

# Alejo Oscar Sfriso

## Practice Leader and Corporate Consultant



<b>Profession</b>	Civil Engineer
<b>Education</b>	Doctor in Engineering, UBA, 2010. Civil Engineer, UBA, 1993.
<b>Registrations</b>	CPIC # 15.131. CIPBA # 45.949.
<b>Affiliations</b>	SAIG/ISSMGE, ISRM, ASAGAI/IAEG, ASCE, IGS, IACMAG, AATES/ITA, CAP/ICOLD.

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**Specialization**      Geotechnical Engineering; Underground Works; Computational Geomechanics.

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**Expertise**      Dr Alejo Sfriso is a geotechnical engineer with 30 years of experience and projects in 25+ countries. He is expert in the application of numerical methods to the design, analysis and risk evaluation of geotechnical structures, with emphasis in construction procedures.

He is the Vice President for South America of the Intl Society for Soil Mechanics and Geotechnical Engineering for the period 2017|2021, and Past President of the Argentinean Society for Geotechnical Engineering. Alejo serves as Professor of Soil Mechanics and Geology at the University of Buenos Aires (UBA) and has 80+ publications.

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**Linkedin**      <https://www.linkedin.com/in/alejo-o-sfriso-45322037/>

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### Employment record

<b>2009 present</b>	SRK Consulting (Argentina), Practice Leader, Corporate Consultant and Director. Managing Director (2009 2020).
<b>1993 present</b>	AOSA SA, Director.
<b>1989 present</b>	University of Buenos Aires, Professor (2006 present); Lecturer (1989 2006).
<b>1996 2015</b>	University of La Plata, Professor (2009 2015); Lecturer (1996 2009).
<b>1993 2009</b>	VS Consultores SA, Director.

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### Corporate roles in SRK (Global)

<b>2016 2018</b>	Board Member.
<b>2018 2020</b>	Coordinator of the Technical Committee.
<b>2019 present</b>	Regional Coordinator for South America.

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**Languages**      Spanish – speaks, reads and writes (mother tongue).  
English – speaks, reads and writes (fluent).

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## Summary of professional experience

### Ground Investigation

From 1980 to 1993, Alejo worked as a laboratory technician at Triaxis Geotechnical Laboratory, where he executed drillings, field and lab testing. In 1993 he became Director of the company rebranding it to *Alejo O. Sfriso y Asociados (AOSA)*. To date, he has either produced or reviewed 3500+ reports for civil, mining and infrastructure projects ([www.aosa.com.ar](http://www.aosa.com.ar)).

### Geotechnical Engineering

What follows is a list of projects where Alejo participated performing analysis and design holding responsible technical roles. The countries where the projects are located are shown in italics.

#### Mining Geotechnics

Mine waste: starter dams, waste dumps, heap leaches, tailings dams and ancillary structures in *AM*: Kapan; *AR*: Pirquitas, Cerro Vanguardia, Lindero, Veladero; *BR*: CBA; *AU*: Olympic Dam, Solomon, Cannington, Eraring, Granny Smith; *CA*: Langlois, Trilogy metals, Bouchard-Hebert; *CL*: Escondida, El Teniente, Los Bronces, Valle Central; *CO*: Marmato, *IRL*: Curraghinalt; *KZ*: Almalyk; *MX*: Peña Colorada, Las Cuevas, Kouras, Ciénega, Velardeña, Sabinas; *PE*: Cerro Tamboraque, Toromocho, Cerro Lindo, Mahr Tunel, Antamina; *PNG*: Frieda River; *ZA*: Mega Sebeke, Mototolo, Tronox, Molagakwena, Impala Dam.

Mine infrastructure: foundations, roads, retaining structures, slopes, tunnels and earthworks in *AR*: Josemaría, Pirquitas, Pascua Lama, Veladero, Potasio Río Colorado, and Salars Hombre Muerto, Pastos Grandes, Caucharí/Olaroz, Pozuelos, Rincón; *BR*: Corumbá; *CL*: Escondida, Antamina, Los Pelambres, Los Bronces, Caserones, El Teniente, Collahuasi, Quebrada Blanca; *CO*: Gramalote; *FI*: Kittila; *MX*: Los Mulatos; *PE*: Toromocho.

Rock engineering: *AR*: Veladero, Bajo La Alumbraera, Cerro Vanguardia, Manantial Espejo; *CL*: Andina, El Teniente, Los Bronces, Los Pelambres; *GT*: Compañía Guatemalteca de Níquel; *UY*: Arenal Deeps, San Gregorio.

#### Energy Geotechnics

Power plants: *AR*: Central Puerto (Mendoza), Central Puerto (Buenos Aires); Río Turbio, Central Costanera, Brigadier López, Ensenada Barragán, and nuclear powerplants Atucha III, CAREM 25, RA-10; *BR*: Parnaiba, Jaguaritica, Barcarena, Sterlite; *MX*: Pesquería, Central Norte 3.

Wind farms: *AR*: Bajo Hondo I, Bajo Hondo II, ENEL Bahía Blanca, Serrana, Parque Pampa; *CL*: Totoral.

Ducts: *AR*: Magallanes, Martínez, Picasa Crossing, Trasadino pipelines; *PE*: Paritori Bridge in Camisea.

High Voltage Transmission Lines: *AR*: Caracoles | Punta Negra, Diamante | Charlone, Trelew | Río Turbio, Choele-Choel | Puerto Madryn; *UY*: Melo | Maldonado.

Oil&Gas: *CA*: Kitimat; *AR*: Axion Campana, YPF CILP, YPF CIE, Genelba, Kinteroni, shale-gas Total, Río Cullén, Corcobo, El Jagüel, Cañadón Alfa, Aguada San Roque, Aguada Pichana, Wintershall NQN; *EC*: AUCA; *SAU*: Rabigh, *BR*: Porto do Açú; *MX*: Dos Bocas; *PE*: Talara; *TT*: Petrotrin.

#### Transportation Geotechnics

Airports: *AR*: Aeroparque Buenos Aires, Tucumán Airport; *PE*: Chinchero, Cuzco Airport.

Roads and bridges: *AR*: Panamericana Highway, AUSA highways, Paseo del Bajo, General Paz Avenue, and several other bridges in Argentina.

Railways: *AR*: San Martín Viaducts, Mitre Viaduct, Belgrano Railway.

Ports: *AR*: Dreyfus Port, San Nicolás, Parque de La Memoria, La Plata, Euroamérica, Alto Paraná, Rawson breakwater, Buenos Aires Port, Astilleros Príncipe y Menghi, Exolgan, Alianza, Shell Inflamables, Tecplata, Terminal Zárate, Galván port, Carena Wharf Puerto Belgrano, Muelle TRP; *UY*: Montevideo, Montes del Plata, M'Bopicuá, Ontur; *HN*: Puerto Cortés; *PE*: Bahía Ancón.

#### Tunnelling Geotechnics

Railway and metro tunnels: 40+ tunnels and 10+ underground stations for *AR*: Buenos Aires Underground, lines A, B, C, D, E, (future) F, H, RER Project and Sarmiento Underground; *CL*: Metro of Santiago, lines 1, 2 y 4.

Hydraulic tunnels: *AR*: III Main Wastewater, Maldonado Sewer, Vega Sewer, South Emissary AySA Lot 1, Lot 2 and Lot 3, Los Caracoles spillway, Tigre | San Fernando aqueduct; *CL*: Quilleco.

Road túneles: *AR*: Mujer Urbana tunnel; *CL*: La Pólvara, Puente Alto.

**Geotechnics for Hydraulic Structures**

Aqueducts: *AR*: Río Colorado Aqueduct; *CL*: El Morro, Sierra Gorda, Puente Alto.

Intake|discharge structures: *AR*: Central Puerto (Buenos Aires); Brigadier López, Ensenada Barragán.

Water dams and hydraulic plants: *AR*: Los Molinos, Escaba, Batirua, Los Caracoles, Tambolar, various for ENOHS; *CL*: Los Cóndores, La Laja, Ancoa, Puntilla del Viento; *CR*: Reventazón, Arenal, San Miguel.

**Civil Geotechnics**

Industrial facilities: *AR*: many, including Fate, Air Liquide, Glucovil, Dupont, Siderca, Siderar, Profertil; *BR*: Fate Guaibas; *US*: Petmin.

Large buildings: *AR*: many, including Alvear Madero, St. Regis, Madero Office, Madero Harbour, Colón theatre, Torre Vista, Callao Clásico, River Plate stadium; *PY*: Blue Tower Asunción; *CL*: Security, Territoria; *BO*: World Trade Center La Paz.

Private condominiums: *AR*: many, including La Lomada, Haras del Pilar, Nordelta, Santa Bárbara, Ayres del Pilar, Tortuguitas, Venice and Country Abril, Costa del Plata.

**Appendices**

- Appendix I: Education.
- Appendix II: Academic record.
- Appendix III: Institutional record.
- Appendix IV: List of principal projects.

## Appendix I: Education

### University degrees

- Degree: Civil Engineer, UBA (1993).
- Degree: Doctor in Engineering, UBA (2010).

### Doctorate in engineering

- Title: Mechanical Characterization of Particulate Materials.
- Supervisors: Prof. Eduardo Núñez (UBA) and Prof. Guillermo Weber (Univ Texas).
- Jury: J M Pestana N. (Berkeley), C Prato (U Córdoba), E Redolfi (U Córdoba), R Bertero (UBA), G Etse (UBA).

The research consisted in the formulation, validation and numerical implementation in Plaxis of a constitutive model for sands.

Courses completed as part of this research were: Continuum Mechanics | Dvorkin; Finite Element Method | Dvorkin; Energy Principles on Solid Mechanics | Batrosse; Rock Mechanics | Suárez; Structural Geology | Massabie; Applied Hydraulics | Sánchez Guzmán; Dams | Bendahan; Fluids in Porous Media | Rosen; Computational Mechanics | Dvorkin; Failure Indicators in Continuous Media | Etse; Numerical and Experimental Simulation of Concrete Cracking | Alvaredo; Constitutive Equations for Cohesive-Frictional Materials | Etse.

### Other courses and seminars

- Lusas Course | P Young.
- Computational Geotechnics | P Vermeer.
- Finite Elements and Non-Linear Numerical Optimization | G Sánchez Sarmiento.
- Modeling Concrete Failure | C López and G Etse.
- Numerical Stabilization of Navier Stokes Equations for Incompressible Flow | R Codina.
- Advanced Numerical Analysis | A Menéndez.
- Modeling Unsaturated Soil | M Sánchez.
- CPT Testing | P Robertson.
- Non Destructive Methods in Geotechnics | C Santamarina.
- Deep Soil Mixing | D Bruce.
- Meso-Scale Structural Analysis of Quasi-Fragile Materials Employing Joint Elements. C López.
- LRFD for Deep Foundations | R Salgado.

## Appendix II: Academic record

### Faculty positions, regular courses

- Faculty of Engineering, UBA: Professor, Numerical Geotechnics (2018|present) ([FIUBA-Geotecnia - YouTube](#)); Associate professor, Soil Mechanics and Geology (2011|present); Assistant Professor, Soil Mechanics (2006|2011); Lecturer, Solid Mechanics, Soil Mechanics, Foundations (1986|2004).
- Faculty of Engineering, Univ of La Plata: Assistant Professor, Geotechnics (2010|2015); Lecturer, Rock Mechanics (1997|2005).
- Torcuato di Tella Institute: External professor, Architecture Postgraduate Program (2003|2005).

### Faculty positions, nonsystematic courses

- Advanced Geotechnics | National Univ of Technology (2020).
- Computational Geomechanics | Ministry for Transportation, Argentina (2019); UBA (2009).
- Intl Seminars of Computational Geotechnics Plaxis | SRK Consulting, Chile (2016); UBA (2015, 2010, 2008); Univ of Queretaro, Mexico (2014, 2011); Federal Confederation of Electricity (CFE), Mexico (2014); Javeriana Univ, Columbia (2013, 2010), Catholic Univ, Peru (2010), Catholic Univ, Chile (2006).
- Ground Improvement | UBA (2011).
- Interpretation of Geotechnical Information | UBA (2008).
- Soil-Structure Interaction | UBA (2007).
- Free Online Course of Computational Geomechanics (2017).

### Research projects

- UBACYT | Use of Micro and Nanotechnologies for the Design of Thin Leachates for the Cementation of Oil Wells (2020).
- PICT | Ministry for Science and Technology. Modeling of Complex Geotechnical Problems, Development of Constitutive and Rheological Models (2014|2018).
- Ferrocarril Belgrano Cargas | Stabilization of Earth Fills between Chajarí and Concordía (2014|2015).
- Secretariat for Management of University Policies | Constructive Solutions for Earth Fills on Soft Soils Undergoing Repetitive Railway Loading (2014|2015).
- PICT | Numerical Simulation of the Morphologic Evolution of Rivers with Margin Erosion (2008).
- SECYT | Numerical Multi-Scale and Experimental Analysis of Failure of Quasi-Fragile Materials (2006).

### Research supervision

- Ledesma O (PhD, ongoing). Extension of a Generalized Plasticity Model to Unsaturated Soils. Application to Pampeano Formation. Co-supervisor.
- Santa Cruz J M (2017). Manual for the Design of Anchored Excavations.
- Abad A (2016). Numerical Modeling of Rock Masses.
- Morandi R, Sterin U, Brusa F (2014). Hydraulic Characterization of the Pampeano Formation in Unsaturated State.
- Ficalora D (2013). Numerical Design of Offshore Foundations.
- Benito J (2013). Computational Analysis of CFRD Dams Subjected to Seismic Loading.
- Rellán G, Ezama I, Paz Walther F, García Mendive I (2013). Characterization of Hydraulic Fill Sands for the Tecplata and Carena Projects.
- Hasbani J (2012). Study on the Localization in J3 Yield Functions.
- Laría T (2012). Small-Strain Young's Modulus of Soil-Cement using Local Strain Measurements.
- Arroyo F (2012). Technologies for the Control of Water Flow in Frozen Soil Lakes.
- Cigana J P (2011). Numerical Design of Earth Retention Port Structures.
- Czelada J (2010). In Situ Measurement of Small-Strain Stiffness using Geophysical Techniques.
- Serigós A (2009). Small-Strain Young's Modulus of Pampeano Formation Soils Compacted in Soil-Cement Admixtures.
- Quintela M (2008). Oedometer Modulus of Undisturbed Soils of the Pampeano Formation.
- Quaglia G (2008). Initial Stiffness and Effective Cohesion of Pampeano Formation.
- Ledesma O (2007). Calibration of Cam Clay Model for the PostPampean Formation Soils.
- Sagüés P (2007). Mechanical Characterization of Compacted Pampeano Loess.

### Seminars delivered

- Numerical Modeling of Earth and Tailings Dams | Leon (2018).
- Computational Geomechanics | PCSMGE, Mexico (2019); ABoTunel, Cochabamba (2017); Intl Seminar on Mine Waste, Lima (2017); SVS Ingenieros, Lima (2015); Catholic Univ of Peru, Lima (2015); Techint, Buenos Aires (2005).
- Geotechnical and Seismic Engineering Applied to Mining Projects | Lima (2017).

- Geotechnics | Techint, Buenos Aires (2015); ORSEP, San Rafael (2015); YPF, Buenos Aires (2012).
- Post Tensioned Ground Anchors | Argentinian Association of Structural Concrete, Buenos Aires (2002).

### Lectures delivered

- Case Histories of Analysis of Tailings Dams using Anisotropic, Strain Softening Models | Annual Meeting of Geotech Eng, Mexico (2021).
- Construction Procedures for Underground Caverns | Seminars in Altiplano, Puno (2021).
- Computational Methods in Geotechnics | 1<sup>st</sup> Intl Conf on Computing in Civil Eng, Manquegua (2020).
- Challenges in the Numerical Modeling of Static Liquefaction | GeoWeek 2020, Lima (2020).
- Discussion Session in the Soil-Geosynthetics Interaction | Panam Geosynthetics Conf, Río de Janeiro (2020).
- Advances of Computational Geomechanics in the Analysis of Tailings Dams | XX COBRAMSEG (2020).
- Numerical Modeling and Geotechnical Design | Bolivian Conf of Geotechnics (2020).
- LRFD for Foundations | Bolivian Geotech Society (2020).
- Advances in CIRSOC 402 | SAIG Seminar on Construction Control (2020).
- Seismic Design of Tailings Storage Facilities | Peruvian Society for Geoeng (2020).
- Evaluating Risk of Tailings Dams | Pan American Conf on Soil Mech and Geotech Eng, Cancun (2019).
- Deep Excavations in the Pampean Formation | SAIG Seminar, Rosario (2019).
- Modeling of Static and Seismic Liquefaction of Tailings Dams | PUCP Seminar, Lima (2019).
- Impacts of Geotechnical Engineering | SAIG Seminar, Buenos Aires (2019).
- LRFD Foundation Design Techniques and Reliability Design | Seminar of Foundations ASCE, Guayaquil (2019).
- Large Excavations in Urban Environments | National Civil Eng Student's Conf, Puno (2019).
- Validation of Construction Procedures for Tunnels using Numerical Methods | 2<sup>nd</sup> Intl Scientific Convention, Santa María (2019).
- Recent Experiences with Ground Retaining Systems in Buenos Aires, Argentina | IV Intl Conf on Deep Foundations in Bolivia, Cochabamba (2019).
- Experiences with the Buenos Aires Metro in the Last 20 Years | Workshop on Urban Geotechnics, Singapore (2019).
- Seismic Analysis of Earth and Tailings Dams | SMIG, Leon, Mexico (2018).
- Building a Code of Foundations for Argentina | ISSMGE Touring Lecture, Asunción, Buenos Aires (2018).
- LRFD and Numerical Modeling of Foundations | ISSMGE Touring Lecture, Asunción, Buenos Aires, Mexico (2018).
- Elements for a (Preliminary) Code of Foundations for Argentina | XXIV CAMSIG, Salta (2018).
- Notes on Numerical Modeling of Tailings Dams | SRK Seminar, Reno (2018).
- Notes on Seismic Analysis of Rockfill Dams | SRK Seminar, Reno (2018).
- Large Excavations and their Support Systems | UTN Concordia, Entre Ríos (2018).
- Constitutive Models for Mining Geotechnics | 1<sup>st</sup> Intl Seminar on Mine Waste Disposal, Arequipa (2017).
- Seismic Design of Waste Dumps | 1<sup>st</sup> Intl Seminar on Mine Waste Disposal, Arequipa (2017).
- Modeling of Construction Procedures for Underground Projects | 2<sup>nd</sup> Intl Tunneling ITA Conf, Cochabamba (2017).
- Evolution of Analysis Tools for the Seismic Response of Earth Dams | HKUST, Hong Kong, (2017).
- The "Paseo del Bajo" | Seminar on Excavations SAIG, Córdoba (2017).
- Analysis of an Earth Dam under Seismic Loading | UBA (2016).
- Computational Geomechanics, Challenges for Rock Masses | UBA (2015).
- Excavations in Buenos Aires and their Support Systems | Seminar AIE, Buenos Aires (2015).
- Applications of Computational Geotechnics | Civil Eng Seminar, Catholic Univ of Peru, Lima (2015).
- Rowe's Strain-Dilatancy Theory | Computational Geomechanics Seminar, Buenos Aires (2015).
- Selecting Advanced Constitutive Models for Computational Geomechanics | Montreal (2015).
- Current Status of Standards CIRSOC 401 | SAIG Geotech Seminar, Buenos Aires (2014).
- Three Dimensional Dynamic Models for Foundations | CFE, Mexico (2014).
- Computational Geomechanics Applied to Rock Masses | CFE, Mexico (2014).
- Old and New Concepts in Geotechnics | UBA (2014).
- Rock Mass Characterization Systems | SRK, Lima (2014).
- Deep Excavations in Urban Areas | 3<sup>rd</sup> Intl Congress on Civil Eng, Bolivia (2014).
- Computational Geomechanics | 3<sup>rd</sup> Intl Congress on Civil Eng, Bolivia (2014).
- Numerical Modeling of Geomaterials, Research at UBA | KAUST, Saudi Arabia (2014).
- Geotechnical Factors that Influence the Design of Large Buildings in Buenos Aires | SAIG Geotech seminar, Buenos Aires (2013).

- The Problem of Excavations and their Support Systems | Seminar on Excavations, Buenos Aires (2012).
- Underground Works at Pascua Lama | Eng pre-congress, Buenos Aires (2013).
- Finite Elements. The Myth Exposed | Workshop on Numerical Modeling, SRK, Salta (2012).
- Evolution of Construction Procedures for Metro Stations in Buenos Aires, Argentina | South American Tunneling. San Pablo (2012).
- Numerical Modeling of Granular Materials in Shear, Applications to Dam Eng | Univ of Texas at Brownsville (2011).
- Introduction to Anchor Design for Soils and Rocks | Seminar on Anchored Structures, Buenos Aires (2011).
- Tunnel Construction Procedures in Buenos Aires | ITS Seminar, Buenos Aires (2010).
- Urban Excavations | Seminar on Excavations, Buenos Aires (2010).
- NATM Tunnel Design in Soils | Univ Javeriana. Bogota (2010).
- Tunnels Pathologies | AIE, Buenos Aires (2009).
- Computational Geomechanics | UNAM, Mexico (2009).
- Underground Excavations | UNAM, Mexico (2009).
- Tunnel Eng | UBA (2008).
- Constitutive Equations for Sands | 1<sup>st</sup> Iberoamerican Seminar on Geoenvironm Eng. Córdoba (2007).
- Computational Geomechanics Aplicaciones | XVIII CAMSIG. San Juan, Argentina (2006).
- The Future of the Strength of Materials ¿Teaching exercises? | Seminar on Strength of Materials, UNLP (2002).

### Other university activities

Supervisor, jury member or panel member for undergrad and post-graduate students. Peer reviewer in international journals. Reviewer of research projects for national agencies.

### Books edited

- Manzanal, D., Sfriso, A. (Eds.). From Fundamentals to Applications in Geotechnics. ISBN 978-1-61499-602-6. IOS Press (2015).
- Sfriso, A., Manzanal, D., Rocca, R. (Eds.). Geotechnical Synergy in Buenos Aires 2015. ISBN 978-1-61499-598-2. IOS Press (2015).
- Rocca, R., Flores, R., Sfriso, A. (Eds.). Integrating Innovations of Rock Mechanics. ISBN 978-1-61499-604-0. IOS Press (2015).

### Journal papers

- Labanda N, Sottile M, Cueto I, Sfriso A (2021). Screening of Seismic Records for Performing Time-History Dynamic Analyses of Tailings Dams: A Spectral-Based Approach. *Soil Dynamics and Earthquake Eng*, doi 10.1016/j.soildyn.2021.106750.
- Ledesma O, Manzanal D, Sfriso A (2021). Formulation and Numerical Implementation of a State Parameter-Based Generalized Plasticity Model for Mine Tailings. *Computers and Geotechnics*, doi 10.1016/j.compgeo.2021.104158.
- Sfriso A, Weber G, Núñez E (2011). Formulación de una Regla de Flujo No Asociativa basada en la Teoría de Tensión-Dilatancia de Rowe. *Revista Internacional de Desastres Naturales, Accidentes e Infraestructura Civil*, 12 (1) 19-26.
- Sfriso A, Weber G (2010). Formulation and Validation of a Constitutive Model for Sands in Monotonic Shear. *Acta Geotechnica*, doi 10.1007/s11440-010-0127-y.
- Sfriso A, Rossello E (1997). Influencias Geomecánicas Regionales sobre el Comportamiento de Taludes Artificiales: Aplicación al Bajo La Alumbreira, Argentina. *XI Anales ASAGAI*, 210-217.
- Rossello E, Sfriso A (1995). Aportes de la Modelización Física a Problemas de la Geología Aplicada a la Ingeniería: Flujos Viscosos. *IX Anales ASAGAI*, 154-162.

### Conference papers

- Sottile M, Labanda N, Kerguelén A, Cueto I, Sfriso A (2021). Stability assessment of a tailings storage facility using a non-local constitutive model accounting for anisotropic strain softening. *IACMAG 2021*.
- Labanda N, Sfriso A, Tsingas D, Aradas R, Martini M (2020). A risk assessment of downdrag induced by reconsolidation of clays after upwards pipe jacking. *World Tunnel Congress*.
- Labanda N, Sfriso A, Tsingas D, Aradas R, Martini M (2020). EPB-TBM tunnel under internal pressure: Assessment of serviceability. *World Tunnel Congress*.
- Sottile M, Cueto I, Sfriso A (2020). A simplified procedure to numerically evaluate triggering of static liquefaction in upstream-raised tailings storage facilities. *XX COBRAMSEG*.

- Sottile M, Ledesma O, Sfriso A (2019). Optimization of a nuclear reactor foundation based on field geotechnical testing and numerical modeling. XVI PCSMGE (Cancún, México), IOS Press, ISBN 978-1-64368-031-6.
- Sottile M, Labanda N, García Mendive I, Ledesma O, Sfriso A (2019). A family of constitutive models implemented in PLAXIS to simulate cemented mine backfill. XVI PCSMGE (Cancún, México), IOS Press, ISBN 978-1-64368-031-6.
- Ledesma O, Gibson W, Sfriso A (2019). Reliability-based design of an anchor-supported excavation. XVI PCSMGE (Cancún, México), IOS Press, ISBN 978-1-64368-031-6.
- Codevilla M, Sfriso A (2019). Geotechnical conditions in the Campana-Zárate industrial complex, Argentina. XVI PCSMGE (Cancún, México), IOS Press, ISBN 978-1-64368-031-6.
- Sottile M, Kerguelen A, Sfriso A (2019). A comparison of procedures for determining the state parameter of silt-like tailings. 17 African Regional Conference on Soil Mechanics and Geotechnical Engineering.
- Sfriso A (2019). Recent experiences with ground retaining systems in Buenos Aires, Argentina. IV International Conference on Deep Foundations in Bolivia.
- Santa Cruz J, Roldán L, Dankert G, Sambataro L, Sfriso A, Bertero R (2018). How to strengthen a geotechnical campaign for tunnel's secondary lining. Implementation and results. WTC 2018, Dubai, UAE.
- Sfriso A (2018). Elementos para un (primer borrador de) reglamento de fundaciones para Argentina. XXIV CAMSIG (Salta, Argentina).
- Sfriso A, Sottile M (2018). Modelación numérica del procedimiento constructivo del túnel de la Avenida de Circunvalación – Córdoba, Argentina. XXIV CAMSIG (Salta, Argentina).
- Ledesma O, Verri A, Sfriso A (2018). Numerical modeling of a rockfill tailings dam subject to seismic loading. IX V CAP (Mendoza, Argentina).
- Ledesma O, Verri A, Sfriso A (2017). Deformation analysis of an AFRD for mine tailings storage and power generation. XIX ICSMGE (Seul, Corea).
- Vardé O, Guidobono R, Sfriso A (2017). Subway station retaining walls: case-histories in soft and hard soils. 3er International Seminar on Deep Foundations, Bolivia.
- Ledesma O, García Mendive I, Sfriso A (2016). Factor of safety by the strength-reduction technique applied to the Hoek-Brown model. ENIEF 2016 (Córdoba, Argentina).
- Kerguelen A, García Mendive I, Sfriso A (2016). Análisis de estabilidad de taludes mediante elementos finitos estocásticos en yacimiento Fénix. XV CCG (Cartagena, Colombia).
- Morandi R, Codevilla M, Ledesma O, Sfriso A (2016). Desafíos geotécnicos en la construcción de una toma de agua para una central térmica a orillas del Río de la Plata. XXIII CAMSIG (Santa Fe, Argentina).
- Ledesma O, Sfriso A (2016). Aspectos geotécnicos de la ejecución del muelle de la Terminal de Contenedores Tecplata. XXIII CAMSIG (Santa Fe, Argentina).
- Ledesma O, Sfriso A, Buonarcoso N (2016). Mejoramiento de suelos blandos con columnas de RDC para la ejecución de fundaciones en la Central Térmica de Ensenada Barragán. XXIII CAMSIG (Santa Fe, Argentina).
- García Mendive I, Kerguelen A, Sfriso A (2016). Análisis de probabilidad de caída de un bloque en la mina San Gregorio: aplicación de una herramienta de simulación estocástica. XXIII CAMSIG (Santa Fe, Argentina).
- García Mendive I, Sterin U, Rellan G, Sfriso A, Erz G (2016). Cerro Vanguardia Open Pit Mining: Database Management for Stability Analyses. Eurock 2016 (Capadoccia, Turkey).
- García Mendive I, Sterin U, Rellan G, Sfriso A, Fuentealba M (2016). Arenal Deeps: application of numerical methods to two- and three- dimensional stability analyses of underground excavations. Eurock 2016 (Capadoccia, Turkey).
- García Mendive I, Abad A, Sfriso A (2015). Geomechanical analysis of open pits at Cerro Vanguardia. Slope Stability 2015 (Cape Town, South Africa).
- Sfriso A (2015). Selecting advanced constitutive models. An overview. Conferencia por invitación en el ISRM Congress (Montreal, Canada) ISBN: 978-1-926872-25-4, paper 903.
- Rellán G, García Mendive I, Quaglia G, Abad A, Figueroa N, Sfriso A (2015). Geotechnical challenges of the biggest mining project in Argentina. Proceedings XV PCSMGE (Buenos Aires, Argentina). ISBN 978-1-61499-602-6. IOS Press.
- Lino E, Ledesma O, Sfriso A (2015). Interacción entre un chancador, un muro reforzado y una pila de acopio en una mina en Perú. Proceedings XV PCSMGE (Buenos Aires, Argentina). ISBN 978-1-61499-602-6. IOS Press.
- López A, Quaglia G, Sfriso A (2015). Madero Office: Fundaciones con barretas y contenciones premoldeadas. Proceedings XV PCSMGE (Buenos Aires, Argentina). ISBN 978-1-61499-602-6. IOS Press.
- Rellán G, García Mendive I, Ezama I, Paz Walther F, Vernengo Lezica I, Codevilla M, Sfriso A (2015). Mechanical characterization of an hydraulic fill sand and FEM simulation of cellular cofferdams at



- Carena project. Proceedings XV PCSMGE (Buenos Aires, Argentina). ISBN 978-1-61499-602-6. IOS Press.
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### Participation in Conferences and Symposiums

- AIE Seminars | Buenos Aires 2021, 2020, 2012, 2011, 2010, 2009.
- XIII Intl Symp of Landslides | Cartagena 2021.
- Pan American Conf on Geosynthetics | Rio de Janeiro 2020.
- Pan American Conf on Soil Mech and Geotech Eng | Cancun 2019, Buenos Aires 2015, Toronto 2011, Isla Margarita 2007, Boston 2003, Foz de Iguazú 1999.
- SAIG Seminars | Buenos Aires 2020, 2019, 2015, 2014, Rosario 2019, Córdoba 2017, 2007.
- Intl Cong Rock Mech ISRM | Foz de Iguazú 2019, Montreal 2015.
- Tailings | Santiago 2019.
- SRK Seminars on Tailings | Lima 2019, Santiago 2019, Reno 2018.
- SRK Seminars on Characterization of rock masses | Lima 2014, Vancouver 2011.
- SRK Seminars on Numerical Methods | Salta 2012.
- Cong of Eng Students, Peru | Puno 2019.

- Intl Scientific Convention, Cuba | Santa María 2019.
- Intl Conf on Deep Foundations, Bolivia | Santa Cruz de la Sierra 2019, 2017.
- Intl Conf on Earthquake Geotech Eng ICEGE | Rome 2019.
- World Tunnel Cong ITA | Naples 2019, Bergen 2017, Foz de Iguazú, 2014, Geneva 2013.
- Workshop on Urban Geotechnics | Singapore 2019.
- National Meeting on Geotech Eng, Mexico | León 2018.
- Argentinian Conf on Soil Mech and Geotech Eng | Salta 2018, Santa Fe 2016, Rosario 2012, Mendoza 2010, La Plata 2008, San Juan 2006, Córdoba 2004, Rawson 2002, Buenos Aires 2000, Córdoba 1998, 1997, 1996..
- AATES Seminars | Buenos Aires 2018, 2017, 2016, 2010.
- Argentinian Congress on Large Dams | Mendoza 2018.
- Brazilian Conf on Soil Mech and Geotech Eng | Salvador 2018, Goiania 2014, Porto Gallinhas 2012.
- Danube-European Conf on Geotech Eng | Skopje 2018.
- AfriRock | Cape Town 2017.
- Brazilian Tunnelling Cong | San Pablo 2017, 2012, 2004.
- ITA Tunneling Conf, Bolivia | Cochabamba 2017.
- ISSMGE Intl Conf on Soil Mech and Geotech Eng | Seoul 2017, Paris 2013, Alexandria 2009.
- Seminar Great Geotech Challenges | Hong Kong 2017.
- Intl Symp on Deformational Characteristics of Geomaterials | San Pablo 2017, Buenos Aires 2015, Atlanta 2008.
- Intl Seminar on Mine Waste Disposal | Arequipa 2017.
- Intl Symp on Geotech Aspects of Underground Construction in Soft Ground TC204 | San Pablo 2017, Shanghai 2008.
- South American Cong on Rock Mech | Buenos Aires 2015.
- Discrete Fracture Network Eng Cong | Vancouver 2014.
- Meeting of Latin American Geotechnicians | Atlanta 2014, 2011, 2006.
- Geocongress | Atlanta 2014, 2011, 2006.
- Conf on Mine Design by Empirical Methods | Lima 2014.
- Intl Conf of Civil Eng Students in Bolivia | Santa Cruz de la Sierra 2014.
- Intl Cong on Geosynthetics | Lima 2013.
- Pre-Conf of Eng CAI | Buenos Aires 2013.
- Slope Stability | Vancouver 2011.
- Intl Conf IACMAG | Goa 2008.
- World Cong in Computational Mech WCCM | Los Angeles 2006, Buenos Aires 1998.
- Intl Symp on Waterproofing for Underground Structures | San Pablo 2005.
- Sem on Strength of Materials | La Plata 2002.
- Geo-Odissey, Speciality Conf on Foundations and Ground Improvement | Blacksburg 2001.
- Argentinian Conf of Port Eng | Buenos Aires 2001, 1999.
- Speciality Conf on In Situ Testing | Atlanta 1998.
- Latin American Conf of Young Geotech Engineers | Caracas 1997.

## **Appendix III: Institutional record**

### **Executive positions**

- Vicepresident for South America of the International Society for Soil Mechanics and Geotechnical Engineering (2017|2021).
- Chairman of the Organizing Committee of the XV Pan American Conf on Soil Mech and Geotech Eng and of the VIII South American Congress on Rock Mech, in 2015 and VI Symposium ISSMGE on Deformation Characteristics of Geomaterials, 2015, Buenos Aires, Argentina.
- President of the Argentinian Society of Geotech Eng (2011|2015). Before, member of the Executive Committee (1997|2011).
- Vicepresident of the Argentinian Chapter of the Intl Geosynthetics Society (2011|2017).
- Editor of standards CIRSOC 401: "Geotechnical Investigations" and CIRSOC 402: "Foundation Structures".

### **Affiliations**

- Civil Eng Professional Council, license # 15.131.
- College of Engineers in the Buenos Aires Province, license # 45.939.
- San Juan Professional Council of Engineering, license # 4242.
- Argentinian College of Engineers.
- Argentinian Society of Geotech Eng | Intl Society for Soil Mech and Geotech Eng.
- Argentinian Association for Geology Applied to Eng and Environment | Intl Assoc for Eng Geology and Environment.
- Comité Argentino de Presas | Intl Commission of Large Dams.
- Argentinian Society of Rock Mech | Intl Society of Rock Mech.
- Intl Geosynthetics Society.
- Argentinian Society on Tunnels and Underground Structures | Intl Tunnelling Association.
- Intl Association of Computer Methods and Advances in Geomechanics.
- American Society of Civil Eng.

## Appendix IV: List of principal projects

In what follows, only projects fulfilling all of the following criteria are included:

- Relevant projects in geotechnical engineering. All routine works in conventional industrial plants, hospitals, buildings, single-family homes, marinas and similar size works, as well as all the geotechnical studies where the engineering design was not part of the job.
- Projects were completed are under construction or scheduled for construction. Project drafts and tender engineering are excluded.
- Contributions have been relevant for the project.

Also, the list excludes all projects where the role was peer-review only. Following this criteria, more than three thousand geotechnical studies and hundreds of small projects are omitted from the list. Projects spanning several years are listed on the last year of activity only.

### Specialization field: Geotechnical Exploration

Develops this specialization field through the Geotechnical Testing Laboratory AOSA SA. Alejo started in 1980 (at the age of 16) at Triaxis Laboratory, owned by his father Mr. Oscar A. Sfriso. He personally executed drillings, field and lab testing. In 1993, he rebranded the company to Alejo O. Sfriso y Asociados (AOSA) where he is now Director. In these years, he has produced or reviewed 3500+ geotechnical reports related to civil, mining, infrastructure and energy projects.

### Specialization field: Geotechnical Engineering

Alejo develops this specialization field through SRK Consulting, a multinational consulting company for mining and geosciences present in 27 countries. He started in 1993 designing foundations, and progressively expanded his experience until reaching almost every geotechnical engineering field of soil and rock mechanics. Currently, he leads a team of 20+ geotechnical engineers, perhaps the biggest in Argentina.

He pioneered the use of numerical methods for the geotechnical design of construction procedures in Argentina, with emphasis in underground works. Among several signature achievements of that time, the following are remarkable:

- First modeling of a construction procedure for a tunnel in Buenos Aires Metro. Línea B Lacroze |Tronador, 1997. It included the first use of shotcrete for a metro tunnel in Buenos Aires.
- First design of a construction procedure for a cavern in Buenos Aires. Línea H, Once Station, 2001. It included the first use of shotcrete as primary support for a cavern in Buenos Aires.
- First design of a construction procedure of a full-face excavation for a tunnel in Buenos Aires. Línea B Los Incas | Esteban Echeverría, 2006. It implied an improvement of 85% in the construction rate for the project.
- First design of a construction procedure for a head-bench excavation of a cavern in Buenos Aires. Línea H, Corrientes Station, 2006. It implied a reduction in the excavation schedule from 18 to 7 months.

### 2021

- Techint. Antamina, Peru. Analysis of the long-term and seismic deformations of a waste dump supporting a conveyor belt.
- BHP. Olympic Dam, Australia (2018|present). Deformation analyses and risk assessment of upstream raised tailings dams.
- Instituto Costarricense de Electricidad (2020|present). Advisor for the numerical dynamic analysis of Sangregado and San Miguel dams.
- Impregilo. TBM Lote 3, Argentina (2018|present). Design and numerical modeling of a TBM tunnel under the River Plate.
- Peñoles. Various mines, Mexico. Design and dam safety reviews for tailings storage facilities in Velardeña, Sabinas and Ciénega mines.
- Techint (1995|present). Company-wide geotechnical consultant for projects in 10+ countries.

### 2020

- Anglogold Ashanti. Cerro Vanguardia Mine, Argentina (2012|2020). Design and analysis of open pits; feasibility and construction engineering of the raise of a tailings dam.
- YPF Refinery La Plata. Argentina (1996|2020). Consultant participating in ten revamping or extension phases in 20 years.
- Y-TEC. La Plata, Argentina. Support to a research project in shale oil.

### 2019

- Anglogold Ashanti. Mototolo Mine. South Africa. Deformation modeling of upstream raised tailings dams.

- Buenos Aires City Government. Arroyo Vega drainage tunnel. Argentina. Owner representative team.
- CNS UTE. Sarmiento Railway Underground. Argentina (2016|2019). Design of seven underground caverns and NATM tunnels.
- ENOHSA. Argentina (2016 - 2019). Country-wide consultant.
- Graña y Montero. Talara refinery (2015|2019). Design and construction of foundations, ground improvement systems and sea intake&outfall.
- Kapan. Geghanush Dam, Armenia. Deformation modeling of upstream raised tailings dam and design of reinforcement buttress.
- Agnico Eagle. Kittila Mine, Finland. Assessment of impact of blasting vibration and curing heat to young concrete for a 1200 m deep mine shaft.
- Nucleoeléctrica Argentina SA. Argentina. Conceptual engineering of the foundations of the IV Nuclear Power Plant.
- Total Austral. Tierra del Fuego, Argentina. Consultant for the retrofitting of cliff erosion, Cañadón Alfa and Río Cullen sites.

## 2018

- Autopistas Urbanas SA. Argentina (2016|2018). Consultant for various expansion projects.
- Axion Campana Refinery. Argentina (1995|2018). Consultant participating in seven revamping or extension phases during 20 years.
- Barrick. Pascua Lama Mine. Argentina (2016|2018). Update of the closure plan of the binational tunnel and construction of a tunnel plug.
- Green SA. Paseo del Bajo. (2017|2018). Consultant for a motorway in Puerto Madero, Buenos Aires.
- Green SA. General San Martín Highway. Buenos Aires, Argentina (2017|2018) Consultant for a highway for rail use.
- Orosur Mining. Arenal Deeps Mine. Uruguay (2010|2018). Consultant during the construction of the tunnel-ramp, access tunnels and stopes.
- Roggio-IECSA. General Mitre Highway. Argentina (2017|2018). Consultant for a trench highway for rail use.
- Roggio. Mujer Urbana Tunnel, Argentina. Optimization of the construction process and numerical modeling of a highway tunnel in Córdoba.
- Ternium. Campana Steel Mill. Argentina (1998|2018). Company-wide consultant participating in several revamping or extension phases.

## 2017

- Caputo. Neutron-Guide Building, National Commission for Nuclear Energy. Ezeiza, Argentina. Optimization of foundations and excavations of the project.
- Techint – Dycasa UTE. Metro Línea H, Corrientes | Plaza Francia. Argentina (2011|2017). Construction design of 4 km of tunnels and five underground stations and ancillary structures.
- World Trade Center La Paz. Bolivia. Construction design for foundations, slope reinforcement and excavations for the largest real-estate Project in La Paz by that date.

## 2016

- Barrick. Pascua Lama Mine. Argentina (2015|2016). Closure plans and studies for the suspension of activities.
- Chinalco. Toromocho Mine. Peru (2015|2016). Deformation modeling of the dynamic MSE wall – crusher structure interaction; construction, operation and seismic loading of a waste dump.
- Pronico. CGN Project. Izabal, Guatemala. Stability and risk analyses for open pit mine operations.

## 2015

- ENAP Sipetrol. New Magallanes pipeline. Santa Cruz, Argentina. Pipe shore approach and landing in the coast of Santa Cruz.
- Milpo. Cerro Lindo Mine, Peru. Review of a 500m high dump located in a high seismicity region.
- Proyecta y Construye S.A. Chinchero Intl Airport, Peru. Design of earthworks, soil improvement and foundations of the new Cuzco airport.
- Total Austral. Cañadón Alfa Plant. Argentina. Auditor of geotechnical reports submitted by different consultants for the expansion of the plant.

## 2014

- AngloAmerican. Los Bronces Mine. Chile (2009|2014). Support systems for exploration adits, rockburst studies and geomechanical advice for an exploratory tunnel +8 km long excavated by a double shield TBM machine.

- Barrick. Pascua Lama Mine, Argentina (2011|2014). Support to the construction of the process plant of the first binational mine and largest mining project in Argentina, leading a group of more than 15 people.
- Isolux-lecsa. Ensenada Barragán Combined Cycle Power Plant, Argentina (2010|2014). Geotechnical and foundation engineering of the project, designing levees, earthworks, foundation of main equipments, fills, excavations and the constructive process of the aqueduct and intake.
- Soderling. Blue Tower Ventures Complex. Asuncion, Paraguay. Design of foundations, support structures and excavations for the largest private investment in Asuncion.

### 2013

- Antofagasta Minerals. Mina Los Pelambres. Chile (2012|2013). Forensic analysis of Quiyalles tunnel, leading the geomechanical stability analysis facing changes in the hydrogeological regime of the tunnel.
- Barrick. Pascua Lama Mine. Argentina. (2012|2013). Engineer of Record of the Binational Tunnel, responsible for geotechnical, construction, environmental, water management and safety aspects. Optimization of the ore-passes design, crossing of the main caverns and other underground works of the mineral transport system between the Pascua pit and the Lama processing plant.
- Igendesa. Los Condores Power Station Tunnel. Chile (2008|2013). Feasibility and construction engineering for a 10 km long TBM pressure tunnel.
- Isolux-lecsa. Brigadier Lopez Combined Cycle Power Plant. Argentina (2010|2013). Design of the water intake, foundations, earthworks, embankments, slopes and walls.
- Riva. Edificio Vista, Coto Botánico. Argentina. Design of the support structure and construction procedure for a 20 m deep excavation in Buenos Aires city center. This was the first deep excavation and leading case after the New City Law for the use of Ground Anchors.

### 2012

- Buenos Aires Port. Argentina (1995|2012). Consultant for various contractors in several expansion works: Techint, CIASA; Larrague & Associates, Soletanche-Bachy, Ingemed, Postensa, Intefema, port Authority, Maitland and Associates.
- Dycasa. Tecplata Wharf. La Plata, Argentina (2010|2012). Design of the construction procedure of the main wharf.
- Exolgan. Dock Sud Port. Argentina (1994|2012). Company-wide consultant for geotechnical works.
- Instituto Costarricense de Electricidad. Reventazón Dam. Costa Rica. Numerical seismic analysis of a rockfill dam and design of the concrete face.
- CH2MHill. Potasio Río Colorado Mine. Argentina (2010|2012). Construction engineering of the Bahía Blanca process plant.

### 2011

- Antofagasta Minerals. Los Pelambres Mine. Chile (2008|2011). Construction procedures, support systems, radier design and site inspection during the construction of Mauro complex – Coiron, La Guardia and Las Animas tunnels – the evacuation tunnel of Mauro tailings dam and the clear water intake.
- Roggio. Metro Line E. Argentina (2008|2011). Design of 3 km tunnel and three underground stations.
- Soletanche-Bachy. Carena Wharf, Puerto Belgrano Naval Base. Argentina (2009|2011). Design of a seven-cell cellular cofferdam for the dewatering of a dry dock.
- Terratest. Antamina Mine. Peru. Design of a piled foundation for new crushers located on mine waste dumps.
- Terratest. Escondida Mine. Antofagasta, Chile. Numerical modeling of foundations subjected to operating and seismic loads, including the analysis of the interaction between crusher foundations and TEM wall to unload trucks of the new crushers founded on a recent mining dump.

### 2010 and before

- Dycasa. Metro Lines A and H. Buenos Aires, Argentina. Design of tunnels and underground stations Once-Hospitales (2002|2004). Primera Junta-Nazca (2004|2007). Taller Nazca (2010). Once-Corrientes (2003|2009).
- Interamerican Development Bank. Puerto Cortes Wharf, Honduras. Auditor for the rehabilitation project, developing specifications for dredging, fills, land densification and compaction.
- GCSB & World Bank. Maldonado Reliever Tunnel. Argentina (2005|2010). Auditor of the construction of two TBM tunnels with a combined length of more than 12 km.
- Soletanche-Bachy. TRP wharf. Argentina. Design team of a diaphragm wall wharf and a wharf on piles, for the new cruise terminal in Buenos Aires Port.
- Murchison. Port Terminal Zárate, Argentina (2000|2009). Design of construction procedures for landfills, coastal slope stability analyses, design of monitoring systems and field inspection, with Juan Larrague.

- Roggio. Metro Line B. Los Incas-Villa Urquiza. Buenos Aires, Argentina (2006|2008). Design of 2 km of tunnels and two underground stations. This project included the first NATM full-face tunnel in soils in Argentina.
- Techint – Panedile UTE. Los Caracoles Dam, Argentina (2006|2008). Consultant together with E. Núñez and R. Flores. Detail engineering of the spillway tunnels, intake and portals, and HVT line.
- Colbún. Quilleco Power Station. Chile (2006|2007). Optimization of the construction procedures and tunnel support for a run-through power station.
- Techint. Pirquitas Mine. Argentina (2006|2007). Design of earthworks and foundations for the process plant, design of the starter dam of the TSF and the river diversion dams.
- Ferrovial – Agroman – Besalco. Metro Santiago Line 5, Chile. Optimization of the design and construction procedures for the Vicente Valdés station.
- Coto. III Main Sewer. Buenos Aires, Argentina. Expert witness in the case of the collapse of the tunnel.
- Ferrovial – Agroman – Besalco. Puente Alto Sewer. Santiago, Chile. Optimization of the design and construction procedure of a 2.6 km long tunnel, portals and structures for pluvial drainage.
- Ferrovial – Agroman – Besalco. Metro Line 4, Tobalaba-Los Orientales. Santiago, Chile. Optimization of tunnels and Los Orientales Station.
- Hidra. La Plata Breakwaters. La Plata, Argentina. Numerical models for the construction of a new breakwater.
- Larrague, Galladini y Asociados. M'Bopicuá Wharf. Fray Bentos, Uruguay. Design of a post-tensioned pavement platform.
- Larrague, Galladini y Asociados. Access Canal. Dock Sud, Argentina. Revamping of Dock Sud channel.
- OHL. Metro Line 4, Vitacura-Rotonda Grecia, Chile. Optimization of the design of tunnels and Plaza Egaña Station.
- Pulte. Various condomoniums, Argentina (1999|2003). Design of the foundations and earthworks for 500 houses.
- SMI. Ancoa Dam, Chile. Numerical modeling of a CFRD dam during construction and seismic loading.
- Terratest. Territoria Building, Chile. Optimization of the construction procedures and support of an excavation +30 m deep.
- Techint – Dywidag UTE. Metro Line B, Lacroze-Los Incas. Argentina (1998|2001). Design of tunnels and underground stations.
- Techint – Skanska UTE. Aqueduct Río Colorado. Argentina (2002|2003). Design of excavations, fills and compaction procedures.
- Vial y Vives – Echevarría Izquierdo – Icafa. Metro Line 4. Chile. Optimization of the design of tunnels and Puente Alto Station.