

CONTENTS

Dam Construction and Rehabilitation

Alternative Project Delivery Methods for Dam Construction and Rehabilitation1
Daniel J. Hertel, Barnard Construction Company, Inc.; **Daniel L. Johnson**, GEI Consultants, Inc.; **William R. Fiedler**, Bureau of Reclamation; and **Dietmar Scheel**, MWH Americas, Inc.

Management of Costs and Schedules on the Olivenhain Dam Project11
Geraldo R. Iglesia, G²D Resources, LLC; **Gerard E. Reed III**, San Diego County Water Authority; **Thomas O. Keller**, GEI Consultants, Inc.; and **Kenneth A. Steele**, San Diego County Water Authority

Estimating Costs and Escalation in Today's Market.....23
Robert G. Aaserude and **Michael F. Rogers**, MWH Americas, Inc.; and **Daniel J. Hertel**, Barnard Construction Company, Inc.

Reconstructing River Reservoir No. 3 — From Emergency Action to Breach to Safe Operation in 21 Months35
Del Shannon, Black & Veatch Corporation; **James R. Swaisgood**, Swaisgood Consulting; and **Michael Johnson**, Arizona Department of Water Resources

Yorkville Dam Modification: Challenges and Opportunities47
Loren A. Wobig, Illinois Department of Natural Resources

Use of Geosynthetics to Rehabilitate Fisher Cañon Dam and Reservoir.....57
Richard A. Millet and **Jennifer L. Williams**, URS Corporation; **Dennis A. Minchow**, Broadmoor Development Co.; and **John B. Heap**, Colorado Lining International

The 2006 ICOLD Bulletin on Geomembrane Sealing Systems for Dams.....69
Robert M. Koerner, Geosynthetic Institute; and **John A. Wilkes**, CARPI USA, Inc.

Arkabutla Dam Outlet Conduit — Methods Used to Seal Monolith Joints Against Loss of Foundation Materials Since 2003, Arkabutla, MS.....79
Dale A. Goss, Corps of Engineers

Completion of Saluda Dam Remediation — An Engineering Challenge89
Jeffrey M. Bair, **Umesh Dayal** and **John P. Osterle**; Paul C. Rizzo Associates, Inc.

Experiences with Risk Management

Reflections on a Decade of Risk-Based Dam Safety Decision Making101
Bruce C. Muller, Jr., Bureau of Reclamation

*U.S. Army Corps of Engineers Dam Safety Program — Status and Lessons
in Transitioning to Risk Informed Approaches*107
Eric C. Halpin, Corps of Engineers

Utilization of Risk in a Dam Safety Regulatory Environment117
Patrick J. Regan and **Daniel Mahoney**, Federal Energy Regulatory Commission

Lessons Learned from the Failure of the Taum Sauk Dam127
Kevin S. Richards, Federal Energy Regulatory Commission

Application of Risk Assessment Methods

Tolerable Risk for Dams: How Safe Is Safe Enough?139
David S. Bowles, Utah State University and RAC Engineers & Economists

Rough River Dam Safety Assurance Project163
Timothy M. O'Leary, Corps of Engineers

Cedar Moraine Embankment Study171
Dalong “Daniel” Huang, Seattle Public Utilities; and **Ed Heavey**, Landau Associates, Inc.

*Design of Embankment Heights for Shallow Aboveground Reservoirs —
Understanding Risk and Uncertainty*.....181
Robert C. Tucker, **Lori L. Hadley** and **Sean L. Smith**, Corps of Engineers

Risk Assessment of Levees and Dikes

Fragility Analysis of the Sacramento-San Joaquin Delta Levees.....191
Said Salah-Mars, **Arulnathan Rajendram**, **Michael Forrest**, **Kanagalingam Thangalingam**, **Segaran Logeswaran** and **Ram Kulkarni**, URS Corporation; and **Ralph Svetich**, California Department of Water Resources

Herbert Hoover Dike: Major Rehabilitation207
Jacob Davis, Corps of Engineers

Embankment Dams and Geotechnical

Considerations for Filter Design217
Mark Pabst, Bureau of Reclamation

Monte Carlo Simulation of the No-Erosion Filter Test227
Christopher Hill and **Mohsen Beikae**, Metropolitan Water District of Southern California

<i>Compaction Grouting of Five Channels Dam — Au Sable River, Michigan</i>	<i>237</i>
Jeffrey M. Bair and Howard Gault , Paul C. Rizzo Associates; Peter J. Hutchinson , The Hutchinson Group; and Stuart Johnson , Consumers Energy	
<i>An Application of Simplified Probabilistic Stability Analysis to an Embankment Dam.....</i>	<i>249</i>
John W. France and Imran S. Gillani , URS Corporation	
<i>Strength of Materials for Embankment Dams: State of the Practice.....</i>	<i>263</i>
Ralph W. Rabus , TCB	
<i>Determination of Cap Model Parameters Using Drained Conventional Triaxial Compression Test Results</i>	<i>275</i>
Kevin Z. Z. Lee , Bureau of Reclamation; Nien-Yin Chang , University of Colorado at Denver; and Kuang-Tsung Chang , National Chung Hsing University, Taiwan	
<i>Three-Dimensional FLAC Stability and Deformation Analysis — How Much Caution Is Needed?.....</i>	<i>285</i>
John W. France and Imran S. Gillani , URS Corporation	
<i>Seepage and Interim Risk Reduction Measure Evaluation for Bolivar Dam</i>	<i>295</i>
Sean Carter , Erich Guy , Michael Robinette and Greg Hensley , Corps of Engineers	
<i>Diagnosing Embankment Seepage with Controlled Source-Frequency Domain Magnetics.....</i>	<i>309</i>
Val Kofoed , Willowstick Technologies, LLC; and Keith Gardiner , United Utilities	
<i>Design and Performance of Drains on Pervious Foundations.....</i>	<i>319</i>
Mark Pabst , Bureau of Reclamation	
<i>Characterization of Iron-Ore Mine Waste Rock Piles to Assess Potential for Use in Salton Sea Rock-Fill Barriers.....</i>	<i>329</i>
Andrew Finney and John Livingston , CH2M Hill, Inc.	

Concrete Dams

<i>Current State-of-the-Practice for Existing Gravity Dam Stability Analysis.....</i>	<i>341</i>
Robert A. Kline and Boyd Howard , Gannett Fleming, Inc.; and Steven M. Davidheiser , Lakhani & Jordan Engineers, P.C.	
<i>Green Lane Gets Green Light: Parameter Sensitivity in Gravity Dam Stability Analysis.....</i>	<i>353</i>
Greg Paxson , Schnabel Engineering; Tony Fernandes , Aqua Pennsylvania, Inc.; and Dave Campbell , Schnabel Engineering	

<i>Wanapum Spillway Flood Stability Review</i>	363
A. Richard Griffith, James H. Rutherford and J. Groeneveld , Hatch Acres; and David D. Moore , Grant County Public Utility District No. 2	
<i>Impact of Contaminated Lift Joints on RCC Tensile Strength</i>	373
James L. Stiadu , G ² D Resources, LLC; Jim Zhou, Gerard E. Reed III and Jeff Shoaf , San Diego County Water Authority	
<i>Zone of Alkali/Aggregate Reaction in Carters Reregulation Dam, North Georgia</i>	383
James H. Sanders, Jr., Toy S. Poole and Bruce C. Barker , Corps of Engineers	
<i>Carter Lake Intake Tower Design: Comparing and Contrasting Design Methods</i>	395
Scott L. Jones, Michael Zusi and Steve Higinbotham , URS Corporation	
<i>Nonlinear Structural Analysis for San Vicente Dam Raise</i>	405
Gilles Bureau and Thomas O. Keller , GEI Consultants, Inc.; and Jim Zhou , San Diego County Water Authority	
 <u>Hydrology and Hydraulics</u>	
<i>Major Repair of Hydraulic Steel Structures, U.S. Army Corps of Engineers, Kansas City District</i>	421
Michael G. Scott and Marvin Parks , Corps of Engineers	
<i>Modernization of the Salt Springs Dam Outlet Works</i>	429
Michael C. Johnson , Utah State University; James E. Pearman , Rodney Hunt Company; and Rod Lubben , Consulting Engineer	
<i>Ballpark PMFs</i>	439
John Harrison and Greg Paxson , Schnabel Engineering	
<i>Managing Debris Dams/Basins after Wildfires and Subsequent Storm Events</i>	449
Jang H. Pak, Shih H. Chieh and Kerry T. Casey , Corps of Engineers	
<i>Summary of Results from the California Tainter Gate Reevaluation Program</i>	459
Mark Schultz, Phu Huynh and Shawn Jones , California Department of Water Resources	
<i>Redesign of Tainter Gate Trunnion Bearings — Tuttle Creek Lake Project, Manhattan, Kansas</i>	469
Michael G. Scott , Corps of Engineers	
<i>Repairs of Spillway Gate Weld Deficiencies and Upstream Face of Dam Pier Cracks and Wall Weathering and Erosion — Hartwell Dam</i>	479
Donald L. Smith and Harold C. Thomas , Corps of Engineers	

<i>Head Discharge Curves for a Mechanical Fuseplug (Fusegate) Spillway: Flood Damage and Gate Operation Considerations at Otter Brook Dam, Keene, New Hampshire</i>	489
Patrick Blumeris , Corps of Engineers	

Environment

<i>The Use of Spreadsheet Programs as a Tool in Reservoir Design and Optimization</i>	501
Manoshree Sundaram , Federal Energy Regulatory Commission; and Terrence E. Arnold and J. Felipe Garcia , MWH Americas, Inc.	

<i>Determining Baseline Conditions for Impact Analysis of San Vicente Dam Raise and Carryover Storage Project</i>	513
M. Kelley Gage , San Diego County Water Authority; and Paul J. Amberg , Kenneth M. Bogdan and Michael S. Jewell , Jones & Stokes	

<i>Project Benefits of Structured Engineering-Environmental Interaction: A Case Study</i>	525
Jack L. White , CH2M Hill, Inc.; Thomas O. Keller , GEI Consultants, Inc.; Laurence J. Purcell and Kelley Gage , San Diego County Water Authority; and Michael J. Gonzales , PBS&J, Inc.	

Instrumentation and Monitoring

<i>Correlation Plot — A Modern Tool in Dam Safety Monitoring</i>	537
Eugene Gall , Federal Energy Regulatory Commission	

<i>Canton Dam Stabilization Design, Instrumentation and Construction</i>	553
Greg Yankey , FMSM Engineers; Cary Lange , Nicholson Construction Co.; Tom Pace , FMSM Engineers; Randel Mead , Corps of Engineers; and Paul Krumm , and Richard Deschamps , Nicholson Construction Co.	

<i>Deformation Monitoring Upgrade for a 106-Year Old Masonry Dam</i>	565
Mark W. Rohde , Coler & Colantonio, Inc.; and Richard F. Murray, Jr. , City of Holyoke	

<i>Utilizing Cartridge Type Flow Meter for Automated Monitoring of Seepage Flow from a Dam</i>	577
Somalingam Balachandran and Joseph J. Kulikowski , GENTERRA Consultants, Inc.; and Joseph McDivitt , South Coast Water District	

Dam Decommissioning

To Rehabilitate or Not to Rehabilitate? Decision-Making Using Cost-Benefit Analysis for Aging Dams587

Katherine E. Sharpe, Gannett Fleming, Inc.; **Kurt Staller**, McMahon Associates, Inc.; **James Featherston**, USDA-NRCS; and **Dean B. Durkee**, Gannett Fleming, Inc.

Removal of Large Dams and Site Restoration — Breaching of Birch Run Dam597

Timothy W. Johnston, Gannett Fleming, Inc.; **Vince Humenay**, Pennsylvania Department of Environmental Protection; and **Eric C. Neast** and **Cy R. Whitson**, Gannett Fleming, Inc.

San Clemente and Matilija Dam Removal: Alternative Sediment Management Scenarios607

Mark H. Capelli, National Marine Fisheries Service

Seismic Issues

Residual Shear Strength of Liquefied Soils621

I. M. Idriss and **Ross W. Boulanger**, University of California, Davis

Seismic Risks to the Seepage Cutoff Wall at Clearwater Dam635

Alan F. Rauch, **Jeffrey S. Dingrando** and **Thomas G. Pace**, Fuller, Mossbarger, Scott and May Engineers, Inc.; and **Robert E. Van Cleave II** and **Mark C. Harris**, Corps of Engineers

Full-Scale Verification of Coupled-Mode Excitation of a 50-Ton Tainter-Gate647

Keiko Anami, Ashikaga Institute of Technology; **Noriaki Ishii**, Osaka Electro-Communication University; **Charles W. Knisely**, Bucknell University; **Tatsuya Oku**, Osaka Electro-Communication University

Poster Session

Dam Development Strategy in Vietnam, Technical and Environmental Aspects659

Pham Hong Giang, Vietnam National Committee on Large Dams; **Trinh Cong Van**, Hydraulic Engineering Consultant Company No. 2; **Pham Hong Nga**, Water Resources University; and **Nguyen Luong Am**, Engineering Contractors No. 47

Using the QFD Approach as a Safety Management Tool in Dam Engineering671

Murat Gündüz, **Metin Arikan** and **Burak Şimşek**, Middle East Technical University

Determination of Wave Run-Up and Over-Wash Rates for Optimizing Levee Height Requirements679

Lori L. Hadley, **Robert C. Tucker** and **Sean L. Smith**, Corps of Engineers