



CLOUGH HARBOUR & ASSOCIATES LLP

May 2, 2008

Ms. Jamie Woodall
Bureau of Flood Protection and Dam Safety
Division of Water
NYS DEC
625 Broadway, 4th Floor, Albany, NY 12233-3504

**Re: Comments on Dam Safety Rule Making
Schoharie County Comments Concerning
Draft DEC Dam Safety Regulations**

Dear Ms. Woodall:

The current and draft regulations require all dams to be maintained in a “safe condition”, but the regulations do not define the criteria that must be met to classify a dam as safe. It is assumed that the NYSDEC will continue to rely on the 1989 NYSDEC document “Guidelines for Design of Dams” to provide safety and design criteria. Under Applicability, the rules should reference an updated version of these guidelines.

The need for updated guidelines became apparent for Schoharie County based on the experience of applying the dam safety guidelines to the Gilboa dam rehabilitation project. Specifically in Section 10.0 of the guidelines, which address stability of concrete gravity dams, the NYSDEC should consider removal of confusing ill-defined methods of analysis and replacing these criteria with a USACE standard. In Section 6.0 the NYSDEC should consider the inclusion of criteria to require flood mitigation be retrofitted to existing Class C dams where it is feasible and effective at reducing future flood damage claims from downstream residents.

Suggested Revision No. 1 – Factor of Safety (FOS) for Existing Gravity Dams

Generally, the more uncertainty there is in a stability analysis (i.e., undefined loading conditions or uncertain foundation shear strength conditions) the higher the FOS required, to insure sufficient stability measures are implemented to correct for the unknown. Both the Federal Energy Regulatory Commission (FERC) and US Army Corps of Engineers (USACE) follow this philosophy. That is, with removal of uncertainty, the FOS requirement may be lowered.

Two Methods of Analysis

For dam stability the NYSDEC “Guidelines for Design of Dams” Section 10.7 recommends using

the “Shear-Friction” method when foundation shear values are based on laboratory tests. Where no subsurface explorations or testing is performed the stability analysis must be computed using the “Friction Factor of Safety.” The guidelines require a higher FOS when using “Shear-Friction” analysis than when using “Friction Factor of Safety” analysis. Requiring a higher FOS in the case of greater certainty (e.g., sample collection and testing) and lower FOS to be used when there is less certainty (e.g., no investigation or testing) is contrary to design practice required by FERC and USACE.

The NYSDEC guidelines should be clarified and follow the same design philosophy as FERC and the USACE, and where certainty is increased, FOS is lowered. The confusion comes from the lack of definition regarding the “Friction Factor of Safety” method and what criteria within this method reduces or compensates for uncertainty to justify a lower factor of safety. Research into this issue suggests that the “Friction Factor of Safety” method requires application of worst case shear strength (residual or conservative presumptive values) and an applying an FOS to these values. NYSDEC needs to provide clarification of this method of analysis in the guidelines. At a NYCDEP workshop held March 29, 2006 for the Gilboa Dam emergency repair design none of the experts (including representatives from NYCDEP, FERC, USACE, NYPA and the NYSDEC) in attendance could reference the origin of the “Friction Factor of Safety” method.

Recommendation

Use of the USACE standards is already in place for embankment dams the NYSDEC Guideline Section 9.2 references in EM 1110-2-1902 Table 3-1. It would follow that USACE EM 1110-2-2100 could be used for analysis of existing concrete gravity dams NYSDEC Guideline Section 10.7.

Based on review this USACE document it is clear there is a well defined method for selecting and evaluating the FOS for an existing concrete gravity dam. The method of analysis follows the design philosophy that the required FOS is reduced with the reduction in uncertainties. The USACE EM 1110-2-2100 document first requires the dam to be classified as a “critical” or “normal” life structure based on the USACE defined criteria. Then with an assigned structure classification the USACE EM 1110-2-2100 requires that the level of site information be evaluated to determine if the available site information is “limited”, “ordinary” or “well defined”. Based on structure classification and the level of site information the USACE document specifies the FOS for the applicable design load cases.

Suggested Revision No. 2 – Improved Dam Safety through Flood Mitigation using Spillway Hydraulics

The new regulations should also recognize the need for enhanced flood mitigation. Understanding storms are becoming more intense and the frequency of these storms is increasing the proposed regulation or guidelines should include that greater freeboard height or multi-level spillway weirs are included with dam rehabilitation projects. These provisions would be retro-fitted on existing dams where it is determined to be structurally feasible and hydraulically effective. The design guidelines could require high hazard dams to reduce the peak inflow hydrograph by a percentage

as compared to the spillway discharge hydrograph. The intent of the new guideline would be to provide effective flood mitigation through storage and controlled release at the dam.

Funding consideration should be given to reimburse the applicant/owner for costs of the flood mitigation measures if the owner satisfactorily demonstrates that the improvements will reduce flood damage claims or improve the safety of downstream residents.

Thank you for this opportunity to present the above dam safety comments.

Very truly yours,

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Associate

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