

Update/

An advisory on the changing regulatory environment

Please return to
2001 W. Durango
Phoenix, AZ 85009

April, 1984:

Changes in Probable Maximum Flood (PMF) estimating requirements

FLOOD CONTROL DISTRICT
RECEIVED

MAY 31 '84

CH ENGR	4	HYDRO
ASST		LMgt
ADMIN		SUSP
C & O		FILE
3 ENGR		DESTROY
FINANCE		

REMARKS

Precipitation Estimates Revised Upward

Changes in National Weather Service estimates of probable maximum precipitation (PMP) have resulted in recent revisions to Hydrometeorological Report 51 (HMR 51) for areas of the continental U.S. east of the 105th meridian.

The area between the 105th meridian and the Continental Divide is also being studied by federal groups. Changes in recommended PMP can be expected to update estimates of the generalized PMP for the Rocky Mountain region.

Larger Floods Affect Spillway Capacity and Stability of Dam Structures

Upward revisions of generalized PMP will result in larger estimates of the Probable Maximum Flood (PMF) at project sites. This in turn may have significant effects on project safety. Increased spillway capacity may be required as well as additional measures to improve the stability of project structures under higher flood case reservoir levels.

Of the dams cited as unsafe in the Corps of Engineers program of inspections under the 1972 National Dam Safety Act, 80 percent had inadequate spillway capacity. Failure of owners to respond to identified deficiencies may result in significant liability should a dam incident occur.

Federal and State Agencies Moving Toward Enforcement

The Federal Energy Regulatory Commission (FERC) is responsible for licensed hydroelectric projects. It and selected state and other federal agencies responsible for dam safety issues are now actively requiring dam owners to prepare new estimates of the PMF using the revised PMP estimates.

As new 5-year dam safety and inspection reports come due, FERC will expect them to include new estimates of the PMF that comply with the latest guidelines. If modern practice were applied with the old HMR51, a new study may not be required. However, rule-of-thumb and short cut methods will no longer be acceptable. Owners are expected to take appropriate action to ensure the safety of their dams based on the latest estimates.

Larger PMFs will require greater spillway capacity, additional structural stability

FERC now requires new PMF estimates

899.103

Update/

An advisory on the changing regulatory environment

April, 1984:

Changes in Probable Maximum Flood (PMF) estimating requirements

LOOD CONTROL DISTRICT
RECEIVED

MAY 31 '84

CH ENGR	4	HYDRO
ASST		LMgt
ADMIN		SUSP
C & O		FILE
3 ENGR		DESTROY
FINANCE		
REMARKS		

Larger PMFs will require greater spillway capacity, additional structural stability

FERC now requires new PMF estimates

Precipitation Estimates Revised Upward

Changes in National Weather Service estimates of probable maximum precipitation (PMP) have resulted in recent revisions to Hydrometeorological Report 51 (HMR 51) for areas of the continental U.S. east of the 105th meridian.

The area between the 105th meridian and the Continental Divide is also being studied by federal groups. Changes in recommended PMP can be expected to update estimates of the generalized PMP for the Rocky Mountain region.

Larger Floods Affect Spillway Capacity and Stability of Dam Structures

Upward revisions of generalized PMP will result in larger estimates of the Probable Maximum Flood (PMF) at project sites. This in turn may have significant effects on project safety. Increased spillway capacity may be required as well as additional measures to improve the stability of project structures under higher flood case reservoir levels.

Of the dams cited as unsafe in the Corps of Engineers program of inspections under the 1972 National Dam Safety Act, 80 percent had inadequate spillway capacity. Failure of owners to respond to identified deficiencies may result in significant liability should a dam incident occur.

Federal and State Agencies Moving Toward Enforcement

The Federal Energy Regulatory Commission (FERC) is responsible for licensed hydroelectric projects. It and selected state and other federal agencies responsible for dam safety issues are now actively requiring dam owners to prepare new estimates of the PMF using the revised PMP estimates.

As new 5-year dam safety and inspection reports come due, FERC will expect them to include new estimates of the PMF that comply with the latest guidelines. If modern practice were applied with the old HMR51, a new study may not be required. However, rule-of-thumb and short cut methods will no longer be acceptable. Owners are expected to take appropriate action to ensure the safety of their dams based on the latest estimates.

Update

Impact on safety reports

Today's federal and state guidelines for dam safety often require that a dam's spillway safely pass the Probable Maximum Flood or a large fraction of it, depending on height of dam, size of reservoir, and potential downstream hazard should the dam fail.

Failure to properly determine new PMF's according to the latest procedures will lead to FERC rejection of 5-year dam safety reports or a requirement to prepare a supplementary report.

Harza Can Help

FERC and active state dam safety offices know what is required. Consultants who are inexperienced in modern-day hydrologic analyses may be unable to satisfy FERC. Our credibility to perform hydrologic analyses acceptable to FERC is established in every FERC regional office across the U.S.

Harza Engineering Company has specialized in the development of hydroelectric and water resources for nearly 65 years. This experience can be put to use to evaluate your project, utilizing recently revised procedures for determining spillway design floods. Harza's experience encompasses all aspects of a dam project: from state-of-the-art basin-wide estimates of the Probable Maximum Flood to the development of cost-effective spillway modifications and improvements to the stability of project structures.

Harza's 10 senior hydrologists have more than 150 man-years of experience in performing PMF and dam break studies. They have performed a number of PMF studies using the new data and procedures which have already been reviewed and approved by FERC and state dam safety agencies.

Innovative Engineering

Regulatory agencies recognize remedial solutions

Remedial solutions such as the raising of dams, provision of additional spillway capacity, and design of fuse plug spillways for additional protection have been recommended and designed by Harza and accepted by regulatory agencies. Harza can carry a project through from hydrologic analyses to remedial designs and construction management. We have developed innovative alternatives to increasing the spillway capacity of a project. Some examples:

- Use of economical concrete highway barriers placed on earth and concrete dams to provide additional flood protection.
- Erodible earthfill plugs on concrete chute spillways to replace costly spillway gates in new emergency spillways.
- Duck-bill shaped spillways to increase the overflow weir length without requiring a corresponding wide chute.

Experience Counts

To date, Harza has performed over 70 PMF studies in 18 states covering all geographic and climatic regions of the U.S. These estimates have included drainage areas ranging from a few square miles

Update

Computer-aided rainfall-runoff relationships

to tens of thousands of square miles. In the last five years, 17 projects have also required analysis of the impact of an upstream dam failure.

HMR 51 presents generalized estimates of the PMP. But there are basins of unique topographic and meteorological conditions where site specific studies are needed to obtain a better estimate of the PMP or to subdivide the drainage basin. That is when Harza's experienced hydrologists can make a difference...by more accurately accounting for lag times in runoff or considering the effects of existing reservoirs, natural lakes, and swamps on attenuating peak inflows.

Transposition of PMP to PMF requires determining rainfall-runoff relationships. New techniques have been developed. Harza has computerized procedures for processing large amounts of historical data and performing the laborious computations required by Hydro-meteorological Report No. 52. Our engineers are free to think, not process numbers. Harza hydrologists routinely use the HEC-1, HEC-5 and SSARR computer models of the Corps of Engineers and the DAMBRK model of the National Weather Service.

Options Are Available: Harza Knows Them

There are a number of options which can be considered to bring a project into compliance with federal and state guidelines for spillway capacity and dam safety. Harza has experience in all of them:

Raising dams, expanding spillways, new gates, fuse plugs, post-tensioned anchors, weight berms, relief well systems.

- Raising earth and concrete dams to increase head on existing spillways and provide flood storage capacity
- Expanding existing spillways; designing new spillway gates
- Earthen fuse-plug spillways to provide emergency spillway capacity
- Installation of post-tensioned anchors to improve the stability of gravity dams under raised reservoir conditions
- Construction of weight berms along the downstream toe of earth dams and/or flattening of earthfill slopes
- Relief well systems to lower the line of saturation through earth dams

We would be pleased to discuss the new PMF requirements or remedial spillway solutions with you, and review your project's requirements. Contact: Robert D. Meredith, PE, at (312) 855-7000, ext. 3314.

Update

Representative Clients PMF Related Projects

<u>Location</u>	<u>Client</u>
Alaska	Alaska Power Authority
Colorado	Denver Water Board
Connecticut	Northeast Utilities Service Company
Idaho	Utah Power and Light
Illinois	Commonwealth Edison
	Lower Marion Conservancy District
	Illinois Power Company
Indiana	Northern Indiana Public Service Company
Kentucky	American Electric Power Service Corp.
Maryland	Pennsylvania Electric Company
Missouri	City Utilities of Springfield
Minnesota	Northern States Power
Montana	Department of Natural Resources & Conservation
New York	NYC Department of Environmental Protection
Pennsylvania	Pennsylvania Electric Company
	Pennsylvania Power & Light Company
	Metropolitan Edison Company
Utah	Utah Power & Light Company
Virginia	Virginia Electric & Power Company
	Appalachian Power Company
Washington	City of Tacoma
Wisconsin	Northern States Power
Wyoming	Office of the State Engineer

Technical Papers and Brochures on PMF Topics Available from Harza

Conservatism of Probable Maximum Flood Estimates, by B. H. Wang and R. Revell.

Evaluation of Alternatives in Selection of Sites for Surface Water Impoundments, by J. Bizer and L. Wang.

Hydrological Analyses for Large Reservoir Projects, by B.H. Wang.

Re-evaluation of Design Flood for Guri Dam, by T. Mantellini, B.H. Wang and K. Jawed.

Site Specific Probable Maximum Precipitation Estimates, Upper South Platte River Basin, Colorado, by J. Riedel, B.H. Wang and J. Diebel.

Water Resources and Regional Land-Use Plan, J. Ringenoldus

"Low Cost Auxiliary Spillways for Dam Safety," brochure.

We would be glad to send additional copies of *Update* and other Harza literature at no charge. Contact the Manager, Public Relations Center, ext. 3369.

Harza Engineering Company Consulting Engineers
150 South Wacker Drive, Chicago, Illinois 60606 (312) 855-7000
Anchorage Denver Minneapolis Phoenix Washington, DC

**Worldwide project development services
for water, land and energy resources**
