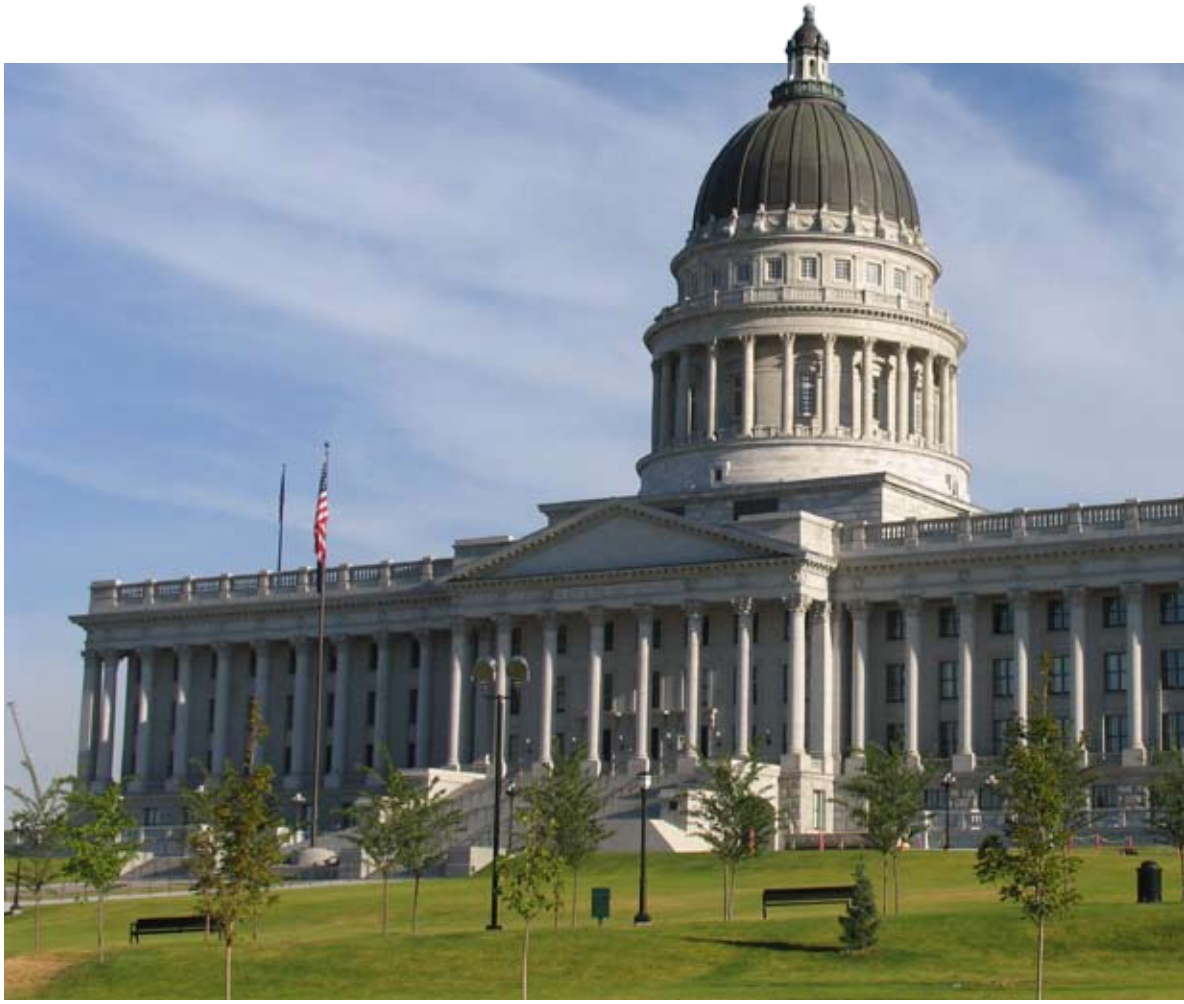
CSCE Western Region Lecture Tour

February 28-29, 2012

Calgary, Edmonton, Victoria, Vancouver

Stantec
Gold Sponsor

Modern Solutions *to* Historic Problems: Utah State Capitol Seismic Retrofit Project



Proximity to a known and active seismic fault coupled with clear seismic deficiencies prompted the State of Utah to undertake a massive renovation of the Utah State Capitol. In 2002 Reaveley Engineers + Associates began the design for seismic retrofit and base isolation of the 90 year old statehouse. The rehabilitation strategy for the project had two primary objectives; Life Safety and Historic Preservation. *(full abstract continued on page 2)*

Jerod G. Johnson, S.E.

Principal of Reaveley Engineers + Associates

Jerod has 16 years of experience in structural engineering and was the lead project engineer on the seismic base isolation of the multi-award winning Utah State Capitol Building.

(speaker bio continued on page 3)

2010 Outstanding Civil Engineering Achievement Award, Top 5 Finalist, American Society of Civil Engineers (ASCE)

2009 National Engineering Excellence Honor Award, American Council of Engineering Companies (ACEC)

2009 Outstanding Project Award Finalist, National Council of Structural Engineering Associations (NCSEA)

CSCE Western Region Lecture Tour

February 28-29, 2012

Calgary, Edmonton, Victoria, Vancouver

GRAHAM Ausenco Sandwell Golder Associates

Silver Sponsors

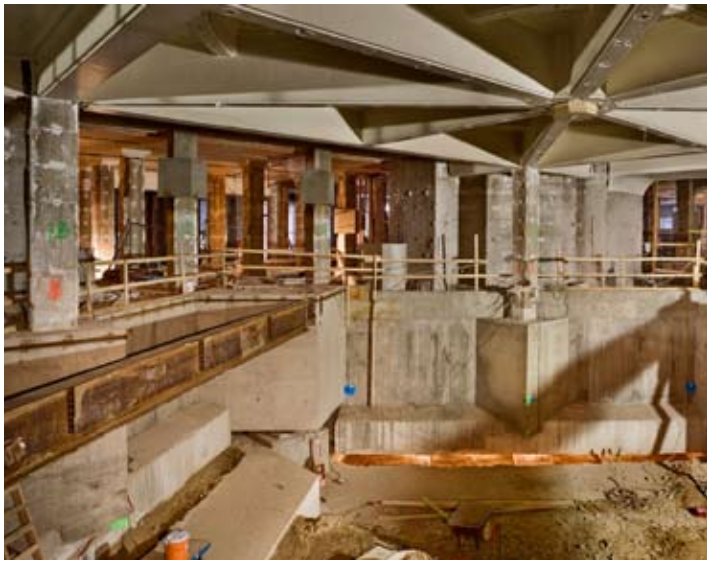
DYWIDAG-SYSTEMS INTERNATIONAL DSI amec

Presentation Abstract

Following two years of intensive design, contractors began the complex process of removing and replacing the building's foundations. This enabled the installation of 265 seismic base isolators below the building. At the same time, other seismic improvements were made to the superstructure to create an end product with vastly improved expected seismic performance. Seismic base isolation was selected as the preferred retrofit strategy owing to the building's rich historic fabric which would have been invariably altered with more conventional retrofit schemes.

Installation of isolators and new foundations required a carefully planned and coordinate effort of staged load transfer throughout the building's foundation. Working as a partner with the contractor, Reaveley Engineers + Associates developed an innovative load transfer scheme that enabled installation of foundations and isolators without allowing more than 1/16" of vertical displacement. The rotunda required a similar strategy but with a circumferential approach of massive post-tensioned load transfer beams to effectively enable installation of 44 large isolators while continuously supporting nearly 40 million pounds of load.

One of the 265 seismic base isolators.



Rotunda load transfer during construction.

Nonstructural elements and components were seismically stabilized throughout the building, a challenge requiring innovative thinking owing to massive stone ornamentation and the need for inconspicuous solutions. Creative strategies with epoxy anchorage and polyeurathane adhesives enabled bracing of many elements and components in ways barely visible to the naked eye.

Decades of infiltration wrought havoc on structural steel, concrete and reinforcement of the dome and drum. The retrofit solution here included an innovative cathodic protection system to alter the electrolytic cycle normally accompanying corrosive processes.

January 4th marks Utah's Statehood Day and in 2008 was marked with great fanfare as the Utah State Capitol was rededicated. The renovated capitol now has vastly improved expectations for seismic performance. The innovative strategies, careful planning, and unparalleled teamwork enabled an end product meeting all client expectations, including falling within the project budget of approximately $212 million.

The presentation will focus on the innovative engineering and construction aspects of the seismic retrofit including the seismic isolation design and construction process, and will be of interest to local engineers, technologists, architects, and contractors alike. ***For registration details, see the following page.***

Cement Association of Canada / Association Canadienne du Ciment

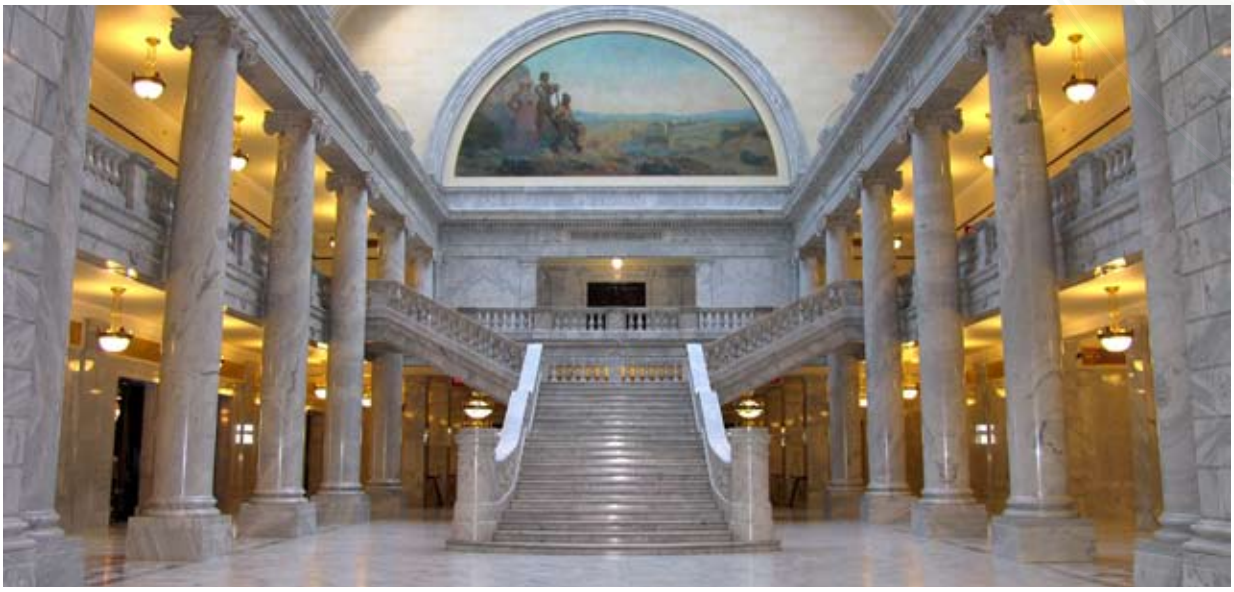
Bronze Sponsor

Speaker Bio: Jerod G. Johnson, S.E.

Jerod was selected as one of the top 20 under the age of 40 professionals in the A/E/C industry by *Mountain States Construction* 2010. He was also selected to be among the "Top 40 under 40" business professionals for 2011 by *Utah Business Magazine*.

Jerod has lent his expertise to a number of projects, including the Southtowne Exposition Center *(2001 Excellence in Concrete Award, American Concrete Institute)*; Meldrum Engineering Building, University of Utah *(2011 Excellence in Concrete Award, Intermountain Contractor Magazine)*; and Huntsman Cancer Institute *(1999 Project of the Year Awards, Intermountain Contractor Magazine & Associated General Contractors)*.

A LEED© Accredited Professional, Jerod is currently a PhD candidate at the University of Utah with a research focus on developing an innovative and cost effective approach for reducing seismic demand on buildings. He has presented on his work to the American Society of Civil Engineering (ASCE), and the American Concrete Institute (ACI).



Stone columns and ornamentation anchored to structure in the Main Hall.

CSCE Western Region Lecture Tour
Schedule

Click your city's link for event details and registration

Tues, February 28, 2012

CALGARY *(click here)*
11:15am (doors), 12:15-1:00pm (pres.)
Danish Canadian Club (727 11 Ave. SW)
Section contact: Dan Dankewich (ddanke2@telus.net, 403-802-0216)

EDMONTON *(click here)*
6:00pm (doors), 6:45-8:00pm (pres.)
Art Gallery of Alberta (2 Sir Winston Churchill Sq.)
Section contact: Andrew Neilson (info@csceedmonton.org, 780-917-4669)

Weds, February 29, 2012

VICTORIA *(click here)*
11:45am (doors), 12:30pm (pres.)
Union Club of British Columbia (805 Gordon St.)
Section contact: Kevin Baskin (Kevin.Baskin@gov.bc.ca, 250-387-7737)

VANCOUVER *(click here)*
6:00pm (doors), 7:00pm (pres.)
Sutton Place Hotel (845 Burrad St., downtown)
Section contact: Lacey Hirtle (lacey.hirtle@gmail.com, 604-871-6734)

Modern Solutions *to* Historic Problems:
Utah State Capitol Seismic Retrofit Project

Thank-you to our event sponsors:

Gold Sponsor:

Stantec

Silver Sponsors:

DYWIDAG-SYSTEMS INTERNATIONAL

DSI

GRAHAM

amec

Golder Associates

Ausenco Sandwell

Bronze Sponsor:

Cement Association of Canada / Association Canadienne du Ciment

About the Canadian Society for Civil Engineering (CSCE)

Founded in 1887 by prominent Civil Engineers in Canada, the Canadian Society for Civil Engineering (CSCE) is a learned society intended to enhance the public image of the civil engineering profession and to develop and maintain high standards of civil engineering practice in Canada. The Society has local non-profit Sections across Canada, which provide regular technical programs, supplemented with special technical workshops and seminars of interest to the civil engineering community.