

1 15A NCAC 02K.0224 IS ADOPTED AS PUBLISHED IN 33:04 NCR 349 WITH CHANGES AS FOLLOWS:

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3 15A NCAC 02K.0224 ADDITIONAL REQUIREMENTS FOR DAMS THAT IMPOUND COAL  
4 COMBUSTION RESIDUALS

5 (a) For the purposes of this Rule:

6 (1) "CCR" means Coal Combustion Residuals.

7 (2) "CCR unit" means any CCR landfill, CCR surface impoundment, or lateral expansion of a CCR  
8 unit, or a combination of more than one of these units, based on the context of the paragraph(s) in  
9 which it is used. This term includes both new and existing units, unless otherwise specified in this  
10 Subchapter or the Dam Safety Law of 1967. For the purpose of this Rule, the term only applies to  
11 CCR dams and surface impoundments.

12 (3) "Dam" means a structure and appurtenant works erected to impound or divert water.

13 (4) "Design flood" means the flood hydrograph that is used during an engineering assessment of the  
14 CCR unit.

15 (5) "Liquefaction" means a phenomenon whereby a saturated or partially saturated soil loses strength  
16 and stiffness in response to an applied stress, usually earthquake shaking or other sudden change in  
17 stress condition, causing it to behave like a liquid.

18 ~~(6) "PMF" means Probable Maximum Flood.~~

19 (6)(7) "Probable Maximum Flood" or "PMF" means the theoretically largest flood that may be expected  
20 resulting from the most severe combination of critical meteorological and hydrological conditions  
21 that could conceivably occur are reasonably possible in the drainage basin. Rainfall associated with  
22 the PMF can be found at the following locations:  
23 [http://www.nws.noaa.gov/oh/hdsc/PMP\\_documents/HMR51.pdf](http://www.nws.noaa.gov/oh/hdsc/PMP_documents/HMR51.pdf) The PMF is the runoff resulting  
24 from the Probable Maximum Precipitation.

25 ~~and [http://www.nws.noaa.gov/oh/hdsc/PMP\\_documents/HMR52.pdf](http://www.nws.noaa.gov/oh/hdsc/PMP_documents/HMR52.pdf).~~

26 (7) "Probable Maximum Precipitation" or "PMP" means the theoretically greatest depth of  
27 precipitation for a given duration that is physically possible over a given storm area at a particular  
28 geographical location at a certain time of the year. Estimates of rainfall amounts and distributions  
29 associated with the PMP can be found at the following locations:

30 [http://www.nws.noaa.gov/oh/hdsc/PMP\\_documents/HMR51.pdf](http://www.nws.noaa.gov/oh/hdsc/PMP_documents/HMR51.pdf) and

31 [http://www.nws.noaa.gov/oh/hdsc/PMP\\_documents/HMR52.pdf](http://www.nws.noaa.gov/oh/hdsc/PMP_documents/HMR52.pdf)

32 (8) "Toe" means the point of intersection between the upstream or downstream face of a dam and the  
33 natural ground.

34 (9) "100-year flood" means a flood that has a 1-percent chance of recurring in any given year. Rainfall  
35 amounts for the 100-year flood can be found at:

36 [https://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html](https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html). and

37 [https://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html](https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html).

(10) “1000-year flood” means a flood that has a 0.1-percent chance of recurring in any given year. Rainfall amounts for the 1000-year flood can be found at: [https://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html](https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html).

(b) This Rule shall apply to a CCR unit that meets one or more of the following:

- (1) has a dam height of 25 feet or more above the downstream toe of the structure and has a storage volume of 50 acre-feet or more, unless the unit is exempt by G.S. 143-215.25A; ~~or~~
- (2) contains residuals to an elevation of five feet or more above the downstream toe of the structure and that has a storage volume of 20 acre-feet or more; ~~or~~
- (3) contains residuals to an elevation of greater than or equal to 20 feet above the downstream toe of the structure; or
- (4) has been classified as high ~~hazard~~ hazard (Class C) according to Rule .0105 of this Subchapter.

(c) Inspections and Structural Stability Assessments of CCR units shall be completed as follows:

- (1) At intervals not exceeding seven days, a qualified engineer, or a person under his or her responsible charge, shall inspect the discharge of all outlets of hydraulic structures that pass underneath the base of the CCR unit for discoloration of discharge or changes in flow.
- (2) A qualified engineer, or a person under his or her responsible charge, shall conduct monitoring of all instrumentation supporting the operation of the CCR unit no less than once per month according to the standards listed under 40 CFR 257.83(a), which is hereby incorporated by reference, including subsequent amendments and additions. A copy of this document may be obtained at no cost at [https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr257\\_main\\_02.tpl](https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr257_main_02.tpl).
- (3) During the annual inspections of all CCR units, a qualified engineer, or a person under his or her responsible charge, shall conduct a visual inspection of hydraulic structures underlying the base of the CCR unit in order to maintain structural integrity by being kept free of deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris.
- (4) A qualified engineer, or a person under his or her responsible charge, shall conduct structural stability assessments and shall document whether the design, construction, operation, and maintenance of the CCR unit is consistent with the provisions of 40 CFR 257.73(d) and 257.74(d), which is hereby incorporated by reference, including subsequent amendments and additions, the NC Dam Safety Law of 1967, and the rules of this Subchapter. The structural stability assessment shall be completed by a qualified engineer once every five years and submitted to the Department for ~~review.~~ review for consistency with this Subchapter and the Dam Safety Law of 1967.

(d) All CCR dams described in Paragraph (b) of this Rule shall have a spillway system with capacity to pass a flow resulting from a design flood as specified in the Minimum Spillway Design Flood for CCR Units table provided in this ~~Item. Paragraph. These requirements shall apply in place of the Minimum Spillway Design Flood table under Rule .0205(e) of this Section,~~ unless the applicant provides calculations, designs, and ~~plans~~ plans, to show, to the satisfaction of the Director, prepared in accordance with generally-accepted engineering standards, to show that the design ~~flow~~ flood can be stored, passed through, or passed over the CCR unit

without failure occurring. ~~The combined capacity of all spillways shall be designed, constructed, operated and maintained to adequately manage flow during and following the peak discharge as provided in the following table. The requirements in the table below shall apply in place of the Minimum Spillway Design Storm table under Rule .0205(e) of this Section.~~

Minimum Spillway Design Flood for CCR Units		
Hazard <sup>1</sup>	Size <sup>2</sup>	Spillway Design Flood <sup>3</sup>
Low (Class A)	Small	100 <del>YR</del> <u>year</u>
	Medium	100 <del>YR</del> <u>year</u>
	Large	1/3 PMF ( <del>Probable Maximum Flood</del> )
	Very Large	½ PMF
Intermediate (Class B)	Small	1000 <del>YR</del> <u>year</u>
	Medium	1/3 PMF or 1000 <del>YR</del> <u>year</u> , whichever is larger
	Large	½ PMF
	Very Large	¾ PMF
High (Class C)	Small	PMF ( <del>Probable Maximum Flood</del> )
	Medium	PMF
	Large	PMF
	Very Large	PMF
<sup>1</sup> The “Hazard” categories in this table for CCR units are based on 15A NCAC 02K .0105 Classification of Dams and are the same “Hazard” categories shown in the “Minimum Spillway Design Storms” table for non-CCR dams contained in Rule .0205(e) of this Section. <sup>2</sup> The “Size” categories are the same as described in the “Criteria for Spillway Design Storm Size Classification” table found in Rule .0205(e) of this Section. <sup>3</sup> The “Spillway Design Flood” specifications were derived from the combination of the more-stringent criterion from the spillway design-flood elements of the federal CCR regulations and the existing spillway design elements of Rule .0205(e) of this Section.		

(e) Structural stability assessments shall be evaluated as follows:

- (1) For purposes of this Rule, the ~~critical cross sections~~ “critical cross sections” utilized for the required structural stability ~~assessments assessments~~, are the cross sections anticipated by the design engineer to be the most susceptible to structural failure.
- (2) CCR surface impoundments shall be assessed under seismic loading conditions for a seismic loading event with a 2 percent probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the USGS Seismic Hazard Maps for seismic events with this return period for the region where the CCR unit is located. This document is hereby incorporated by reference, including subsequent amendments and editions. A copy may be obtained at no cost at <https://earthquake.usgs.gov/hazards/hazmaps>.
- (3) CCR units constructed of or founded upon soils that are susceptible to liquefaction, as identified by a liquefaction potential analysis, shall meet liquefaction factors of safety as required in Part 5(E) of this Subparagraph. The liquefaction potential analysis shall include:
  - (A) soil classifications of the embankment and foundation soils;
  - (B) finer content;
  - (C) plasticity index;
  - (D) water content;

1 (E) saturation;

2 (F) maximum current, past, and anticipated phreatic surface levels within the  
3 embankment, foundation, and abutments;

4 (G) location beneath or above the natural ground surface; and

5 (H) penetration resistance through cone penetration testing (CPT).

6 (4) Stability assessments shall be required for CCR units with downstream slopes that may be inundated  
7 by the pool of an adjacent water body. These assessments shall include conditions for maximum  
8 pool loading, minimum pool loading, and rapid drawdown of the adjacent waterbody.

9 (5) The safety factor assessments shall be supported by the following engineering calculations:

10 (A) The calculated static factor of safety for the end-of-construction loading condition shall  
11 equal or exceed 1.30. The assessment of this loading condition is only required for the  
12 initial safety factor assessment and is not required for subsequent assessments;

13 (B) the calculated static factor of safety for the long-term, maximum storage pool loading  
14 condition shall equal or exceed 1.50;

15 (C) the calculated static factor of safety under the maximum surcharge pool loading condition  
16 shall equal or exceed 1.40;

17 (D) the calculated seismic factor of safety shall equal or exceed 1.00; and

18 (E) for dams constructed of or founded upon soils that have susceptibility to liquefaction, the  
19 calculated liquefaction factor of safety shall equal or exceed 1.20. Post-liquefaction  
20 stability analyses shall include characterization of the site conditions, identification of the  
21 minimum liquefaction-inducing forces based on soil characterization, determination of  
22 seismic effect on liquefied layers of the embankment, and calculation of factors of safety  
23 against liquefaction for each liquefied layer of the embankment.

24 (f) CCR units and surrounding areas that are constructed of earthen material shall be designed, constructed,  
25 operated, and maintained so that the vegetation meets the conditions outlined in the FEMA 534 guidance document  
26 entitled, "Technical Manual for Dam Owners: Impacts of Plants on Earthen Dams" issued on September 2005. This  
27 document is hereby incorporated by reference, including subsequent amendments and editions. A copy may be  
28 obtained at no cost at <https://www.fema.gov/media-library/assets/documents/1027>. However, alternative forms of  
29 slope protection may be approved by the Director, upon request by a qualified engineer through a plan ~~submittal~~,  
30 submittal which is shown to showing that the proposed alternative slope protection will provide equal or better  
31 protection from erosion as ~~than~~ would be achieved with vegetation as specified in FEMA 534.

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33 *History Note: Authority G.S. ~~143-215.25A; 143-215.26; 143-215.27; 143-215.31; 143-215.32; 143-215.34; 143-~~  
34 ~~215.25A(6).~~  
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