

# Juan E. Quiroz Ph.D., PE

Principal, Structural Engineer · 22 Years of Experience

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Dr. Quiroz has 22 years of experience as a project and design engineer on numerous projects involving feasibility studies, analysis, design, preparation of construction drawings, review of contractor design and submittals. These projects have included hydroelectric power plants, spillways, dams, navigation locks, pumping stations, major underground facilities, retaining, water/wastewater conveyance structures, penstocks, tunnels and shafts. He is also experienced with building structures, bridges, footings, tanks, and most civil infrastructure.

Dr. Quiroz has extensive expertise on numerical analyses and earthquake engineering, ranging from staged construction to non-linear dynamic Finite Element Analyses (FEA), including soil-structure interaction (SSI) for heavy infrastructure. Dr. Quiroz is currently the structural group lead for the Energy & Infrastructure division in Chicago and adjunct professor at the Illinois Institute of Technology (IIT).

## EDUCATION

Ph.D. Structural Engineering, Illinois Institute of Technology, Chicago, Illinois, 2013

Ms. Structural Engineering, Universidad Nacional de Colombia, Medellín, Colombia, 2001

Bs. Civil Engineering, Universidad Nacional de Colombia, Medellín, Colombia, 1998

## REGISTRATIONS

Professional Engineer, State of California

## MEMBERSHIPS

Member, American Institute of Steel Construction

Member, United States Society on Dams

Member, American Concrete Institute

Member, American Society of Civil Engineers

## AWARDS

2015 "Top 20 under 40" by the ENR magazine

2000 "Alejandro Ángel Escobar" for the "Hydrological Balance of Colombia" project

## PROJECT EXPERIENCE

Dams/Hydro Power

**Nalsyagu Gad Dam (Dam Analysis/Design)**

Client: Nepal Electricity Authority

Nalsyau Gad Storage Hydroelectric Project is located in Jajarkot District in the mid western development region of Nepal. The dam is RCC and arch shaped with an approximated maximum height of 240m. The analysis of the dam was mainly focused on two levels of seismic ground motions, OBE with a PGA of 0.29g and an SEE with a PGA of 1.24g. The behavior of the dam was evaluated with a 3D FE analysis including the foundation and reservoir with acoustical elements.

**Bluestone Dam Stress Analysis (Design Lead)**

3D stress FE analysis of two spillway Monoliths for the evaluation of three proposed paths for new connecting galleries along with the identification of areas for potential stress concentrations and crack initiation. The study included 4 spillway monoliths, their foundation and piers, and the analysis was staged including the construction sequence.

*\* denotes projects completed with other firms*

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Warragamba Dam Raising Detailed Concept  
Design, Sydney

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**Cowlitz Falls – Powerhouse Stability Analysis,  
Washington, 2014**

**Client: Lewis County PUD**

Dynamic and post-earthquake analyses of the Cowlitz Falls (70MW) powerhouse for a stronger revised seismic event after a Part 12 Safety Inspection Report. A series of 3D FE analysis were

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**Neelum-Jhelum Hydropower Project, Pakistan,  
2012-2013**

**Client: Pakistan W&P Development Authority**

Technical reviewer of several detailed design features  
for the \$2.2 Billion Neelum-Jhelum Hydropower Project  
(969 MW); Involvement

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### Lake Mead Intake No.3, Nevada, 2006

**Client:** Southern Nevada Water Authority (SNWA)

Structural analysis of tunnel/shaft connections for the new intake structure and tunnel beneath the lake. The SNWA constructed a third deep-water intake in Lake Mead to protect the existing water system capacity against the potential inoperability of Intake No. 1 should the lake levels fall below 1050 ft. The connection was designed to resist the stresses caused by internal and external pressure loads. A 3D FE model was used for the analyses.

### Karahnjúkar Hydro, Landsvirkjun, Iceland, 2005-2006

Participated as structural engineer for the analysis and design of several components for the Kárahnjúkar hydroelectric project. Among the structures designed are: Bottom outlet structure, intake shaft, flip bucket, parapet wall at the crest, two tunnel plugs, a tunnel shaft and the toe concrete wall at the canyon to start dam construction works.

### Pinalito Hydroelectric Project, Dominican Republic, 2005

**Client:** Harza-Hidrobrasileira

Finite Element Analysis (FEA) of several dam monoliths for the 60m high Pinalito RCC dam. The scope of work included sensitivity analysis of foundation parameters and seismic evaluations for synthetic time-history records.

### Tekeze - Arch Dam, Ethiopia, 2005,2007

**Client:** Ethiopian Electric Power Corporation

The Tekeze Dam is a double-curvature logarithmic spiral arch dam with a total height of 190m. Structural design and analysis of this project consisted of 4 sub-phases: 1) entire arch dam analysis including the foundation block, where a staged construction analysis was performed in the lines of the odd-and-even cantilever method followed by a full 3D FEA including a cracked base procedure; 2) the bottom outlets 3D FEA which was based on the sub-modeling technique to evaluate the stress concentrations around these openings; 3) low level outlet walls and trunnion beam analysis and posttensioned design; and 4) the left abutment stress analysis for an over excavated area restituted with anchored concrete lifts.

### Sigatoka Ba Qaliwana (Nadarivatu) Dam Design, Fiji, 2005

**Client:** Sustainable Energy Limited

FEA stress analysis of a 60m high RCC dam including the foundation for static and response-spectra dynamic analysis. The study included stability evaluation for an MDE case.

### Alpaslan II Hydro, Turkey, 2004

**Client:** Dsi-General Directorate of State Hydraul

Structural analysis and design of the spillway (7,100 m<sup>3</sup>/s) and adjacent structures for the 110m high Alpaslan II earth-fill dam. The items designed included: spillway, slab, concrete lined chute and stilling basing walls. Stability, concrete design and quantities estimations.

### Tekeze Field Staff - CM, Ethiopia, 2004

**Client:** Ethiopian Electric Power Corporation

Structural design revisions for several lattice steel towers (high voltage transmission lines). Structural review included pad & chimney foundations for concrete and steel elements, drawings, and tower test evaluations.

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### Lake Hodges Project, Virginia, 2004-2005

**Client:** San Diego County Water Authority

Structural engineer for the Lake Hodges Project. The project included the Emergency Storage Project, the Pumpstation, inlet/outlet structures and the Olivenhain Pipeline. The structural design included the MPT structure for the pumphouse transformers, roof slab, intermediate pumphouse slabs and walls, stairs, the take-off structure and the bifurcation Tunnel: 2D & 3D FE Model of the connections. Also, the structural analysis and design involved crane slabs, generator room, walls, hatches and beams.

### Leaburg Spillway, Oregon, 2004

**Client:** Eugene Water & Electric Board

Performed seismic analysis for three 100ft wide spillways. The study included the pier No.6, a 50ft tributary ogee, apron, and spillway. The structure is supported on 19936 0 Td (apertary)3on,

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### **Panama Canal Proposal, Panama, 2008-2009**

**Client:** Autoridad Canal de Panamá (ACP) & Grupo Unidos por el Canal (GUPC)

Tender Proposal Phase: Design engineer for the Third Set of Locks Design-Build proposal. Preparation of stability analyses for the lock chamber wall structures using Non-linear FEA. The analysis of the lock walls involved elasto-plastic material models, contact interfaces & dynamic time-history analyses (direct integration) using SSI techniques, including water elements and absorbing boundary conditions.

### **Chickamauga Monolith Design, Tennessee, 2007-2008**

**Client:** Tennessee Valley Authority

After decommissioning of



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## **Pawtucket Tunnel and Dewatering Pump Station**

The Pawtucket Tunnel project includes a deep rock tunnel, a dewatering pump station, three drop shafts, five near-surface consolidation conduits, and a stub tunnel for a future connection. The tunnel is expected to be approximately 13,000 feet long and 150 to 200 feet deep to invert. Tunnel diameter of 28 feet and a pump station (rock cavern). Preliminary sizing of the shafts and tunnel linings.

## **Mining**

### **Idarado Mining Company, Colorado, 2004**

Bridge abutment and plug design for a 16ft wide by 60ft long single span bridge, development of construction drawings and reports.

### **Bamputañe Dam, Perú, 2007**

**Client:** Sociedad Minera Cerro Verde

Structural analysis and design of conduit & intake tower. Provided calculations for inlet & outlet structures and spillway stability and design. The study involved seismic analyses and a 3D challenging geometry.

## **Bridges**

### **Obra 808\*, Bello, Colombia, 2001-2002**

**Client:** City of Bello

Several simple span bridge designs and revision of hydrologic reports. Surveying supervision, field tasks coordination.

### **Montería Highway\*, Montería, Colombia, 1996**

**Client:** City of Montería

Quantity estimations, CAD drawing preparation and documentation of bridge detailing.

## **Buildings**

### **Construction Inspections - Chicago Area\*, Illinois, 2003**

**Client:** IRI CEPCO

Field inspections, work coordination, CAD support, proposal and bid preparations.

### **Industrial Steel Roofing\*, Colombia, 2001**

**Client:** ICC

Inspection and analysis of existing industrial steel roofing systems.

### **High School Building\*, Colombia, 2000-2001**

**Client:** ICC

Analysis and design of reinforced concrete buildings for a high school facility.

### **Cultural Center Roof Design\*, Andes, Colombia, 2000**

**Client:** City of Andes

Analysis and design of roofing system for the city of Andes cultural center.

### **San Rafael Hospital\*, Andes, Colombia, 1999**

**Client:** City of Andes

Analysis and structural design of reinforced concrete building (San Rafael hospital) for the city of Andes.

### **Several Building Designs\*, Colombia, 1999-2001**

Analysis, design, licensing and construction drawings of building structures for the private sector.

## **Water**

### **Mi Río\*, Medellín, Colombia, 2000**

**Client:** City of Medellín

Tasks coordination for Mi Río project. Hydraulic and hydrological studies supervision.

### **Andes Pumping System\*, Andes, Colombia, 1999-2000**

**Client:** City of Andes

Evaluation of pumping system, pipe network and underground tank storage. Detailed FEA analysis and reinforced concrete design for water supply pumping system.

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Hydrological Balance of Colombia\*, Colombia,  
1997-1998

Client: Colombia's Department of Energy

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## PUBLICATIONS

Design of Lock Gates under Seismic Actions. The World Association for Waterborne Transport Infrastructure (PIANC). Working Group 151 Publication, 2016.

Linear and Nonlinear Seismic Analysis for the Post Tensioning System Design of the Wanapum Dam Spillway Monoliths. USSD, April, 2016.

A Structural Analysis Framework for Concrete Faced Rockfill Dams. International Journal of Geomechanics, February, 2015.

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