Submittal and Review Requirements for Overtopping Protection Utilizing Articulated Concrete Blocks (ACBs)
For
NJDEP- Division of Dam Safety & Flood Control

The following guidelines are developed based on the information available at this time. As this technology develops, changes to the guides will follow. The Bureau of Dam Safety (Bureau) will remain open to new technologies as long as the applicant can demonstrate that a proposal has been properly designed and tested and that the material properties can provide long term, low maintenance performance.

1. All ACBs must be hydraulically tested to verify performance and to provide the data necessary to evaluate stability. Hydraulic testing and collection/interpretation of test data must be in accordance with ASTM standards. Engineers must provide supporting documentation that the block which is being specified has been properly tested to verify performance, unless the Bureau already has said documentation.
2. ACBs may be installed for overtopping protection only where there is straight, uniform flow similar to the flows used to test the block's performance. ACBs should not be installed where flow turbulence is expected such as along angled embankment groins, or in the vicinity of structures or obstacles that re-direct or impede the flow.
3. The potential hydraulic jump location(s) must be analyzed. It may be necessary to analyze a range of flows/tailwater conditions. If a hydraulic jump is expected to occur over the ACBs (on the slope or apron), the forces associated with the jump must be analyzed in accordance with the manufacturer's guidance. The manufacturer's guidance must be based on appropriate hydraulic test data. If such data is unavailable or is inconclusive, other erosion protection measures may be needed.
4. Computations of the velocities and shear stresses on the downstream slope must be submitted. A safety factor against overturning of at least 1.5 must be achieved using the industry standard Factor of Safety methodology or other analysis method if approved by the Bureau. It is likely that a higher safety factor is warranted for overtopping applications at high and significant hazard dams.
5. If computed peak velocity over the ACBs exceeds the velocity developed during hydraulic testing, sound engineering justification

will be required unless the stability analysis is able to account for the higher velocities.

6. If tapered blocks are specified, 0" of assumed projection is acceptable for the stability analysis. If regular (non-tapered) blocks are specified, the analysis must assume a minimum ½" projection.
7. Use of ACBs along the side-slope of a channel that is part of an overtopping application may require a separate analysis for the side-slope because of the different angles involved in the analysis.
8. ACBs must be cabled (cables parallel to flow) and all ACB system details must be essentially the same as the details which were utilized in the testing procedures (i.e. drainage layers, filters, etc.). Details such as mat terminations must be in accordance with the manufacturer's guidance.
9. Use of a typical woven or non-woven geotextile layer between the ACB and any required drainage layer will not be permitted unless it can be demonstrated that the proposed design meets required safety factors. Use of a geogrid or geomesh between the ACB and drainage layer may be appropriate. Topsoiling over ACBs may not be permitted unless it can be demonstrated that the topsoil will not clog any drainage layer necessary to meet the required hydraulic performance.
10. Specifications must identify the block and manufacturer that was analyzed in the design report. If the design engineer determines that an "approved equal" is permissible, the specification must further require that any proposed change in block or manufacturer will require a new design analysis that must be submitted to this Bureau for review/approval as a modification to the permit, prior to construction.
11. Specifications for ACBs must include a requirement for freeze/thaw durability testing and should specify the required ASTM test, the minimum number of freeze/thaw test cycles as well as the corresponding weight loss criterion for a pass-fail determination.

The Bureau may, on a case by case basis, require additional information.