significant, or Low hazard
712 impounding structure, the EAP shall be submitted with the dam owner's renewal of their
713 operation and maintenance certificate application.

714 D. It is imperative that the dam owner furnish all holders of the EAP section updates to
715 the EAP immediately upon becoming aware of necessary changes to keep the EAP workable.
716 Should a dam be reclassified, an emergency action plan in accordance with this section shall be
717 submitted.

718 E. A drill shall be conducted annually for each High, Significant, or Low hazard
719 impounding structure. A table-top exercise shall be conducted once every 3 years for High, and
720 Significant hazard structures. Owners shall certify to the Department annually that an exercise
721 has been completed and the statement shall include a critique of the exercise and any revisions or
722 updates to the plan or a statement that no revisions or updates are needed.

723 F. Dam owners shall test existing monitoring, sensing, and warning equipment at
724 remote/unattended dams at least twice per year and maintain a record of such tests.

725 G. An EAP shall contain the following seven basic elements unless otherwise specified in
726 this subsection.

- 727 1. Notification chart - A notification chart shall be included for all classes of dams that
 728 shows who is to be notified, by whom, and in what priority. The notification chart shall include
 729 contact information that assures 24-hour telephone coverage for all responsible parties.
 730 2. Emergency Detection, Evaluation, and Classification - The plan shall include a
 731 discussion of the procedures for timely and reliable detection, evaluation, and classification of an
 732 emergency situation to ensure that the appropriate course of action is taken based on the urgency
 733 of the situation. Where appropriate, the situations should address dam breaks that are imminent
 734 or in progress, a situation where the potential for dam failure is rapidly developing, and a
 735 situation where the threat is slowly developing.
 736 3. Responsibilities – The plan shall specify a determination of responsibility for EAP-
 737 related tasks. The EAP shall also clearly designate the responsible party for making the decision
 738 that an emergency condition no longer exists at the dam.
 739 4. Preparedness – The plan shall include a section that describes preparedness actions to
 740 be taken both before and following development of emergency conditions.
 741 5. Dam Break Inundation Maps – The plan shall include an inundation map that
 742 delineates the areas that would be flooded as a result of a dam failure. All properties identified
 743 within the dam break inundation zone shall be incorporated into the EAP’s dam break inundation
 744 zone map to ensure the proper notification of persons downstream and other affected persons or
 745 property owners in the event of a flood hazard or the impending failure of the impounding
 746 structure. Such maps shall be developed in accordance with 4VAC50-20-52.
 747 6. Appendices - The appendices shall contain information that supports and supplements
 748 the material used in the development and maintenance of the EAP such as analyses of dam break
 749 floods; plans for training, exercising, updating, and posting the EAP; and other site-specific
 750 concerns.
 751 7. Certification – The plan shall include a section that is signed by all parties involved in
 752 the plan, where they indicate their approval of the plan and agree to their responsibilities for its
 753 execution.

754
 755 Table X: Emergency Action Plan Requirement Summary

<u>Class</u>	<u>Notification Chart</u>	<u>Emergency Detection, Evaluation, and Classification</u>	<u>Responsibilities</u>	<u>Preparedness</u>	<u>Dam Break Inundation Maps</u>	<u>Appendices</u>	<u>Certification</u>	<u>Drill</u>	<u>Table Top Exercise</u>
<u>High</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
<u>Significant</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
<u>Low</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

- 756
 757 H. The development of the EAP shall be coordinated with all entities, jurisdictions, and
 758 agencies that would be affected by a dam failure or that have statutory responsibilities for
 759 warning, evacuation, and post-flood actions. Consultation with state and local emergency

760 management officials at appropriate levels of management responsible for warning and
761 evacuation of the public is essential to ensure that there is agreement on their individual and
762 group responsibilities.

763 I. The EAP shall at a minimum be filed with the Department, the local organization for
764 emergency management, and the State Department of Emergency Management. Two copies
765 shall be provided to the Department.

766 J. The following format shall be used as necessary to address the requirements of this
767 section.

768 Title Page/Cover Sheet

769 Table of Contents

770 I. Certifications

771 II. Notification Flowchart

772 III. Statement of Purpose

773 IV. Project Description

774 V. Emergency Detection, Evaluation, and Classification

775 VI. General Responsibilities Under the EAP

776 A. Dam Owner Responsibilities

777 B. Responsibility for Notification

778 C. Responsibility for Evacuation

779 D. Responsibility for Termination and Follow-Up

780 E. EAP Coordinator Responsibility

781 VII. Preparedness

782 VIII. Inundation Maps

783 IX Appendices

784 A. Investigation and Analyses of Dambreak Floods

785 B. Plans for Training, Exercising, Updating, and Posting the EAP

786 C. Site-Specific Concerns

787

788

Part IV: Procedures

789

4VAC50-20-180. Inspections.

791 The director may make inspections during construction, alteration or operation and
792 maintenance as deemed necessary to ensure that the impounding structure is being constructed,
793 altered or operated and maintained in compliance with the permit or certificate issued by the
794 board. During the maintenance, construction, or alteration of any dam or reservoir, the director
795 shall require the owner to perform, at the owner's expense, such work or tests as necessary to
796 obtain information sufficient to enable the director to determine whether conformity with the
797 plans and specifications approved by the certificate is being secured. The director shall provide
798 the owner a copy of the findings of these inspections. This inspection does not relieve the owner
799 from the responsibility of providing adequate inspection during construction or operation and
800 maintenance. Periodic inspections during construction or alteration shall be conducted under the
801 supervision of a licensed professional engineer who shall propose the frequency and nature of the
802 inspections subject to approval by the director. Periodic inspections during operation and
803 maintenance shall be conducted under the supervision of a licensed professional engineer at an
804 interval not greater than that required to update the operation and maintenance certificate. At a

805 minimum, an annual owner's inspection shall be conducted when a professional inspection is not
806 required. Every owner shall provide for an inspection by a licensed professional engineer after
807 overtopping of the impounding structure. A copy of the findings of each inspection with the
808 engineer's recommendations shall be filed with the board within a reasonable period of time not
809 to exceed 30 days subsequent to completion of the inspection.

810
811 Statutory Authority: §10.1-605 of the Code of Virginia.
812 Historical Notes: Derived from VR625-01-00 §4.1, eff. February 1, 1989.

813
814 **4VAC50-20-190. Right to hearing.**

815 Any owner aggrieved by an action taken by the director or by the board without hearing,
816 or by inaction of the director or the board, under the provisions of this chapter, may demand in
817 writing a formal hearing.

818
819 Statutory Authority: §10.1-605 of the Code of Virginia.
820 Historical Notes: Derived from VR625-01-00 §4.2, eff. February 1, 1989.

821
822 **4VAC50-20-200. Enforcement.**

823 ~~Any owner refusing to obey any order of the board or the director pursuant to this chapter~~
824 ~~may be compelled to obey and comply with such provisions by injunction or other appropriate~~
825 ~~remedy obtained in a court proceeding. Such proceeding shall be instituted by the board or in the~~
826 ~~case of an emergency, by the director in the court which granted approval to the owner to~~
827 ~~impound waters or, if such approval has not been granted, the proceeding shall be instituted in~~
828 ~~any appropriate court. Enforcement of the provisions of this chapter shall be in accordance with~~
829 ~~the provisions of the Dam Safety Act (§ 10.1-604 et seq. of the Code of Virginia).~~

830
831 Statutory Authority: §10.1-605 of the Code of Virginia.
832 Historical Notes: Derived from VR625-01-00 §4.3, eff. February 1, 1989.

833
834 **4VAC50-20-210. Consulting boards.**

835 A. When the board needs to satisfy questions of safety regarding plans and specifications,
836 construction or operation and maintenance, or when requested by the owner, the board may
837 appoint a consulting board to report to it with respect to those questions of the impounding
838 structure's safety ~~of an impounding structure~~. Such a board shall consist of two or more
839 consultants, none of whom have been associated with the impounding structure.

840 B. The costs and expenses incurred by the consulting board, if appointed at the request of
841 an owner, shall be paid by the owner.

842 C. The costs and expenses incurred by the consulting board, if initiated by the board,
843 shall be paid by the board.

844
845 Statutory Authority: §10.1-605 of the Code of Virginia.
846 Historical Notes: Derived from VR625-01-00 §4.4, eff. February 1, 1989.

847
848 **4VAC50-20-220. Unsafe conditions.**

849 A. No owner shall ~~have the right to maintain an unsafe impounding structure which~~
850 ~~unreasonably threatens the life or property of another person. The owner of any impounding~~
851 ~~structure found to have deficiencies which could threaten life or property if uncorrected shall~~
852 ~~take the corrective actions needed to remove such deficiencies within a reasonable period of~~
853 ~~time.~~ Designation of an impounding structure as unsafe shall be made in accordance with §
854 10.1-607.1 of the Code of Virginia.

855 B. Imminent danger. When the director finds that an impounding structure is unsafe and
856 constitutes an imminent danger to life or property, he shall immediately notify the State
857 Department of Emergency Management and confer with the owner and ensure that the
858 emergency action plan has been implemented if appropriate to do so. The owner of an
859 impounding structure found to constitute an imminent danger to life or property shall take
860 immediate corrective action to remove the imminent danger as required by §10.1-608 of the
861 Code of Virginia.

862 C. Nonimminent danger. The owner of an impounding structure who has been issued a
863 report by the board containing findings and recommendations for the correction of deficiencies
864 which threaten life or property if not corrected, shall undertake to implement the
865 recommendations for correction of deficiencies according to a schedule of implementation
866 contained in that report as required by §10.1-609 of the Code of Virginia.

867
868 Statutory Authority: §10.1-605 of the Code of Virginia.
869 Historical Notes: Derived from VR625-01-00 §4.5, eff. February 1, 1989; Amended, Virginia
870 Register Volume 18, Issue 14, eff. July 1, 2002.
871 Effect of Amendment: The July 1, 2002 amendment, in subsection B, changed "Emergency Services" to "Emergency
872 Management"; and, in subsection C, changed "director" to "board", following "issued a report by the".
873

874 **4VAC50-20-230. Complaints.**

875 A. Upon receipt of a complaint alleging that the person or property of the complainant is
876 endangered by the construction, maintenance or operation of impounding structure, the director
877 shall cause an inspection of the structure, unless the data, records and inspection reports on file
878 with the board are found adequate to determine if the complaint is valid.

879 B. If the director finds that an unsafe condition exists, the director shall proceed under the
880 provisions of §§10.1-608 and 10.1-609 of the Code of Virginia to render the extant condition
881 safe.

882
883 Statutory Authority: §10.1-605 of the Code of Virginia.
884 Historical Notes: Derived from VR625-01-00 §4.6, eff. February 1, 1989.
885

886 **Part V: Design Requirements**

887 888 **4VAC50-20-240. Design of structures.**

889 A. The owner shall complete all necessary investigations prior to submitting the design
890 report. The scope and degree of precision required is a matter of engineering judgment based on
891 the complexities of the site and the hazard potential classification of the proposed structure.

892 B. Surveys shall be made with sufficient accuracy to locate the proposed construction site
893 and to define the total volume of storage in the impoundment. Locations of center lines and
894 other horizontal and vertical controls shall be shown on a map of the site. The area downstream

895 and upstream from the proposed impounding structure shall be investigated in order to delineate
896 the areas and extent of potential damage in case of failure or backwater due to flooding.

897 C. The drainage area shall be determined. Present, ~~projected and potential future~~ and
898 planned land-use conditions shall be considered in determining the runoff characteristics of the
899 drainage area. The most severe of these conditions shall be included in the design calculations
900 which shall be submitted as part of the design report.

901 D. The geotechnical engineering investigation shall consist of borings, test pits and other
902 subsurface explorations necessary to adequately define the existing conditions. The
903 investigations shall be performed so as to define the soil, rock and ground water conditions.

904 E. All construction materials shall be adequately selected so as to ensure that their
905 properties meet design criteria. If on-site materials are to be utilized, they shall be located and
906 determined to be adequate in quantity and quality.

907
908 Statutory Authority: §10.1-605 of the Code of Virginia.
909 Historical Notes: Derived from VR625-01-00 §5.1, eff. February 1, 1989.

910
911 **4VAC50-20-250. Design flood.**

912 The minimum design flood to be utilized in impounding structure evaluation, design,
913 construction, operation and maintenance shall be commensurate with the size and hazard
914 potential of the particular impounding structure as determined in 4VAC50-20-50 and Table 1.
915 Competent, experienced, ~~professional~~ engineering judgment by a licensed professional engineer
916 shall be used in applying those design and evaluation procedures referenced in 4VAC50-20-320
917 of this chapter.

918
919 Statutory Authority: §10.1-605 of the Code of Virginia.
920 Historical Notes: Derived from VR625-01-00 §5.2, eff. February 1, 1989.

921
922 **4VAC50-20-260. Emergency spillway design.**

923 A. Every impounding structure shall have a spillway system with adequate capacity to
924 discharge the design flood without endangering the safety of the impounding structure.

925 B. An emergency spillway shall be required.

926 C. Vegetated earth or an unlined emergency spillway may be approved when the
927 applicant demonstrates that it will pass the spillway design flood without jeopardizing the safety
928 of the impounding structure. In no case, however, shall dam owners permit the growth of trees
929 and other woody vegetation in the emergency spillway area.

930 D. Lined emergency spillways shall include design criteria calculations, plans and
931 specifications for open channel, drop, ogee and chute spillways that include crest structures,
932 walls, panel lining and miscellaneous details. All joints shall be reasonably water-tight and
933 placed on a foundation capable of sustaining applied loads without undue deformation. Provision
934 shall be made for handling leakage from the channel or under seepage from the foundation which
935 might adversely affect the structural integrity and structural stability of the impounding structure.

936
937 Statutory Authority: §10.1-605 of the Code of Virginia.
938 Historical Notes: Derived from VR625-01-00 §5.3, eff. February 1, 1989.

939

940 **4VAC50-20-270. Principal spillways and outlet works.**

941 A. It will be assumed that principal spillways and regulating outlets provided for special
942 functions will operate to normal design discharge capabilities during the spillway design flood,
943 provided appropriate analyses show:

944 1. That control gates and structures are suitably designed to operate reliably under
945 maximum heads for durations likely to be involved and risks of blockage by debris are minimal;

946 2. That access roads and passages to gate regulating controls would be safely passable by
947 operating personnel under spillway design flood conditions; and

948 3. That there are no other substantial reasons for concluding that outlets would not
949 operate safely to fill design capacity during the spillway design flood.

950 B. If there are reasons to doubt that any of the above basic requirements might not be
951 adequately met under spillway design flood conditions, the "dependable" discharge capabilities
952 of regulating outlets shall be assumed to be less than 100% of design capabilities, generally as
953 outlined in the following subsections C through G of this section.

954 C. Any limitations in safe operating heads, maximum velocities to be permitted through
955 structures or approach channels, or other design limitations shall be observed in establishing
956 "dependable" discharge rating curves to be used in routing the spillway design flood hydrograph
957 through the reservoir.

958 D. If intakes to regulating outlets are likely to be exposed to dangerous quantities of
959 floating ~~drift~~ debris, sediment depositions or ice hazards prior to or during major floods, the
960 dependable discharge capability during the spillway design flood shall be assumed to be zero.

961 E. If access roads or structural passages to operating towers or controls are likely to be
962 flooded or otherwise unusable during the spillway design flood, the dependable discharge
963 capability of regulating outlets will be assumed to be zero for those period of time during which
964 such conditions might exist.

965 F. Any deficiencies in discharge performance likely to result from delays in the operation
966 of gates before attendants could be reasonably expected to reach the control for in estimating
967 "dependable" discharge capabilities to be assumed in routing the spillway design flood through
968 reservoir. Reports on design studies shall indicate the allowances made for possible delays in
969 initiating gate operations. Normally, for projects located in small basins, where critical spillway
970 design flood inflows may occur within several hours after intense precipitation, outflows through
971 any regulating outlets that must be opened after the flood begins shall be assumed to be zero for
972 an appropriate period of time subsequent to the beginning of intense rainfall.

973 G. All gates, valves, conduits and concrete channel outlets shall be designed and
974 constructed to prevent significant erosion or damage to the impounding structure or to the
975 downstream outlet or channel.

976

977 Statutory Authority: §10.1-605 of the Code of Virginia.
978 Historical Notes: Derived from VR625-01-00 §5.4, eff. February 1, 1989.

979

980 **4VAC50-20-280. Drain requirements.**

981 All new impounding structures regardless of their hazard potential classification, shall
982 include a device to permit draining of the impoundment within a reasonable period of time as
983 determined by the owner's licensed professional engineer, subject to approval by the director.
984

985 Statutory Authority: §10.1-605 of the Code of Virginia.
986 Historical Notes: Derived from VR625-01-00 §5.5, eff. February 1, 1989.

987

988 **4VAC50-20-290. Life of the impounding structure.**

989 Components of the impounding structure, the impoundment, the outlet works, drain
990 system and appurtenances shall be durable in keeping with the design and planned life of the
991 impounding structure.

992
993 Statutory Authority: §10.1-605 of the Code of Virginia.
994 Historical Notes: Derived from VR625-01-00 §5.6, eff. February 1, 1989.

995

996 **4VAC50-20-300. Additional design requirements.**

997 A. Flood routings shall start at or above the elevation of the crest of the lowest ungated
998 outlet.

999 B. All elements of the impounding structure and impoundments shall conform to sound
1000 engineering practice. Safety factors, design standards and design references that are used shall be
1001 included with the design report.

1002 C. Inspection devices may be required by the director for use by inspectors, owners or the
1003 director in conducting inspections in the interest of structural integrity during and after
1004 completion of construction and during the life of the impounding structure.

1005
1006 Statutory Authority: §10.1-605 of the Code of Virginia.
1007 Historical Notes: Derived from VR625-01-00 §5.7, eff. February 1, 1989.

1008

1009 **4VAC50-20-310. Plans and specifications.**

1010 The plans and specifications for a proposed impounding structure shall consist of a
1011 detailed engineering design report that includes engineering drawings and specifications, with
1012 the following as a minimum:

1013 1. The name of the project; the name of the owner; classification of the impounding
1014 structure as set forth in this chapter; designated access to the project and the location with respect
1015 to highways, roads, streams and existing impounding structures and impoundments that would
1016 affect or be affected by the proposed impounding structure.

1017 2. Cross-sections, profiles, logs of test borings, laboratory and in situ test data, drawings
1018 of principal and emergency spillways and other additional drawings in sufficient detail to
1019 indicate clearly the extent and complexity of the work to be performed.

1020 3. The technical provisions, as may be required to describe the methods of the
1021 construction and construction quality control for the project.

1022 4. Special provisions, as may be required to describe technical provisions needed to
1023 ensure that the impounding structure is constructed according to the approved plans and
1024 specifications.

1025

1026

Statutory Authority: §10.1-605 of the Code of Virginia.

1027

Historical Notes: Derived from VR625-01-00 §5.8, eff. February 1, 1989.

1028

1029

4VAC50-20-320. Acceptable design procedures and references.

1030

The following are acceptable as design procedures and references:

1031

1. The design procedures, manuals and criteria used by the United States Army Corps of Engineers.

1032

1033

2. The design procedures, manuals and criteria used by the United States Department of

1034

Agriculture, Natural Resources Conservation Service.

1035

1036

3. The design procedures, manuals and criteria used by the United States Department of

1037

the Interior, Bureau of Reclamation.

1038

1039

4. The design procedures, manuals and criteria used by the United States Department of

1040

Commerce, National Weather Service.

1041

5. Other design procedures, manuals and criteria that are accepted as current, sound

1042

engineering practices, as approved by the director prior to the design of the impounding

1043

structure.

1044

Statutory Authority: §10.1-605 of the Code of Virginia.

1045

Historical Notes: Derived from VR625-01-00 §5.9, eff. February 1, 1989; Amended, Virginia Register Volume 18,

1046

Issue 14, eff. July 1, 2002.

1047

Effect of Amendment: The July 1, 2002 amendment, in paragraph 2, changed "Soil" to "Natural Resources" before

"Conservation"; and, in paragraph 3, changed "or Interior" to "of the Interior".

1048

1049

4VAC50-20-322. Other applicable dam safety references.

1050

EAP reference

1051

Incremental reference

1052

FORMS

1053

Dam Owner's Annual Inspection Form, DCR 199-098 (rev. 12/01).

1054

Operation and Maintenance Application Class I, II and III Impounding Structures, DCR

1055

199-099 (rev. 12/01).

1056

As-Built Report for Class I, II and III Impounding Structures, DCR 199-100 (rev. 12/01).

1057

Design Report for the Construction/Alteration of Impounding Structures, DCR 199-101

1058

(rev. 12/01).

1059

~~Emergency Action Plan for Class I, Class II and Class III Impounding Structures, DCR~~

1060

~~199-103 (rev. 12/01).~~

1061

Inventory Report for Class III and Class IV Impounding Structures, DCR 199-104 (rev.

1062

12/01).

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1070 Reinspection Report for Class I and II Impounding Structures, DCR 199-105 (rev.
1071 12/01).

1072
1073 Agricultural Certification for Impounding Structures, DCR 199-106 (rev. 12/01).

1074
1075 Transfer Application for Impounding Structures, DCR 199-107 (rev. 12/01).

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1080 Spillway Flow Reduction Parking Lot Items

1081 Full scale exercise (every 2 years) and functional exercise (every 6 years) might be part of a
1082 reduction process.

1083 Inundation maps updated more frequently

1084 Functioning I-Flow System or other observation system

1085 Proactive – Inundation maps driving future zoning

1086 DCR in-depth review of the EAP require \$\$\$'s

1087 Automated warning/ notification system

1088

1089 Functional and full scale exercises shall be considered comprehensive exercises and shall only be
1090 required pursuant to section xxxx (spillway design reduction strategies).

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1092 § 3.1-249.27. Definitions.

1093 "Agricultural commodity" means any plant or part thereof, or animal, or animal product,

1094 produced by a person, including farmers, ranchers, vineyardists, plant propagators, Christmas

1095 tree growers, aquaculturists, floriculturists, orchardists, foresters, nurserymen, wood treaters not

1096 for hire, or other comparable persons, primarily for sale, consumption, propagation, or other use

1097 by man or animals.

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1099 § 3.1-337. Definitions.

1100 (1) "Agricultural product" means any horticultural, viticultural, dairy, livestock, poultry, bee or

1101 other farm or garden product;

