Fax

2010 OCT -4 P 12: 25

To:	MSHA	From:	George Tapp PE
Fax:		Fax:	
Phone:		Phone:	573-244-8138

Date:	10/4/2010
Subject:	RIN 1219 – AB70

Comments:
Comments on proposed rules and regulations.

AB70-COMM-2

9-30-10

Comments on MSHA Proposed Rules for Metal and Non Metal Dams -- RIN 1219-AB70

George Tapp P.E.
PO Box 525
Viburnum, MO 65566

General Questions:

1. What measures do mine operators currently take to design, construct, operate, and maintain safe and effective dams? Doe Run has all dams designed by a competent registered professional engineer and the design is then approved by the state of Missouri. The construction is then monitored by a competent registered professional engineer. After construction, a qualified person (mill superintendent or equal) inspects the dams (see question 12) and schedules required maintenance. An experienced registered professional engineer inspects the dams quarterly and the state of Missouri (Dam Safety Council) inspects dams over 35 ft. high every one to five years (usually 2 years for tailings dams). (Dam safety has proposed changing the 35 requirement to 25 ft, but the law has not been changed yet.)
What measures do mine operators currently take to safety abandon their dams?
Doe Run has not abandoned any dams since the mid 1960's except for one dam at an abandoned mine (Indian Creek). This dam (MO 30717) was breached and removed from the roster of regulated dams in 1995.
Please provide your experiences: Doe Run has been constructing dams since early in the 20th century. All dams built or enlarged since 1975 have been designed by an experienced registered professional engineer. Doe Run at this time has 18 dams over 35 ft. high all of which are inspected and regulated by Missouri's Dam and Reservoir Safety Council. In addition, Doe Run has 8 dams between 20 ft and 35 ft high which are regulated by Metallic Minerals Waste Management (see question 31).. Missouri has proposed regulating all dams over 25 ft high by the Dam and Reservoir Council, but has not changed their law yet. This writer has worked on dams as a registered professional engineer since 1974.

2.How should MSHA determine safety requirements based on a dam's size and hazard potential? Only dams over 15 ft. high with a storage volume of at least 50 acre ft of water should be regulated. (This will almost be in agreement with new law as proposed by Missouri's Dam and Reservoir Safety Council instead of present law's 35 ft. high). In addition the hazard classification should be: "High Hazard" loss of human life is probable or expected if the dam were to fail. Loss of life is assumed to occur if dam fails and permanent dwellings, public buildings, campgrounds, industrial buildings, mine buildings, or mines shaft or open pits exist within the downstream flood area. "Low Hazard", any dam that is not high hazard. By using the above size and hazard definitions, MSHA and the Missouri Dam and Reservoir Safety Council's proposed law would be in agreement which will make it easier to comply with all rules and regulations.

3. What non-federal authority regulates the safety of dams at metal and nonmetal mines in your state? The state of Missouri Dam and Reservoir Safety Council and Missouri's Metallic Minerals Waste Management.
Please discuss the specific requirements, including the principles that they address. The Missouri Dam and Reservoir Safety Council has issued (Dam Safety Publication No. 3) rules and regulations for construction of new dams and enlargement, repair, or alterations to existing dams. The rules and regulations require all permit applications to be prepared by or under the direction of an experienced professional engineer.
Requirements for a construction permit for a conventional (water) dam include; 1. Up to date topographic maps. 2. Exploration records and results. 3. Testing records and results. 4. Geotechnical design procedures or methods. 5. Structural design procedures or methods. 6. Hydrologic information used.. 7. Hydrologic/hydraulic design procedures used. 8. Location and design of diversion channels 9. Construction control and inspection procedures 10. Procedures for record keeping during construction 11. Protection measures for existing utilities. 12 Topographic surveys 13. 2 sets of plans and specifications 14. Procedures for conversion to retaining structure if required 15. Procedures for regular inspections by owner including an emergency action plan.
Requirements for a construction permit for an industrial water retention (tailings) dam include:
1. Description of system to deposit tailings on dam 2. Up to date topographic maps 3. Location of surface and underground mine workings 4. Exploration records and results. 5. Testing records and results 6. Geotechnical design procedures or methods 7. Type and physical properties of materials used in construction of dam and contained in reservoir 8. Changes created in downstream environment zone as dam becomes larger 9. Embankment changes and new factors of safety as dam becomes larger 10. If starter dam is used, whether it will be pervious or impervious 11. Crest elevation, dam configuration, spillway elevation, and configuration of each successive stage of dam. 12 Anticipated storage volumes of solids, semi-solid material, and liquids at completion of dam 13. Structural design procedures or methods 14. Hydrologic information used 15. Hydrologic/hydraulic design procedures or methods used 16. Spillway alteration and freeboard changes as dam becomes larger 17. Location and design of diversion channels for stream flow 18 Location and design of diversion channels to control runoff 19. Construction control and inspection procedures 20.. Procedures for record keeping during construction 21. Protection measures for existing utilities 22 Topographic surveys 23 2 sets of plans and specifications 24. Procedure for conversion to retaining structure if required 25. Procedures for regular inspections by owner including an emergency action plan.
For additional requirement for both conventional dams and industrial water retention (tailings) dams including required factors of safety for slope stability, see Missouri Dam and Reservoir Safety Council Dam Publication No. 3.

4. What records should be kept of activities related to the safety of dams? Copies of all inspection reports including inspections made by Missouri Dam and Reservoir Safety Council, any inspections made by consultants, and quarterly inspections made by a competent registered professional engineer. The quarterly inspections

should include reservoir water level, rainfall, changes in the downstream environment zone (new houses, new roads, new churches, etc.) piezometer readings for dams with piezometers, quantity of tailings deposited for tailings dams, and all observed defects including seepage, slides, piping of fines, animal burrows, unusual zones of softness and irregular settlement, vegetation, erosion on both faces of dam, cracks and riprap condition if applicable.

What records should be provides to miners if hazardous conditions are found? All inspection reports on the hazardous conditions if failure of dam would put miners at risk. The only dam Doe Run has with miners working below it on a regular basis is the 132 ft tall West Fork Main dam (MO 31833) Missouri Dam registration permit no. R-001 with a reservoir area of 25 acres and a drainage area of 685 acres, hazard class 1 (high hazard). For all other dams, miners do no work below the dam on a regular basis. For these dams, the greatest risk to miners is when the miners are driving on public roads in the downstream environment zone, or in a few cases – the risk to miner's homes that are in the downstream environment zone.

5. How should mine operators assure that dams are safely and effectively designed? By following Missouri's Dam and Reservoir Safety Council's Rules and Regulations for the design, construction, modification, and operation of all dams over 35 ft tall. For all dams under 35 ft tall they should also follow the above rules but would not have their plans approved by the Missouri Dam and Reservoir Safety Council, but would have to comply with Metallic Minerals rules, see question 31. Note; Missouri Dam and Reservoir Safety Council only regulates dams over 35 ft high at this time but has proposed changing this to 25 ft high.

Please suggest requirements that MSHA should consider for safe design of dams. MSHA should adopt the Missouri Dam and Reservoir Safety Council's Rules and Regulations for the design of all dams in Missouri. These rules and regulation work well for Missouri conditions (earthquake design, etc.) and have been used since 1980. MSHA should not adopt any rules that are in conflict with the Missouri rules.

6. Please suggest requirements for review of dam designs by mine operators and MSHA. All dam designs must be reviewed by the Missouri Dam and Reservoir Safety Council if they are more than 35 ft high per Missouri law. The design of dams less thank 35 ft. high should be reviewed by an independent registered professional engineer after being designed by an experienced registered professional engineer. This will duplicate as far as possible the review required by Missouri law for Dams over 35 ft tall and will avoid any possible conflict between Missouri and MSHA. Note: Missouri only regulates Dams over 35 ft high at this time but has proposed changing this to 25 ft high. In addition Metallic Minerals Waste Management has similar rules for dams under 35 ft high, see question 31.
7. With new standards operators may need to evaluate and upgrade existing dams. Please elaborate on how the safety of existing dams should be addressed. All new standards should be evaluated by an experienced registered professional engineer to determine how they apply to individual dams. For some new standards, i.e. on freeboard or spillway capacity, it should be possible to modify the dam. For other new standards i.e. foundation design, it would not be practical to modify an existing dam. In all cases the new standards must not conflict with Missouri state law.

8. What measures are necessary to ensure that mine operators construct dams as designed? Provide on site inspections by an experienced registered professional engineer at least once per month during construction. Engineer to maintain records of the inspections including records of soil compaction tests, concrete cylinder tests, etc. Records to also include photographs showing each stage of construction. In addition a qualified person (mill superintendent or equal) should provide on site inspections daily.
9. How should MSHA verify that dams have been constructed as designed? By reviewing the records of the inspections in item 8 above MSHA can verify the construction of the dam. In addition MSHA may want to make their own on site visit using their own experienced registered professional engineer or may want to review the Missouri Dam and Reservoir Safety Council inspection reports.
10. What should a mine operator do to operate and maintain a safe dam? The operator should make a weekly routine inspection of all active dams by a qualified person (mill superintendent or equal) and submit all results to an experienced registered professional engineer. The professional engineer should review all routine inspection reports and make a detailed inspection of all dams every quarter. In addition the Missouri Dam and Reservoir Safety Council makes one to five year (usually 2 years for tailings dams) detailed inspections of all dams over 35 ft high. For dams at inactive properties a routine inspection should be made monthly instead of weekly with a detailed quarterly inspection by a professional engineer. Also see question 12.
    How should MSHA verify that dams are safely operated and maintained? By having the operator submit to MSHA an annual report for each dam over 15 ft high with a registered professional engineer's certification that construction, operation, and maintenance of the dam has been in accordance with approved plans. This will be similar to the existing MSHA requirements for coal mines. Note: Dams less than 15 ft high should be exempt since any failure should only cause minor flooding in the downstream environment zone.
11. What measures should mine operators take to assure that dams are adequately inspected for unusual conditions and signs of instability? All dams shall be inspected after unusual events including earthquakes of Richter 5.0 or greater, rainfall of 6" or greater in 24 hours, or at any signs of instability. Initial inspection to be by a qualified person (mill superintendent or equal). As soon as possible a follow up inspection is to be made by an experienced professional engineer who will report any serious problems to Missouri Dam and Reservoir Safety Council unless the operators have activated the Emergency Action Plan which includes calling the Missouri Dam and Reservoir Safety Council and MSHA. Also see question 16.
12. How often are routine inspections of dams conducted? Daily to weekly for active dams, monthly for inactive dams. How often should they be conducted? Weekly for active dams (weekly conforms with MSHA rules for coal mines) and monthly for inactive dams in addition to inspection after unusual events. (see question 11 above) Tailings dams should be inspected daily when tailings are being added to dam or reservoir. Also see question 10. What determines the frequency? Past experience. For active dams (dams at operating mines). too much can change to

inspect at any less than once a week. For inactive dams (dams at closed/abandoned mines) things do not change as fast. In some cases experience may dictate more frequent inspection, for example, daily where tailings are being used to increase the height of dam. Who conducts the routine inspection? Routine inspections are conducted by qualified persons (mill superintendent or equal) who have basic knowledge of dams and are able to read drawings.

13. How frequently should mine operators monitor dam instrumentation? Weirs should be read and recorded weekly and piezometers should be read and recorded quarterly unless tailings are being added to dam or water level in reservoir is increasing. In this case, the piezometers should be read and recorded monthly or even more often if sizeable changes are observed in the monthly readings. MSHA requires instrumentation to be monitored weekly for coal mines but this seems excessive for reading piezometers unless large changes are found.
14. What information should be documented during routing dam inspections? Location where tailings are being added to dam or reservoir (for tailings dams only). For all dams, documentation should include information on any cracks, settlement, seepage, animal burrows,or wet areas of dam, reservoir water level, condition of the toe including toe drains,(increase flow or muddy water), and condition of spillway, documentation should also included inspector's name, date, and time with photographs of all unusual conditions.
15. Does a competent engineer inspect your mine's dams? Yes , this is a detailed inspection by a registered professional engineer. If so at what frequency?

Quarterly for all dams, in addition dams under construction are inspected about once per month by a competent registered professional engineer (also see question 8). The state of Missouri Dam and Reservoir Safety Council inspects all dams over 35 ft high on a 1-5 year interval (usually 2 years for tailings dams) with their own experienced registered professional engineers. What is evaluated? A. Does vegetation need to be cut on dam/spillway? B. Evidence of excessive seepage (all dams have some seepage) C. Condition of spillway (condition of riprap/erosion) D. Condition of embankment (sinkholes, cracks, settlement, animal burrows, wet areas) E. Reservoir water level F. Groin area erosion G. Toe drains (muddy water, increased flow) H. Piezometer readings if dam has piezometers I. Rainfall J. Remaining tailings storage available (for tailings dams)

16. How often should detailed inspection be conducted? Quarterly and after unusual events including earthquakes of Richter 5.0 or greater, rainfall of 6" or greater in 24 hours, or at any signs of instability, also see question 11 remarks. This is based on past experience. In addition dams over 35 ft high are inspected by the state of Missouri Dam and Reservoir Safety Council on a 1-5 year interval (usually 2 years for tailings dams) with their own experienced registered professional engineers before they renew the registration permit for the particular dam.
17. What information and findings should be documented during detailed dam inspections? All items that were evaluated in list in question 15. In addition photographs of all unusual conditions found during the inspection. This will give a bench mark to compare with conditions found in future inspections.

18. How should MSHA verify that mine operators conduct routine and detailed inspections? By examining on a nonroutine basis the dam inspection reports of both routine inspections and detailed inspections using MSHA own registered professional engineers. It should not be necessary to examine all reports. If the MSHA registered professional engineers had any questions they could then make a site visit using their own knowledgeable registered professional engineers accompanied by the owners' knowledgeable professional engineer.
19. What qualifications do mine operators currently require of persons who design, inspect, operate and manage dams? All dams shall be designed and inspected by competent registered professional engineers, (The state of Missouri Dam and Reservoir Safety Council will not permit the design of new dams over 35 ft tall or enlargement of any dam over 35 ft tall if it is not designed by Missouri registered professional engineers). What qualifications do mine operators currently require of persons who operate and manage dams? All dams shall be operated and managed by responsible qualified personnel who are knowledgeable about dam safety (mill superintendent or equal). In what capacities are engineers used? Competent registered professional engineers are used to design and inspect dams and also advise the mill superintendents of the operation and management of their dams. The engineers would also select and monitor the work of any consultants used for the design of any dams. In turn the consultants would also use competent registered professional engineers for all their design work.
20. What specific qualifications or credentials should persons who design dams possess? They should be professional engineers registered under state law to practice in the particular state the dam is located in. In addition they should have experience in the design of dams. This is required by the Missouri Dam and Reservoir Safety Council to obtain a construction permit.
21. What specific qualifications or credentials should a person have who verifies that a dam is being constructed as designed? The same qualifications as listed for question 20 above. Again this is required by the Missouri Dam and Reservoir Safety Council.
22. What training should personnel receive who perform frequent, routine inspections and who monitor instrumentation at dams? Personnel performing frequent routine inspections should be responsible qualified personnel (mill superintendent or equal) and as a minimum should check the following: A. Reservoir water elevation B. Location of tailing discharge into reservoir C. Any changes or unusual conditions of dam or Reservoir D. Embankment slope conditions for: signs of sloughing or sliding, signs of subsidence, evidence of sheet erosion, evidence of gully erosion, evidence of seeps or springs, evidence of animal burrows, extent of vegetation cover (does vegetation need to be cut) piezometer readings (monthly or more often) Condition of Adjacent areas for : signs of abutment or foundation sloughing or sliding, signs of subsidence, evidence of erosion, conditions of springs or seepage area, changes in vegetation (does vegetation need to be cut) Condition of spillway for: Evidence of erosion, obstruction to flow, condition of structures, condition of vegetation(does vegetation need to be cut), evidence of high water since last inspection. Underdrain system for: volume or rate of discharge, characteristics of discharge, damage or corrosion to pipes.
SUGGESTED sources of training for the above personnel:
A. MSHA's experienced registered professional engineers

B. Missouri Dam and Reservoir Safety Council's Manual "Maintenance, Inspection and Operation of Dams in Missouri." 1991
C. US. Army Corps of Engineers ER1110-1-106 Recommended Guidelines for Safety Inspection of Dams 26 Sept 1979
D. US Dept of the Interior Bureau of Mines Information Circular/ 1977
E. FEMA 473 Sept 2005 Technical manual for Dam Owners – Impacts of Animals on Earthen Dams
F. US Dept of the Interior Bureau of Reclamation Design of Small Dams 1974
G. US Dept of the Interior Bureau of Reclamation Training aids for Dam Safety (TADS) Identification of visual Dam Safety Deficiencies 1989

Section 3.0 of FEMA 473 gives detailed information on Dam Inspection, Item "E" above

23. What qualifications or credentials should be required of persons who perform detailed inspections to evaluate the safety of a dam? All persons performing detailed inspections of dams should be professional engineers registered in the same state that the dam is in. In addition they should have one or more years experience working on dams with an experienced engineer.
24. What actions should mine operators take to safely abandon dams? Missouri state law requires a permit from the Missouri Dam and Reservoir Safety Council before the reduction or removal of any regulated dams. This would also include breaching or abandoning dams. Note: Missouri regulates all dams over 35 ft high at this time, but has proposed changing this to over 25 ft.
25. How can MSHA verify that a mine has safely abandoned a dam? By verifying that the mine has followed the procedure as required by state law as discussed in item 24 above for dams over 35 ft high. For dams below 35 ft high, MSHA should verify the mine has had an experienced registered professional engineer provide a similar plan before any work is done and the having the professional engineer certify the work was done correctly.
26. What are the costs of designing a new dam? This writer has no cost information available to him.
27. What are the costs of constructing a dam? This writer has no cost information available to him.
28. How much does it cost per year per dam for oversight and quality control? This writer has no cost information available to him.
29. How often do you add height to an existing dam or modify it in some other way? About every 6-17 years depending on the dam and rate tailings are being added to reservoir. Who supervises the design of the modifications? The design of the raise is done by a Missouri registered professional engineer and then sent to the Missouri Dam and Reservoir Safety Council for their approval, they then issue a construction permit before start of construction. Who supervises the construction of the modifications? The construction is supervised on a daily basis by responsible qualified personnel (mill superintendent or equal who have basic knowledge of dams and are able to read drawings) and monthly by a Missouri registered professional engineer. How much does it cost? This writer has no cost information available to him.

30. How much does it cost per year per dam for routine inspections? This writer has no cost information available to him. How often do you have a detailed inspection conducted? Quarterly. In addition, all dams over 35 ft high are inspected by the state of Missouri Dam and Reservoir Safety Council using their own Missouri registered professional engineers on a 1-5 year interval (usually 2 years for tailings dams) before they renew the permit for the dam. Note: At this time Missouri regulates all dams over 35 ft high but has proposed changing this to 25 ft high. How much does is cost per year for these inspections? This writer has no cost information available to him.
31. Does the state or local jurisdiction in which you operate require you to use a professional engineer? All applications for construction permits for dams over 35 ft high in Missouri shall bear the seal and signature of an experienced professional engineer registered in Missouri per Missouri state law [236.435(2), RSMO (1986)]. In addition The Missouri Department of Natural Resources under 10 CSR 45-8.030 says for dams less than 35 ft high located in Metallic Minerals Waster Management Areas " The operator shall certify using standards that are currently acceptable and available to the engineering profession that the structures meet the requirements for spillway capacity, slope stability, correction of observable defects, maintenance and inspection in order the ensure the continued integrity of the structure"
32. What are the costs associated with training personnel who conduct frequent, routine inspections and monitor instrumentation at dams? This writer has no cost information available to him.
33. What costs are involved in capping, breaching, or otherwise properly abandoning a dam? This writer has no cost information available to him. Provide details of your experience and what was involved when you properly abandoned a dam: This writer has not been involved in abandoning any dams. Also see question 1
34. What are the costs to a mine operator if a dam fails? Unknown. Each case would be different (since each dam is unique) and would depend on use of dam, size of dam, damage done to downstream environment zone, any loss of life, damage to private property, damage to public property,(roads, etc) or damage to mine operators' property
35. Do you have insurance against dam failure? This writer has no insurance information available to him.
36. Comments: Since the Missouri Dam and Reservoir Safety Council does a thorough job of regulating dams over 35 ft high (see question no. 3) and the Missouri Department of Natural Resources Metallic Minerals Waste Management regulates dams less than 35 ft high in Metallic Minerals Waste Management areas (see question 31), this writer thinks MSHA should accept the above rules for Missouri dams. By using Missouri registered professional engineers and Missouri Dam Safety Council rules for the design, construction, and inspection of all Missouri dams, MSHA can best insure miners' safety. For states that do not have a Dam Safety Program, a report from a professional engineer from that state that the design, construction, and inspection is consistent with good engineering practice should also insure the miners' safety.