DFI presentation at the USSD Levee Workshop
By Gianfranco DiCicco - Oakland, CA -- November 3, 2015
DFI Contribution to
US Levee Safety Coalition

To be the go-to technical resource for foundation-related design and construction and to ensure Safety, Quality, Durability and Sustainability in relation to levee systems seepage and piping issues.
DFI Purpose

Advances the design and construction of deep foundations by disseminating information to engineers, contractors, manufacturers (technology providers) and educators through publications, seminars and discussion.  

Connecting the industry with Government agencies and Owners.
Total members as October 30, 2015: 2934
Argentina · Australia · Austria · Barbados · Belgium · Brazil · Canada · China · Columbia · Czech Republic · Dominican Republic · Ecuador · Egypt · Estonia · Finland · France · Germany · Guatemala · India · Ireland · Israel · Italy · Japan · Korea · Lebanon · Malaysia · Mexico · New Zealand · Nigeria · Oman · Panama · Poland · Russia · Saudi Arabia · South Africa · Spain · Sweden · Taiwan · Thailand · The Netherlands · Trinidad · Turkey · UAE · United Kingdom · United States · Venezuela · Vietnam
Past International Conferences

- Beijing, China
- Luxembourg
- London, England
- Stressa, Italy
- Bruges, Belgium
- Vienna, Austria
- Sao Paolo, Brazil
- Stockholm, Sweden
- Nice, France
- Amsterdam, Netherlands
- Dubai, UAE
- London, UK
- Doha, Qatar
- Bangalore, Bombay, Chennai, Delhi, Hyderabad, India
- Mexico City, Mexico
- Milan, Italy
- Krakow, Poland
- Next...... Rome May 2018!
  (to be confirmed)
Technical Committees and Working Groups

- Augered Cast-in-Place Piles (CFA Piles)
- Codes and Standards
- Deep Foundations for Landslides and Slope Stabilization
- Driven Piles
- Drilled Shafts
- Electric Power System Foundations
- Energy Foundations
- Ground Improvement
- Helical Foundations and Tiebacks
- Marine Foundations
- Manufacturers, Suppliers and Service Providers
- Micropiles
- **Seepage Control Working Group**
- Seismic and Lateral Loads
- Slurry Walls
- Soil Mixing
- Subsurface Characterization
- Sustainability
- Testing and Evaluation
- Tiebacks and Soil Nailing
- Women in Deep Foundations
Technical Committees & Working Groups

- Guidelines for selecting cutoff wall systems.
- Slurry primer guidelines for excavation support.
- Guidelines for specifying liquefaction mitigation methods.
- GeImpuls future cooperation on failure and risk reduction.
- Evaluation of FHWA GeoTechTools for possible updating.
- Review and input to AIA geotechnical contract document.
- Developed Carbon Calculator Tool for geotechnical technologies.
- Developed project funds initiatives.
What DFI members mainly do?

- Foundations for new structures or retrofitting existing structures, slope and landslide stabilization
- Soil modification to improve ground characteristics and/or prevent settlement or liquefaction
- Containing water underground to avoid seepage and piping which will create instability of above ground structures (levees, dikes, dams, reservoirs, contaminated sites etc.)
What is expected......

(Courtesy of Raito)
Do No Harm... (Courtesy of USACE)
Work with stakeholders to assess, communicate, reduce and then manage the residual risks to people, the economy, and the environment from inundation associated with the presence of levee systems.
USACE Levee Safety Program Mission
(courtesy of USACE)

Risk Assessments
Tailored to Decision

Special
Inspections
Post Flood

Rehabilitation
or Repair

Levee
Screenings

National
Levee Database

Levee
Inspections
Visual Inspection/Annual

FEMA’s Mid-
term Levee
Inventory and
other sources

- Task Force identified as most beneficial to align
Levees within USACE Authorities

- Huge Footprint on Society
- Half Actionable from Risk Perspective
- Main Risk Drivers:
  - Overtopping: 50%!!
  - Seepage & Piping
  - Culverts
  - Consequences
- 40% cutoff walls (of the remaining 50%)

Levee Portfolio - LSAC

- LSAC 1, 14, 3%
- LSAC 2, 60, 14%
- LSAC 3, 112, 27%
- LSAC 4, 239, 56%

95% Earthen Structures
5% Floodwalls

Courtesy of USACE
Why DFI is involved?

To participate in the implementation of the USACE National Levee Safety Initiative as member of the U.S. Levee Safety Coalition

• If we are talking about Safety it is because there is Risk
• Improved Safety = Reduced Risk
• Risk → Prevention → Risk Assessment
• Risk Assessment → Decision for needed repairs/rehabilitation (or new construction!!!!!!)
• When risk is related to seepage/piping problems DFI members will do the actual work! → To REDUCE RISK!
DFI Technologies for Seepage and Piping Remediation

- Excavated Cutoff Systems (existing materials are replaced with engineered backfill material)
- Ground Treatment Cutoff Systems (existing materials are improved through addition of stabilizing agents and binders)
- Drilled and Grouted Cutoff Systems
- Driven Cutoff Walls
Excavated Cutoff Systems
- Element Walls
- **Panel slurry walls**
- Secant pile walls
- Trench Systems
- Soil Bentonite Walls
- Cement Bentonite Walls
Lower Wood River Cutoff Wall (IL) – depth 140 LF – SHS technology
DFI Technologies

Excavated Cutoff Systems

- Element Walls
- Panel slurry walls
- Secant pile walls

Trench Systems

- Soil Bentonite Walls
- Cement Bentonite Walls

SHS Cutoff Wall
Excavated Cutoff Wall Systems
• Element Walls
  • Panel slurry walls
  • **Secant pile walls**
Excavated Cutoff Wall Systems

- Element Walls
  - Panel slurry walls
  - **Secant pile walls**
DFI Technologies

Excavated Cutoff Wall Systems

- Element Walls
- Panel slurry walls
- Secant pile walls
Excavated Cutoff Trench Systems Walls
- Soil Bentonite
- Cement Bentonite
- Soil Cement Bentonite

Typical cross section

Bedrock

200’-300’
Excavated Cutoff Trench Systems Walls
- Soil Bentonite
- Cement Bentonite
- Soil Cement Bentonite
Excavated Cutoff Trench Systems Walls
- Soil Bentonite
- Cement Bentonite
- Soil Cement Bentonite
Excavated Cutoff Trench Systems Walls
- Soil Bentonite
- Cement Bentonite
- Soil Cement Bentonite
Excavated Cutoff Trench Systems Walls

- **Soil Bentonite**
- **Cement Bentonite**
- **Soil Cement Bentonite**
Ground Treatment
Cutoff Wall Systems
- Soil Mixing
- Jet Grouting
Ground Treatment
Cutoff Wall Systems
- **Soil Mixing**
- Jet Grouting

Soil Mixing Single Auger Test Program
Soil Mixing Triple Augers Cutoff Wall
Ground Treatment
Cutoff Wall Systems
- Soil Mixing
- Jet Grouting

CSM Technology
DFI Technologies

Ground Treatment
Cutoff Wall Systems
- Soil Mixing
- Jet Grouting

TRD technology
Ground Treatment Cutoff Systems
- Soil Mixing
- Jet Grouting
Ground Treatment
Cutoff Systems
- Soil Mixing
- Jet Grouting

Jet Grouting Methods

LEGEND:
- GROUT
- AIR
- WATER
Jet Grouting
DFI Technologies

Jet Grouting
Jet Grouting Field Test
Mono and Bi - Directional Jet Grouting Cutoff Wall
Inclined Bi-Directional Jet Grouting Cutoff Wall
Elliptical Jet Grouting Cutoff Wall
DFI Technologies

Driven Cutoff Walls
- Vibrated Elements
- Pressed Elements
Driven Cutoff Walls
- Vibrated Elements
- Pressed Elements
What is important?

- To have qualified, experienced engineers and contractors working on levee systems.
- To select technologies based on:
  - Substrata conditions, logistic and project requirements
  - Construction risk to the structure
  - Risk analysis of the consequences of the construction activities.
- When the project risk is higher it is essential to have:
  - Experienced companies and qualified personnel
  - Sophisticated modern technologies (equipment and materials)
  - A QC/QA data acquisition and assessment system to respond to problems during construction and to expedite final project acceptance
The Data Management System or DMS

We need to know
What we are doing...
how we are doing it......
while we are doing it!!!!!!!
The Data Management System or DMS

Analyzing before, during and after construction:

• Data collected in **real time** of the quality and results of any work executed (correlated with data collected before during and after construction)

• Data collected in **real time** on the stability status of the structure(s) where the work is performed including possible reaction due to the activities (planned, undergoing or completed).

• In addition.... immediate information on environmental effects of the activities performed.
The DMS

**Inputs**

- **Contractor Data Entry**
  - Excavation Details
  - Slurry/Concrete QC

- **USACE Data Entry**
  - QA Data
  - Manual Instruments

- **Automated Data**
  - Hydromill drilling
  - Koden survey
  - Automated instruments
  - Grout Monitor

- **Photographs**

- **Borehole Data**
  - Borehole logs in gINT

**Storage**

- Web Forms
- Import Tools
- sFTP
- Photo Manager

**Access**

- **Website**
  - Web Reports
  - Web GIS

- **Desktop GIS**
- As-Builts

**Cross-Sections**

- gINT Database
Implementing SQDS is an investment that will reduce risk during construction and cost during the life span of the structure built/repaired.

Implementation of the SQDS can be achieved by ensuring project information are collected and analyzed in **REAL TIME** during installation/construction.
The SQDS Concept

- Quality and durability are paramount to increasing safety and reducing risk.
- Owners can use quality assurance data to clearly explain value of the work performed and justify the project costs.
- DFI members are the vital link necessary to increase public safety while reducing risk.
Safety

Data Management System

Risk Assessment

Risk

Technologies

Construction

To assure the high quality of work performed.

To ensure proper construction to minimize risk and avoid future catastrophes (loss of life and economic impact).

We cannot predict natural disasters but we can prevent catastrophes.
Acknowledgements:

USACE - Risk Management Center

Other photos/information from:
SEA LEVEL ENG. – RAITO – TREVIICOS
The symposium will provide an opportunity for attendees to interact with world leaders in Seepage Control and Remediation. Presenters will share lessons in risk management learned from major dam and levee rehabilitation projects in North America and new dam and flood control construction projects worldwide.

**Symposium Goals:**

- To connect with the international seepage remediation community
- To share knowledge and experiences, network, and plan future collaborations and partnerships.
- To discuss the similarities and differences between seepage and internal erosion control practices with government agency representatives, dam and levee owners, regulators, researchers, designers, specialty contractors, consulting engineers and technology providers from around the world.

- Call for papers on: [www.deepfoundations2016.org](http://www.deepfoundations2016.org)
Working together!

Thank you!
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