Antonio Miranda

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Antonio Nunes de Miranda has 50 years of experience in geotechnical engineering. He has a PhD degree in Civil Engineer from Colorado State University and is a retired Soil Mechanics Professor of Federal University of Ceará, Brazil.

His experience includes geotechnical investigations, grouting, site studies, and evaluation of material properties and design of dams. Working as a team member, coordinator or consultant, his experience within the geotechnical field includes the plan, design and execution of:

- Site investigations
- Foundations for buildings, industrial plants, bridges and other structures
- Dewatering and drainage systems
- Anchored curtains
- Dams, levees and earth fills
- Roads, airports and ports

From 2004 to 2013, as a dam safety specialist of Brazil's Ministry of National Integration he participated in the preparation of the Brazilian dam safety inspection and design guidelines, performed dam inspections and reviewed repair plans for dams and levees. In addition, from that time to now he has directed and participated in more than 20 short courses on dam safety in many Brazilian States.

For the past 17 years, participated in many important projects throughout Brazil:

- Fortaleza 310 MW Thermal Power Plant, at the Pecém Industrial/Port Complex, in Caucaia, Ceará.
- USC Integrated Slab Production Complex, at the Pecém Industrial/Port/Complex, in Caucaia, Ceará
- Wind Energy Generator Parks of Aracatí and Taíba, Ceará
- Fortaleza and Belém Airports, Ceará and Pará
- Design of Paranã Dam Spillway (2.500 m3/s), Goiás

- **CURRICULUM VITAE**

Personal Information

Date of Birth: 15/06/46
Place of Birth: Fortaleza - Ceará – Brazil
Citizenship: Brazilian
Sex: Male
Profession: Civil Engineer

Education

- Ph.D. Civil Engineering
  Colorado State University (1984 -1988)
- M.S. Geotechnical Engineering
  Pontifícia Universidade Católica of Rio de Janeiro (1970 -1972)
- B.S. Civil Engineering
  Federal University of Ceará (1965 -1969)

Professional History

- Civil Engineer in charge of the soil laboratory and soil projects sector of the Guanabara branch of GEOTÉCNICA S A (1971-1973)
- Head of GEONORTE – Engineering of Soils and Foundation Ltda (1974 - 1984)
- Soil Mechanics and Dam teacher of Federal University of Ceará (1974 – 1995)
- Dam Safety Consultant of Brazil's Ministry of National Integration (2004 - 2013)
- Geotechnical Consultant (since 1989)

Publications

- Master degree thesis: 'Estudo Estatístico das Propriedades dos Solos Residuais de Gnaisse das Encostas da Guanabara' - Pontifícia Universidade Católica do Rio de Janeiro (1972)
- Paper discussion: 'Prediction of Collapse Settlement of High Embankment' - The Civil Engineer in South Africa (1988)
- PhD degree thesis: 'Behavior of Small Earth Dams During Initial Filling' - Colorado State University (1988)
- 'Finite Element Method Approach for Collapsing Soil' - XII International Congress of Soils Mechanics and Foundation Engineering - Rio de Janeiro (1989)
- 'Modelo 'versus' Realidade na Engenharia de Barragens' - Journal: Engenharia CT/UFC, (1989)
- Thesis of the Full Professor Exam: 'O Estudo de Fundações em Solos Colapsíveis pelo Método dos Elementos Finitos' Universidade Federal do Ceará (1989)
- 'O Método dos Elementos Finitos Aplicado aos Solos Expansivos' - IX Brazilian Congress of Soils Mechanics and Foundation Engineering - Salvador (1990)
- 'Análise de Percolação pelo Método dos Elementos Finitos' Journal: Tecnologia Universidade de Fortaleza, No 12, 1991 (Authors: Antônio Miranda / Vanda Malveira)
- 'Análise de Fundação de Barragens Rígidas Sobre Solos Colapsíveis' X Brazilian Congress of Soils Mechanics and Foundation Engineering - Foz do Iguaçu (1994) (Authors: Antonio Miranda/ Rogério Menescal)
- 'O Método dos Elementos Finitos Aplicado ao Estudo de Fundações de Barragens Rígidas Sobre Solos Colapsíveis' 2nd Symposium on Unsaturated Soils, Recife, PE, UFPE/ABMS - (1994) (Authors: Antonio Miranda / Rogério Menescal)
- 'UNSTRUCT - A Finite Element Method Program For Unsaturated Soils' - First

Internacional Conference on Unsaturated Soils, Paris, France (1995) (Authors: Antonio Miranda/ Rogério Menescal/ Francisco Chagas)

- 'Modelagem de Ensaio Triaxial Ko em Amostras de Solo Não-Saturado' – 3rd Symposium on Unsaturated Soils - Rio – PUC / ABMS (1997) - (Authors: Antonio Miranda/ Francisco Chagas)
- 'Variação da Rigidez - Modelagem do Colapso de Solos Não Saturados' - XI Brazilian Congress of Soils Mechanics and Foundation Engineering - Brasília (1998) (Authors: Antonio Miranda/ Francisco Chagas)
- 'Análise Comparativa de Metodologias de Previsão de Capacidade de Carga de Fundações Profundas em Fortaleza - CE' - XI Brazilian Congress of Soils Mechanics and Foundation Engineering - Brasília (1998) (Authors: Renato Cunha/ Antonio Miranda / Alfran Moura)
- 'Matric Suction: Stress variable or state variable?' - International Symposium on Problematic Soils - Sendai, Japan (1998)
- 'Improving the Root Pile Execution Process through Setup Time Reduction' – 21st Annual Conference of the Association of Researchers in Construction Management - Londres – UK (2005) (Several Authors)
- 'Manual of Dam Safety Inspection' - Ministry of National Integration – Brasília (2004). (Several authors).
- 'Joana Dam - An emergencial safety intervention' - Dam Safety – ASDSO - New Orleans – Louisiana –USA (2005) (Authors: Antonio Miranda / Rogério Menescal / Daniel Perini / Francisco Ribeiro)
- 'Guideline for Dam Design' - Ministry of National Integration – Brasília (2007). (Several authors).
- "Transversal Crack Repair in Piaus Dam" – II International Conference on Dam Maintenance and Rehabilitation – Zaragoza – Spain (2010). (Several authors)

Books

- 'Caderno de Encargos de Fundações' – 'Programa de Inovação da Industria da Construção Civil do Estado do Ceará - INOVACON-CE', financed by CNPq - (2006)
- 'Prática de Fundações no Ceará' chapter of the book 'Geotecnia no Nordeste'– Editora Universitária da UFPE - (2005)
- 'Roteiro para Projeto de Pequenos Açudes' (Authors: Vicente Vieira / Antônio Gouveia / Antônio Miranda / Vanda Malveira) - Universidade Federal do Ceará - (1997)
- 'The Program UNSTRUCT 2.0' – English version of the UNSTRUCT manual (1993)
- "Barragem de Terra e Solos Não Saturados" chapter of the book "Solos Não Saturados no Contexto Geotécnico " - organized by José Camapum de Carvalho and others (2015) - ABMS

Awards

"The software UNSTRUCT 3.0" (1995) – Honor Mention in the National Educational and Technological Software Competition of Brazilian Ministry of Education
Received the Medal "Eng. Paulo de Frontin" from the Centro de Tecnologia da Universidade Federal do Ceará (2016)

Organization Memberships

- Brazilian Association of Engineering Education
- Regional Council of Architecture, Engineering and Agriculture - 9th Region

- Brazilian Large Dams Committee
- Brazilian Soil Mechanics Association
- Brazilian Pavement Association
- Cearense Academy of Engineering

Congresses, Seminaries and Symposiums

- VII Brazilian Congress of Soils Mechanics and Foundation Engineering - Olinda - Recife (1982) - Lecturer of IV Theme - 'Dams on Semi-Arid Region'
- 1st Northeast Hydrogeology Seminary - Recife - 1987 - Lecturer
- Seminary on "Behavior of Small Earth Dams During Initial Filling" - Fort Collins - USA (1988) - Lecturer
- 2nd Symposium on Unsaturated Soils - Recife - Pernambuco - UFPE/ABMS (1994) - President of the 5th Section
- X Brazilian Congress of Soils Mechanics and Foundation Engineering - Foz do Iguaçu - Paraná (1994) - Panelist
- Meeting on Unsaturated Soils - UFRG - Porto Alegre - Rio G Sul (1995) - Lecturer
- 3rd Symposium on Unsaturated Soils - Rio - PUC/ABMS (1997) - Moderator of Session
- Geotechnical Seminary: 'Numerical Analyses on Unsaturated Earth Fills'- UENF - Campos - Rio - 1997 - Lecturer
- 1st Civil Engineering Seminary of UNIFOR – Fortaleza – 2000 – Lecturer on Building Foundations in Fortaleza
- XXIV National Seminary of Large Dams – CBB – Fortaleza – 2001 – Vice-President of the Organization Commission
- XIV FECON – CREA - PI - Teresina – 2010 – Moderator of Session: 'Castelo Dam – Flood Control'.
- Second International Symposium on Rock Fill Dams - Rio de Janeiro – 2011.
- 3º Congresso Brasileiro de Túneis e Estruturas Subterrâneas – São Paulo – 2012.
- XVI Congresso Brasileiro de Mecânica dos Solos e Engenharia Geotécnica – Porto de Galinhas – PE - 2012. Chaired the section Barragens e Obras de Terra.
- 3º Simpósio de Geotecnia do Nordeste – Fortaleza – 2013. Delivered the Conference Jaime Gusmão: Modelos na Engenharia Geotécnica.
- V Simpósio Sobre Segurança de Barragens e Riscos Associados – Fortaleza – 2016. Presented the Lecture: Fator de Risco Associado a Interpretações Geotécnicas.

Professional Experience

Participated in the following projects as:

* Team member
** Coordinator
*** Consultant

Site Investigation and Laboratory Test

* Itumbiara dam - Minas Gerais (1971)
* Preliminary studies of Itaipú Dam – Brazil / Paraguay (1971)
* Irrigation projects of Betume, Boacica, Cotinguiba, Manituba e Brejo Grande - Sergipe (1974)
* Levees of 70 small areas of São Francisco River – Sergipe / Alagoas (1976)
* Levee of Limoeiro - Ceará (1974)

** 24 Microwave communication tower and administration buildings of Teleceará - Ceará (1974-1983)
** 15 Microwave communication tower and administration buildings of Embratel - Rondônia (1979)
** Bridge over Melancia River - RFFSA - Ceará (1974)
** 13 bridge on state highways - DAER - Ceará (1974-1983)
** 8 bridge and viaduct on federal highways - DNER - Ceará (1975-1976)
** 6 school buildings of PREMEN – Ceará / Piauí (1974-1979)
** 22 bank agencies of Banco do Brasil S / A - Ceará - Piauí (1974-1983)
** 25 bank agencies of BNB - Brazil Northeast (1974-1983)
** Fisher pier of Mucuripe Harbor - Ceará (1977)
** Railroad embankments of Mucuripe Harbor and Fortaleza Central - Ceará (1974-1983)
*** Fortaleza 310 MW Thermal Power Plant, at the Pecém Port , Ceará (2002)
*** Wind Energy Generator Parks of Aracatí and Taíba, Ceará (2003)
*** USC Integrated Slab Production Complex, at the Pecém Port, Ceará (2002-2005)

Investigation and Design of Dams

* Sitiá and Peixe Gordo dams - Ceará (1974 -1975)
* Pedras Brancas dams - Ceará (1977)
* Atalaia, Lagoa de Parnaguá, Angico, Rangel and Contrato dams of Gurguéia Valley Planning - Piauí (1974-1983)
* Longá and Matos dams of Low Parnaíba River Planning - Piauí (1978)
* Frios and Tejussuoca dams - Ceará (1982)
* 30 small dams on Baturité Mountains - Ceará (1981)
** Acioli, Ibuaçu, Aroeiras, Serrinha, Mucambo, Massangana, Santa Felicia, Oreb II, Broco, Bandeira and Saco do Belém dams - Ceará (1977-1983)
** Pituba dams - Ceará (1979)
*** Prazeres dam - Ceará (1985)
*** Marco dam - Ceará (1988)
*** Piracuruca dam – Piauí (1990)
*** Carnaubal dam - Ceará (1990)
*** Cachoeira, Rosário, Muquém, Souza, Monsenhor Tabosa, Barra Velha, Flor do Campo, Cauhipe and Gangorra dams of Project PROURB - Ceará (1996-1998)
*** Review of the Castanhão dam design - Ceará (1997-1998)
*** Preliminary studies of a flood control dam at Maranguapinho River - Maracanaú – ASTEF - Ceará (2005)
*** Design revision of the following dams: Poxim Açu (Sergipe), Peão and Setúbal (Minas Gerais), Castelo (Piauí), Oiticica (Rio Grande do Norte), Extrema (Goiás), Jaguari, Taquarembó and Arvorezinha (Rio Grande do Sul) - (2005 - 2011)
*** Geotechnical consulting for the Concremat Consortium - Arcadis Logos in its support contract to the Ministry of National Integration in the preparation of documents necessary for monitoring the initial filling of the structures of the PISF - São Francisco River Integration (2014)
*** Geotechnical consulting for the Concremat Consortium - Arcadis Logos in its support contract to the Ministry of National Integration in the examination of the

projects (basic and executive) of the following PISF- São Francisco River Integration dams, as an aid to the elaboration of the safety plan of these works and for guidance contingency plan during its filling test:
East Axis: Areias, Braúnas, Mandantes, Salgueiro, Muquém, Copiti, Barreiro e Campos.
North Axis: Tucutu, Terra Nova, Serra do Livramento, Mangueira, Negreiros, Milagres, Jati, Atalho, Porcos, Cana Brava, Cipó, Boi I, Boi II, Morros, Boa Vista e Caiçara (2015).

*** Geotechnical consulting in the elaboration of the term of reference of the Jaburu I Dam spillway executive project, Tianguá, Ceará (2017).

*** Geotechnical consulting in the elaboration of the Jaburu I Dam spillway executive project, Tianguá, Ceará (2020).

*** Geotechnical consulting in the rehabilitation works of several dam of COGERH – State of Ceará Company of Water Resources, Ceará (2020).

Load Tests, Field Tests and Supervision of Foundations Contracts

* Horizontal 100 ton-load test on a pile of the Rio - Niterói bridge - Rio de Janeiro (1972)
* Slope-Indicator measurements to monitor the performance of an anchored curtain of the Rio de Janeiro subway (1972)
* Settlement control of Block 18 of Condominium Jacaré - Rio de Janeiro(1972)
** Structural load test of Riacho Fresco bridge at Highway CE-046 - Ceará (1977)
** Several plate load tests and pile load tests in building foundation- Ceará (1975-1983)
** Supervision of the foundations contract of the BNH building in Fortaleza - Ceará (1983)
*** Underpinning of elevated water reservoir of FSESP, Ipú - Ceará (1987)
*** Remedial underpinning of the BNB agency, on collapsible soil, at Tianguá - Ceará (1989)
*** Remedial underpinning of Block 34 of Condominium Jardim da Maraponga, Fortaleza - Ceará (1990)
*** Consulting on foundations, drainage and retaining structures of International Airport of Fortaleza - Ceará (1996 - 1997)
*** Consulting on foundations, drainage and retaining structures of Pre-Treatment Sewage Plant of Fortaleza, Program SANEFOR - Ceará (1996 - 1997)
*** Consulting on foundations of International Airport of Belém - Pará (1997)
*** Consulting on Fortaleza 310 MW Thermal Power Plant, at the Pecém Port, Ceará (2002)
*** Consulting on foundations, drainage and retaining structures of many residential and commercial buildings in Fortaleza – Ceará, Natal – Rio Grande do Norte and São Luiz - Maranhão (1989 - 2020)

Design and Execution of slope stabilization and retaining structure

* Slope stabilization, drainage and retaining structure of MACIFE industrial plant - Rio de Janeiro (1972)
* Slope stabilization, drainage and retaining structure of PETROBRÁS industrial plant in Governador Isle - Rio de Janeiro (1971)
* Slope stabilization, drainage and retaining structure of SHELL industrial plant in Governador Isle - Rio de Janeiro (1971)

* Reinforcement of retaining structure of São João Fortress - Rio de Janeiro (1971)
*** Rehabilitation of embankment slopes of the Castelo - Altos branch of the Fortaleza - Teresina Railroad - Piauí (1973)
*** Design of slope stabilization of the Seminário Hill, Crato - Ceará (1985)
*** Margin protections of the of the Acaraú River, Sobral - Ceará (1989)
*** Anchored curtains of several buildings in Fortaleza – Ceará and Natal – Rio Grande do Norte (2002 – 2020)

Foundation Constructions

** General Clovis Alexandrino Building, with basement curtain construction and steel pile driving - Ceará (1980)
** Viaduct of Contorno Avenue, Crato - Ceará (1980)
** Oil pier of Mucuripe Harbor, onshore section - Ceará (1980)
** Repair pier of INACE - Ceará (1983)
** Macau Hotel - Rio Grande do Norte (1983)
** Physics e Geosciences Labs of UFRN - Rio Grande do Norte (1983)
** Pile driving of 31 residential and commercial buildings in Fortaleza - Ceará (1974-1983)
*** Foundation design and construction of several buildings in Fortaleza – Ceará and Natal – Rio Grande do Norte (2002 – 2004)

Roads and Urban Avenues Studies and Design

** State Highway CE-257 - Potengi - Araripe (20 km) - Ceará (1976)
** State Highway CE-285 - Araripe - Campos Sales (30 km) - Ceará (1976)
** State highway CE-057 - Catunda - Tamboril (54 km) - Ceará (1980)
** State highway CE-184 - Iguatú - Jucás (30 km) - Ceará (1979)
** State highway CE-046 - Morada Nova - Quixadá (80 km) - Ceará (1975)
** Municipal road of the Ceará Project (211 km) - Ceará (1981-1982)
** Municipal road of the Sertões Cearenses Project (97 km) - Ceará (1981-1982)
** Municipal road of the 5th Operative Plan of Serra da Ibiapaba Project (45 km) - Ceará (1979)
** Municipal road of DAER (119 km) - Ceará (1974-1983)
** Municipal road of the 6th Operative Plan of Serra da Ibiapaba Project (31 km) - Ceará (1980)
** Access roads of communication microwave tower of Vaca Brava and Sítios Novos of Embratel - Bahia (1974-1983)
** Access roads of communication microwave tower of Mutamba of Embratel - Ceará (1974 - 1983)
** Access roads of communication microwave tower of Oeste and Montimó of Teleceará - Ceará (1976)
** Santos Dumont, Dioguinho, 4º Anel Viário, José Bastos, Beira Rio Avenues in Fortaleza - Ceará (1976 - 1978)
** Highways and avenues of Metropolitan Region of Fortaleza, Ceará (1980)
*** Pavement rehabilitation of 200 km of state highways - Ceará (1987-1988)
*** Geotechnical consulting in the intersection overpass project of Av. Bezerra de Menezes / Mister Hull and Av. Humberto Monte / Parsifal Barroso, Fortaleza Ceará - Hugo A. Mota Consultoria e Engenharia de Projetos S/C (2007)
*** Geotechnical consulting in the intersection overpass project of Av. Santana

Junior com Av. Pe. Antonio Tomaz, Fortaleza - Hugo A. Mota Consultoria e Engenharia de Projetos S/C (2007)

*** Geotechnical consulting in the access overpass project of Centro de Feiras e Eventos, Fortaleza - Hugo A. Mota Consultoria e Engenharia de Projetos S/C (2010 - 2011)

*** Geotechnical consulting in the access overpass project of Estádio Castelão, Fortaleza - Hugo A. Mota Consultoria e Engenharia de Projetos S/C (2012 - 2013).

*** Geotechnical consulting in the structural design of the road overpass of the intersection of CE-040 and Anel Viário, Fortaleza - Hugo A. Mota Consultoria e Engenharia de Projetos S/C (2013).

*** Geotechnical consulting in the retaining structure design of the VLT-Fortaleza from Padre Antônio Tomás Av. to Antônio Sales Av. (2016 - 2017)

Supervision and Control of Roads, Avenues, Railroad and Airports Construction

** Municipal road of the 4th ,5th and 6 th Operative Plans of Serra da Ibiapaba Project (293 km) - Ceará (1978-1981)

** Santos Dumont, Dioguinho, 4º Anel Viário and Lagoa do Opaia Avenues in Fortaleza - Ceará (1977-1978)

** Sobral Airport - Ceará (1978)

** Caio Prado Branch of the Fortaleza - Crato Railroad - Ceará (1981-1982)

Diverses

* Research on anchor ties with 85-ton capacity - Rio de Janeiro (1972)

* Design and installation of horizontal pipe (1.60-m diameter) with hydraulics jackets under the 'Central do Brasil' Railroad in Duque de Caxias Refinery - Rio de Janeiro (1972)

* Research on dewatering using injector-pump - Rio de Janeiro (1972)

* Subsoil dewatering to allow the construction of Nuclear Power Plant Angra I - Rio de Janeiro (1972)

* Subsoil dewatering to allow the construction of the Oceanic Interceptor of Fortaleza (length 6 km, depth 4 to 6 meters) - Ceará (1978)

* Geotechnical studies and pavement design of Sobral Airport- Ceará (1977)

* Design of the basement drainage of SARONORD industrial plant- Ceará (1974)

*** Indicated by the Regional Council of Engineering and Architecture to support the National Department of Works Against Droughts on litigation relative to the construction of Acauã dam - Parnaíba (2004)

Consulting and Control of Dams Construction

** Construction quality control of Massangana, Aroeiras, Broto, Jaburu II, Pedras Brancas and Pituba - Ceará (1974-1983)

*** Castro, Jerimum, Sousa, Sítios Novos and Cauhipe dams of Project PROURB - Ceará (1996 -1998)

*** Remedial measures of Pacajús dam spillway - Ceará (2003-2004)

*** Emergency remedial measures of Rosário dam spilway - Ceará (2004)

*** Emergency remedial measures to rehabilitation of Joana dam – Piauí (2004)

*** Remedial measures of Alegre dam - Ceará (2005).

*** Safety evaluation and visual Inspection of the following dams: Capivara, Bartolomeu II and Saulo Maia (Paraíba), flood control dams of Itajaí Valley

(Santa Catarina), Berizal and Setúbal (Minas Gerais), Boqueirão de Parelhas, Passagem das Traíras, Itans and Campo Grande (Rio Grande do Norte), Juturnaíba (Rio), Duas Bocas and Caçamba (Alagoas), Poço Verde (Sergipe), Pinheiros (Espírito Santo), Poço Marruá (Piauí) Olho d'Água (Ceará) and Riacho de Santana (Bahia) - (2005 -2011)

*** Design of Paranã River dam spillway (2.500 m^3/s), Goiás (2004-2006)

*** Remedial measures of Piaus dam - Piauí (2009).

*** Construction of Tinguís dam – Piauí (2010).

*** Geotechnical consulting in the restoration and modernization works of the São Gonçalo Dam of DNOCS – Departamento Nacional de Obras contra a Seca, São Gonçalo, Paraíba (2018 - 2019).

Fortaleza, October, 19th 2020

Antonio Nunes de Miranda