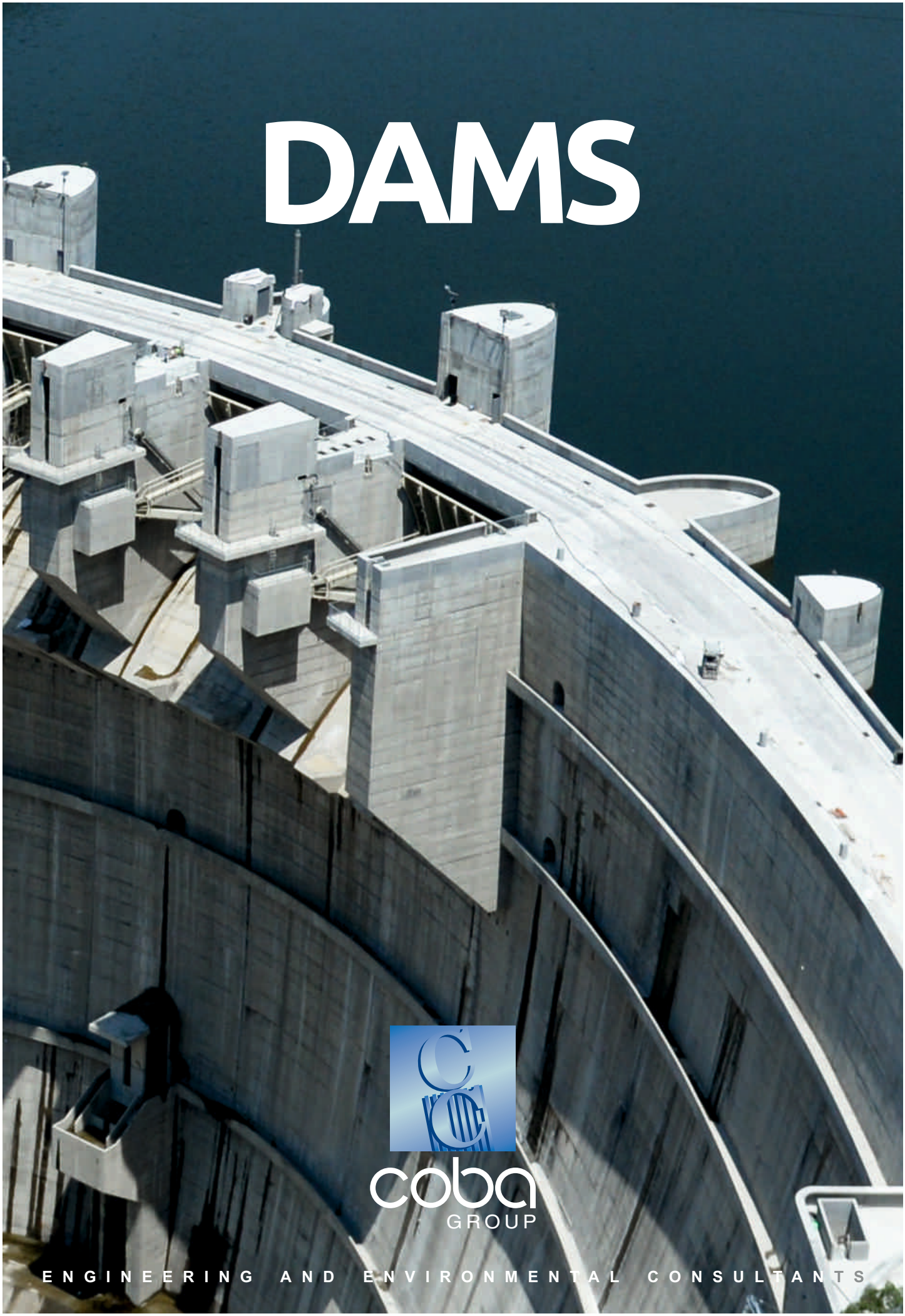
DAMS



coba
GROUP

ENGINEERING AND ENVIRONMENTAL CONSULTANTS

PRESENTATION

COBA is a multinational and multidisciplinary group of Engineering and Environmental Consultants, founded in 1962.

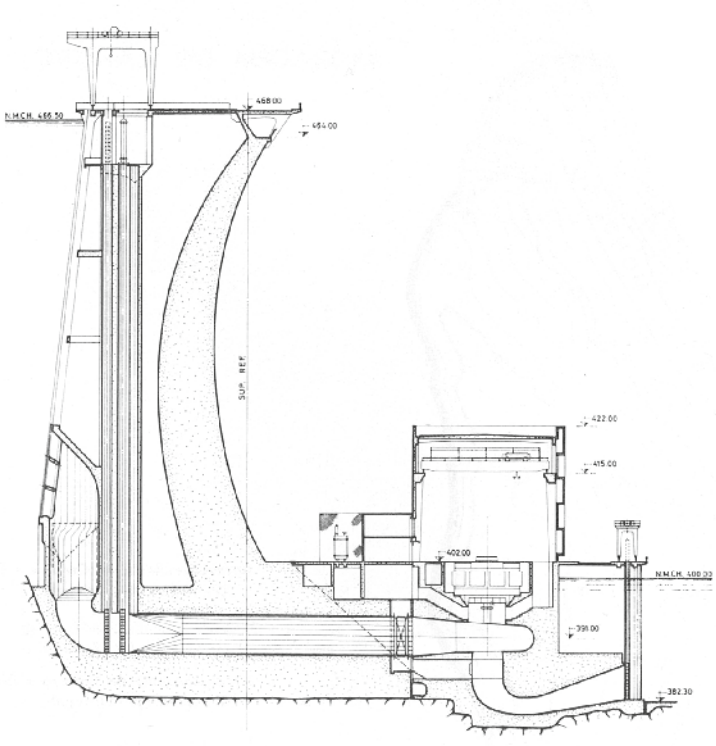
The Group provides engineering consultancy services ranging from basic and planning studies, technical, environmental and economic feasibility studies, design and construction design as well as project management and works supervision, to operation follow-up and behaviour monitoring.

The Group has offices/subsidiaries in three continents and experience in sixty countries and encompasses several companies in accordance with functional specializations or geographical areas.

The competences acquired along the last six decades, together with the state-of-the-art employee expertise, the stability of its permanent staff and the comprehensive international experience allow to find out the best solutions for the full satisfaction of public and private Clients' needs and expectations.

During its existence, the Group has participated together with public authorities or private developers, in the feasibility of multidimensional projects, some of them being structuring projects and with major impacts on the improvement of peoples' life conditions in the several countries where it worked.

At present, the Group has a wide number of competences and technical areas that allow the composition of multidisciplinary teams who share knowledge and experiences in the execution of projects.



Funil Hydropower Development - Brazil 1962

FIELDS OF ACTIVITY

HYDRAULIC UNDERTAKINGS
Concrete, Earth-fill and Rock-fill Dams. Weirs and Reservoirs Water Conveyance Systems. Hydraulic Structures.

POWER GENERATION AND TRANSMISSION
Hydroelectric Power Plants. Photovoltaic power plants and wind farms. Small Hydropower Plants. Power Plants Rehabilitation and Modernization. Substations High Voltage Transmission Lines. Cooling Water Systems for Thermoelectric Plants.

WATER SUPPLY AND WASTEWATER SYSTEMS
Catchment, Transport and Distribution of Potable Water. Water Treatment Plants. Drainage Systems. Wastewater Treatment Stations. Pumping Stations.

AGRICULTURES AND RURAL DEVELOPMENT
Irrigation and Drainage Systems. Rural Roads. Production Systems. Mapping and Basic Information.

TRANSPORTATION INFRASTRUCTURES
Roads and highways. Railways. Passenger and Freight Railway Stations. Metro and Light Rail. Airports. Bridges and other engineering structures.

ENVIRONMENT
Environmental Impact Assessment. Environmental Management, Monitoring and Auditing. Pollution Control. Landscaping. Land Management. Recovery of Degraded Areas. Waste Landfills.

GEOTECHNICAL STRUCTURES
Tunnels and Caverns. Slopes in Fill and Cut Section. Special Foundations Breakwaters. Embankment Works.

MARITIME AND FLUVIAL WORKS
Wharfs. River Training. Quay Rehabilitation. Flood and Flow Control.

MINING INDUSTRY
Environmental Studies. Design of Tailings Dams and Related Structures. Safety Assessment of Tailings Dams. Design Review of Tailings Dam Closure. Operations Maintenance and Monitoring Manual for Tailings Dams. Risk Analysis.
Mine Closure Plan. Training.

BUILDINGS
Residential and Services Buildings. Industrial Buildings.
Steel and Mixed Industrial Structures. Rehabilitation and Restoration of Ancient Buildings.

CARTOGRAPHY AND CADASTRE
Geographic Information Systems (GIS). Digital Cartography. Thematic Cartography. Thematic Cadastres. Land Acquisition.

SAFETY CONTROL AND REHABILITATION
Expertise, Monitoring. Inspection and Reinforcement of Dams and Transportation Infrastructures. Works Instrumentation. Project Maintenance and Operation.

PROJECT MANAGEMENT AND CONSTRUCTION SUPERVISION
Project Management. Cost Management. Site Supervision.
Quality Assurance/Quality Control.

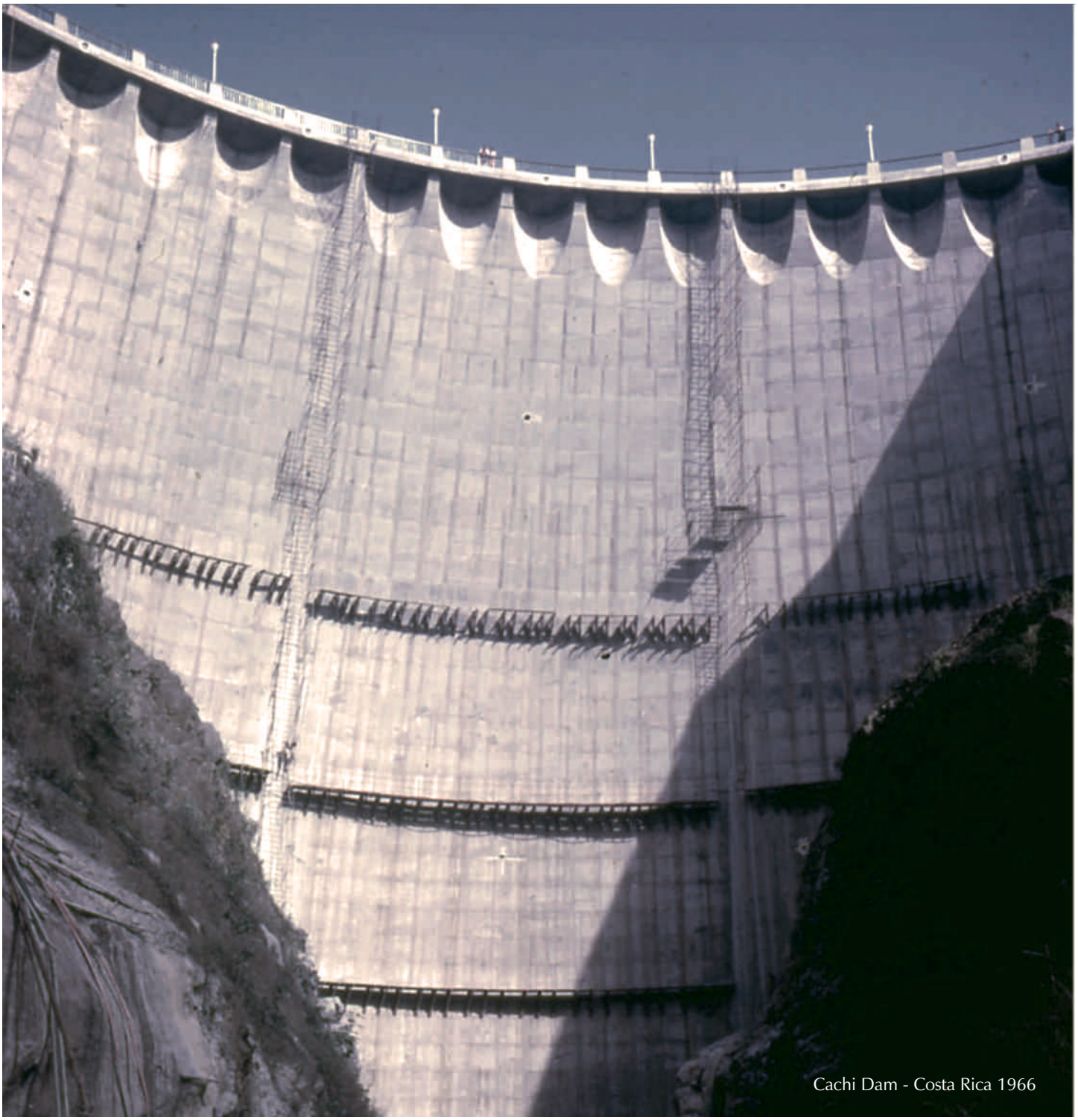
DAM ENGINEERING

COBA's activity associated to dam design dates back to its foundation and represents the field in which COBA is internationally renowned, having designed and provided technical assistance to dams in Europe (Portugal, Spain, Greece and Turkey), Africa (Angola, Algeria, Cape Verde, Guinea-Bissau, Guinea-Conakry, Mozambique, Senegal and Tunisia), America (Brazil, Costa Rica, Dominican Republic and Venezuela) and Asia (Vietnam).

COBA began its activity with the design of concrete dams, having contributed to the evolution of knowledge of science and technique of arch dams. Reference is made to the trial load method, totally conceived by the firm's experts in the 60's. Later on, COBA's experience extended to the design and construction of earthfill dams and, more recently, to RCC (roller compacted concrete) dams.

Within its several Departments, besides the design of the dam itself, COBA also undertakes all associated activities, such as hydrological studies, geological and geotechnical studies, hydraulic structures designs, design and specifications for hydro and electromechanical equipment, power generation and distribution and environmental studies.

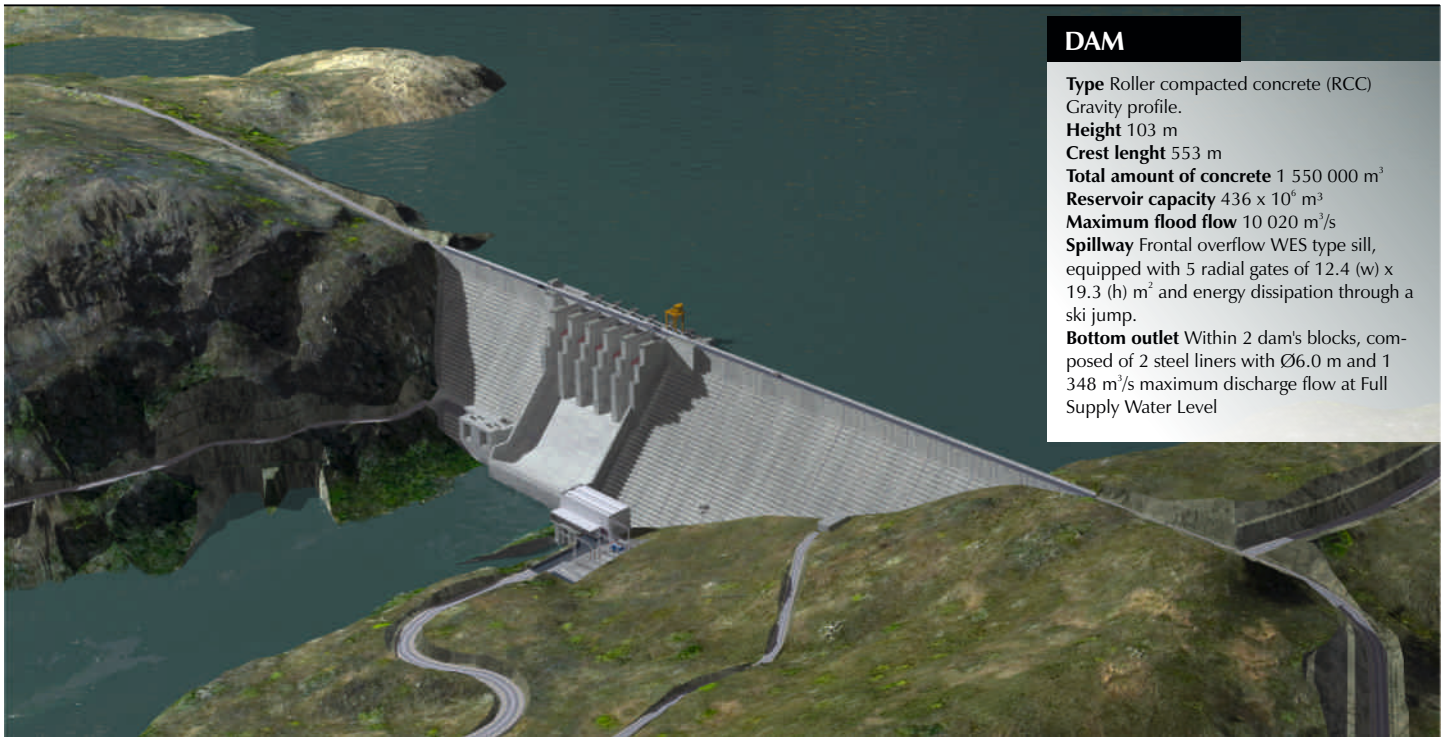
Furthermore, COBA's experts have frequently participated in expertise missions and Consulting Panels for international financing agencies and other organizations, in a large number of countries.



Cachi Dam - Costa Rica 1966

CACULO CABAÇA HYDROPOWER DEVELOPMENT
KWANZA RIVER - ANGOLA

Detailed Design and Tender Documents: 2013-2015 | **Technical Assistance to the Owner and Construction Design Review:** 20172024



DAM

Type Roller compacted concrete (RCC) Gravity profile.
Height 103 m
Crest lenght 553 m
Total amount of concrete 1 550 000 m^3
Reservoir capacity 436 x 10^6 m^3
Maximum flood flow 10 020 m^3/s
Spillway Frontal overflow WES type sill, equipped with 5 radial gates of 12.4 (w) x 19.3 (h) m^2 and energy dissipation through a ski jump.
Bottom outlet Within 2 dam's blocks, composed of 2 steel liners with Ø6.0 m and 1 348 m^3/s maximum discharge flow at Full Supply Water Level

The Caculo Cabaça Hydropower Development is the third scheme of the cascade development in the middle section of the Kwanza River, located upstream of the Caculo Cabaça falls, about 260 km from the city of Luanda. It will be the fourth scheme built in the river, upstream of Cambambe and downstream of Capanda and Laúca. The detailed design layout adopted for this scheme considered the integrated operation with Capanda and Laúca Hydropower Developments.

The Caculo Cabaça dam, with a straight axis, is an RCC gravity dam with upstream conventional concrete face and a maximum height of 103 m above the lowest foundation level in the river bed. The crest has a total length of 553 m and is 9 m-wide. The dam profile has a downstream face sloped at 0.85h:1.0v and a vertical upstream face. In the central blocks, aligned with the main river bed, the dam accommodates a frontal overflow spillway with a 10 020 m3/s design flood. The spillway is divided into five bays, controlled by 12.4(w)x19.3(h) m2 radial gates. The flow is guided along the downstream surface of the dam onto a flip-bucket that directs the water into an evolving plunge pool on the river bed rock mass.

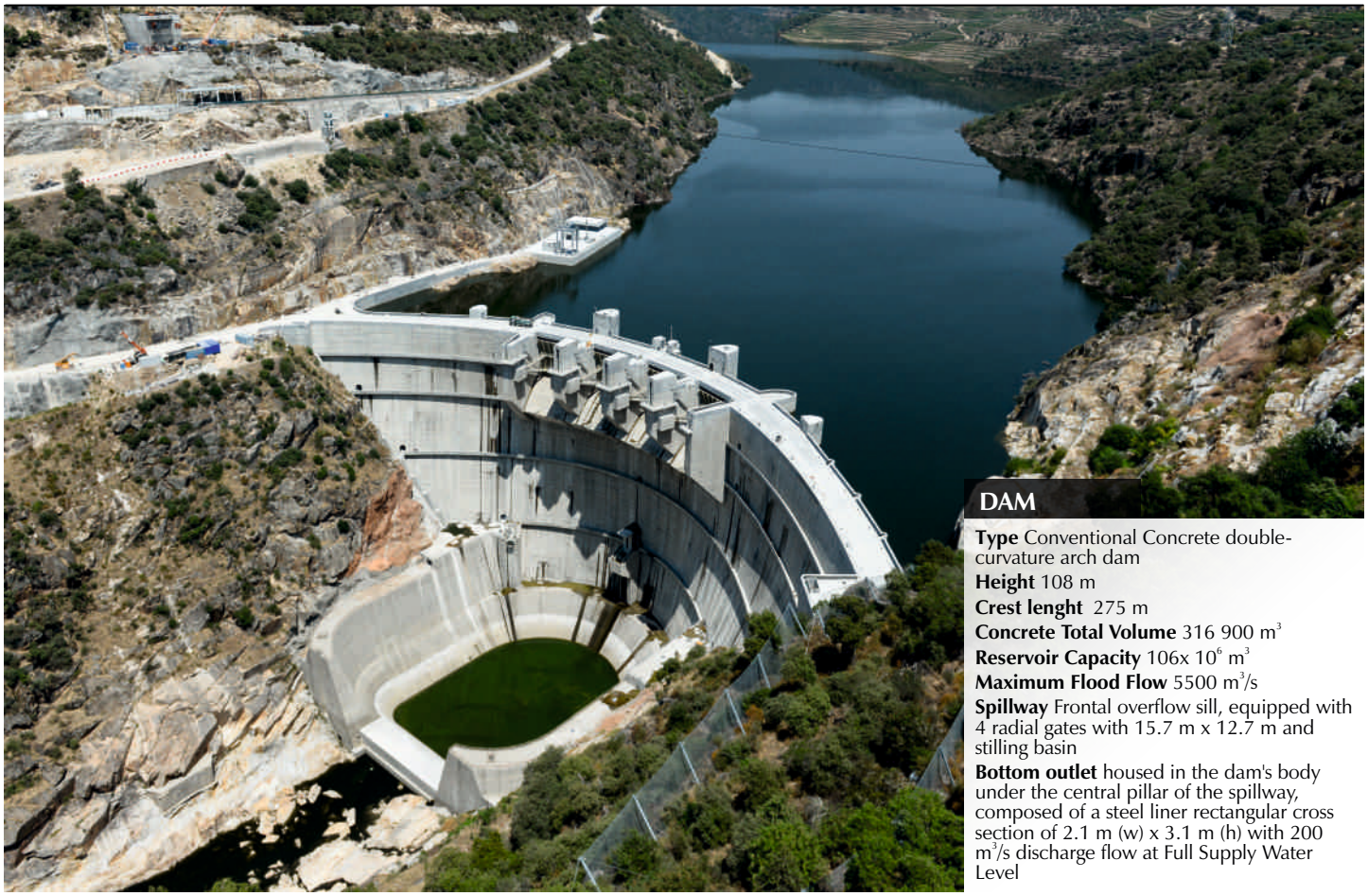
The double bottom outlet is located in the two blocks contiguous with the spillway, on the right side. It is steel lined, with a diameter of 6.0 m and a maximum discharge flow of 1 348 m3/s at Full Supply Water Level. The waterway system of the environmental flow power plant, located on the block adjacent to the spillway on the left side, is also steel lined with a diameter of 4 m and includes an independent submerged intake tower, 25 m-high, protected by trash racks.

Two saddle dams on the left bank are required to close the reservoir with crest lengths of 525.0 m and 192.0 m, included on the alignment of the road connecting the dam to the water intake of the main powerplant's waterway system. Both saddle dams, with maximum heights of 36.0 m and 4.0 m respectively, are RCC gravity dams.

The Caculo Cabaça Hydropower Development additionally integrates a main underground powerplant, with a waterway system on the left bank as well as an environmental flow power plant at the dam's toe. The underground power plant is equipped with four vertical axis Francis turbines including cylindrical valves with a nominal capacity of 530 MW, coupled to 590 MVA generators, operating at a nominal net head of 209 m. The environmental flow power plant is also equipped with one vertical axis Francis turbine with a nominal capacity of 52 MW.

FOZ TUA HYDROPOWER DEVELOPMENT
TUA RIVER - PORTUGAL

Detailed Design and Tender Design Documents of the Waterway System, Powerplant and Substation: 2010-2011;
Construction Design and Technical Assistance to the Dam's construction works: 2011-2016



DAM

Type Conventional Concrete double-curvature arch dam
Height 108 m
Crest lenght 275 m
Concrete Total Volume 316 900 m^3
Reservoir Capacity 106x 10^6 m^3
Maximum Flood Flow 5500 m^3/s
Spillway Frontal overflow sill, equipped with 4 radial gates with 15.7 m x 12.7 m and stilling basin
Bottom outlet housed in the dam's body under the central pillar of the spillway, composed of a steel liner rectangular cross section of 2.1 m (w) x 3.1 m (h) with 200 m^3/s discharge flow at Full Supply Water Level

The Foz Tua Hydropower Development, located on the Tua River, near the confluence with the Douro River, integrates a dam, an underground waterway system on the right bank and a reversible powerplant installed in two shafts, covered at the surface by the operation building.

This scheme is part of the studies carried out by COBA within the scope of the National Program of Dams with High Hydroelectric Potential, in Portugal, in 2007.

COBA's studies included the Detailed Design and Tender documents of the powerplant and waterway system and the Construction Design and Technical Assistance to the dam's and temporary river diversion's works.

The Foz Tua dam is a conventional concrete double-curvature arch dam with a maximum height 108 m. The crest has a length of 275 m and a thickness of 5 m. The maximum thickness of the central cantilever at the base is 22 m and that of the arches' insertion on the banks is 32 m. The theoretical volume of the arch dam body is approximately 316 900 m^3.

The spillway, located in the central area of the dam's crest, with a maximum design flow of 5500 m^3/s, includes a frontal overflow sill structure and a stilling basin for energy dissipation. It is divided into four bays by pillars with a hydrodynamic shape, with 7.7 m maximum thickness, and each bay is equipped with 15.7(w)x12.7(h) m^2 radial gates. The frontal overflow sill has a WES type profile, ending 14 m away from its crest. The energy dissipation of the discharged flow is done by damping in the water inside the concrete stilling basin, located on the river bed, in the extension of the dam's toe.

The bottom outlet, housed in the dam's body under the central pillar of the spillway, has a maximum discharge flow of 200 m^3/s at full water supply level and is composed of a steel lined rectangular cross section of 2.1 m (w) x 3.1 m (h).

The power plant is composed of two shafts, covered at the surface by the operation building, which have a total height of 98.6 m. The average annual energy generation is 349 GWh, of which 44 GWh correspond to reversible energy.

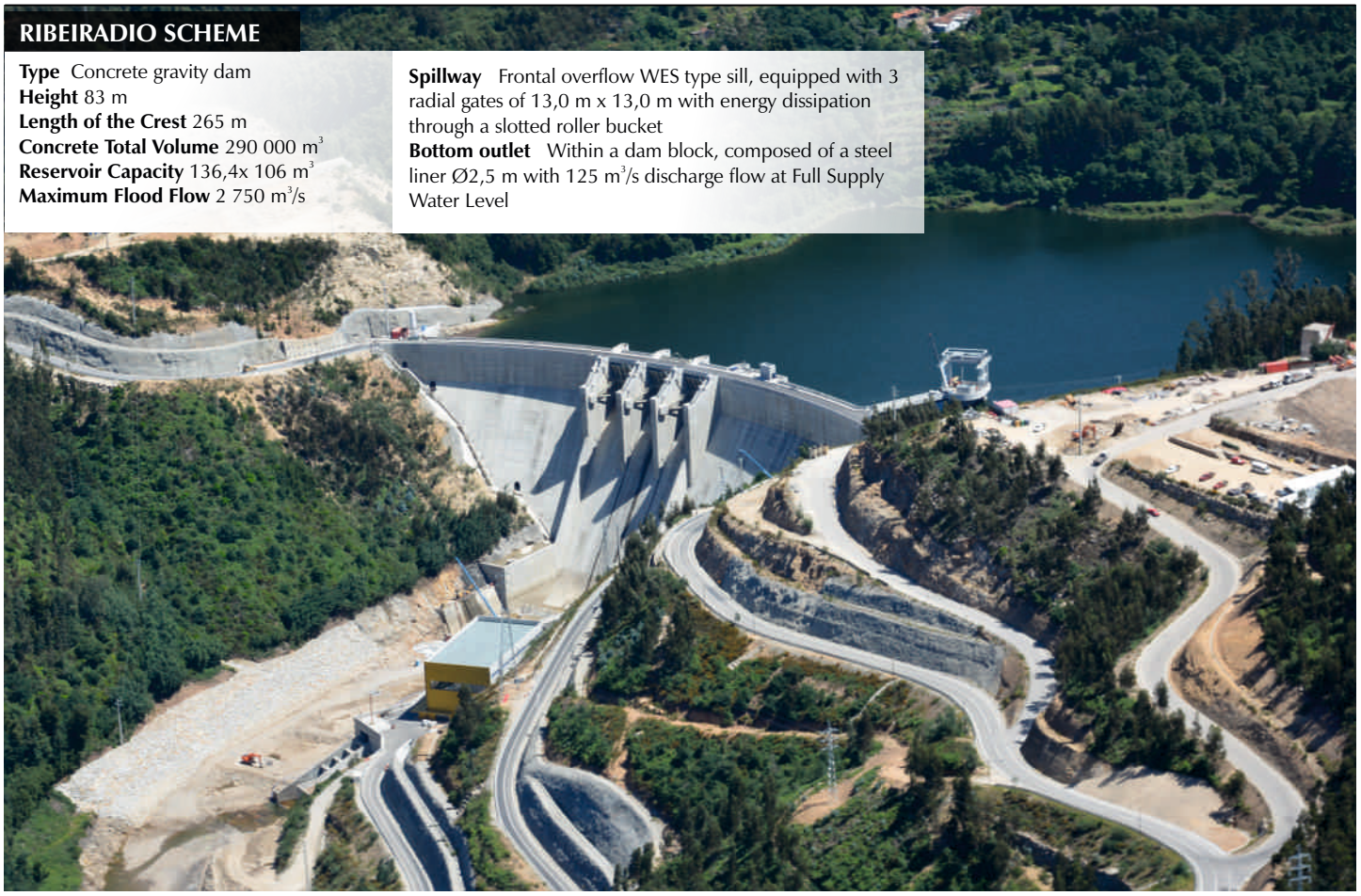
RIBEIRADIO - ERMIDA HYDROPOWER DEVELOPMENT
VOUGA RIVER - PORTUGAL

Preliminary Study, Detailed Design and Tender Documents: 2007-2009 | **Construction Design and Technical Assistance of the works:** 2010-2015

RIBEIRADIO SCHEME

Type Concrete gravity dam
Height 83 m
Length of the Crest 265 m
Concrete Total Volume 290 000 m^3
Reservoir Capacity 136,4x 106 m^3
Maximum Flood Flow 2 750 m^3/s

Spillway Frontal overflow WES type sill, equipped with 3 radial gates of 13,0 m x 13,0 m with energy dissipation through a slotted roller bucket
Bottom outlet Within a dam block, composed of a steel liner Ø2,5 m with 125 m^3/s discharge flow at Full Supply Water Level



Ribeiradio scheme's initial studies date back to 1975. In 2007, the EDP-MARTIFER Consortium was awarded the concession for the use of water from the Vouga River, on a site called Ribeiradio-Ermida, and hired COBA to prepare studies, projects and environmental impact studies of the hydropower development.

The Ribeiradio-Ermida Hydropower Development is composed of two schemes. Ribeiradio, upstream, is the main scheme of the project. Downstream, a secondary scheme, Ermida, has as main purpose to create a reservoir to regulate the flow released by the Ribeiradio powerhouse, allowing its regular flow and avoiding sudden flow variations downstream which can be potentially harmful. The Ermida scheme also includes a small power plant.

The Ribeiradio dam is a concrete gravity dam, with a maximum height of 83 m, length of 265 m at the crest following a circular alignment with radius of 240 m and a total concrete volume of 290 000 m^3.

The dam includes a gated spillway, located over the dam's central blocks, with 2 750 m^3/s design flood, divided in three bays, and equipped with 13x13 m^2 radial gates. The discharged flow is guided along the downstream surface of the dam into a slotted roller bucket that restores the water into the river. The bottom outlet is located in the block adjacent to the spillway, on the left side, steel lined, with a diameter of 2.5 m and a maximum discharge flow of 125 m^3/s at Full Supply Water Level.

The Ermida dam is also a concrete gravity dam, with a straight axis, 35 m of maximum height above the foundation and 175 m development at the crest and a total concrete volume of 85 000 m^3. The uncontrolled overflow spillway, with a WES type weir profile, is located in the dam's central section and has a total length of 55 m. The discharged flow is conducted along the downstream surface of the dam into a hydraulic jump stilling basin. The bottom outlet is steel lined with 1,0(w) x 1,2(h) m^2 and has a discharge flow of 10 m^3/s at Full Supply Water Level.

The powerplant of the Ribeiradio scheme is equipped with a vertical axis Francis turbine with 74,5 MW nominal capacity and has an average annual energy generation of 117 GWh. The Ermida scheme is equipped with two tubular horizontal axis Kaplan turbines, with upstream S, each one with 3.9 MW nominal capacity and a design flow of 25 m^3/s.

The construction of the hydropower development started in July 2010 and its commercial operation began in 2015.

ERMIDA SCHEME

Type Concrete gravity dam
Height 35 m
Length of the Crest 175 m
Concrete Total Volume 85 000 m^3
Reservoir Capacity 3,9x 106 m^3
Maximum Flood Flow 2 750 m^3/s

Spillway Frontal uncontrolled overflow WES type sill with energy dissipation by a hydraulic jump stilling basin
Bottom Outlet Within a dam block, steel lined with a cross section of 1,0(w) x 1.2(h) m^2 with a maximum discharge flow of 10 m^3/s at Full Supply Water Level

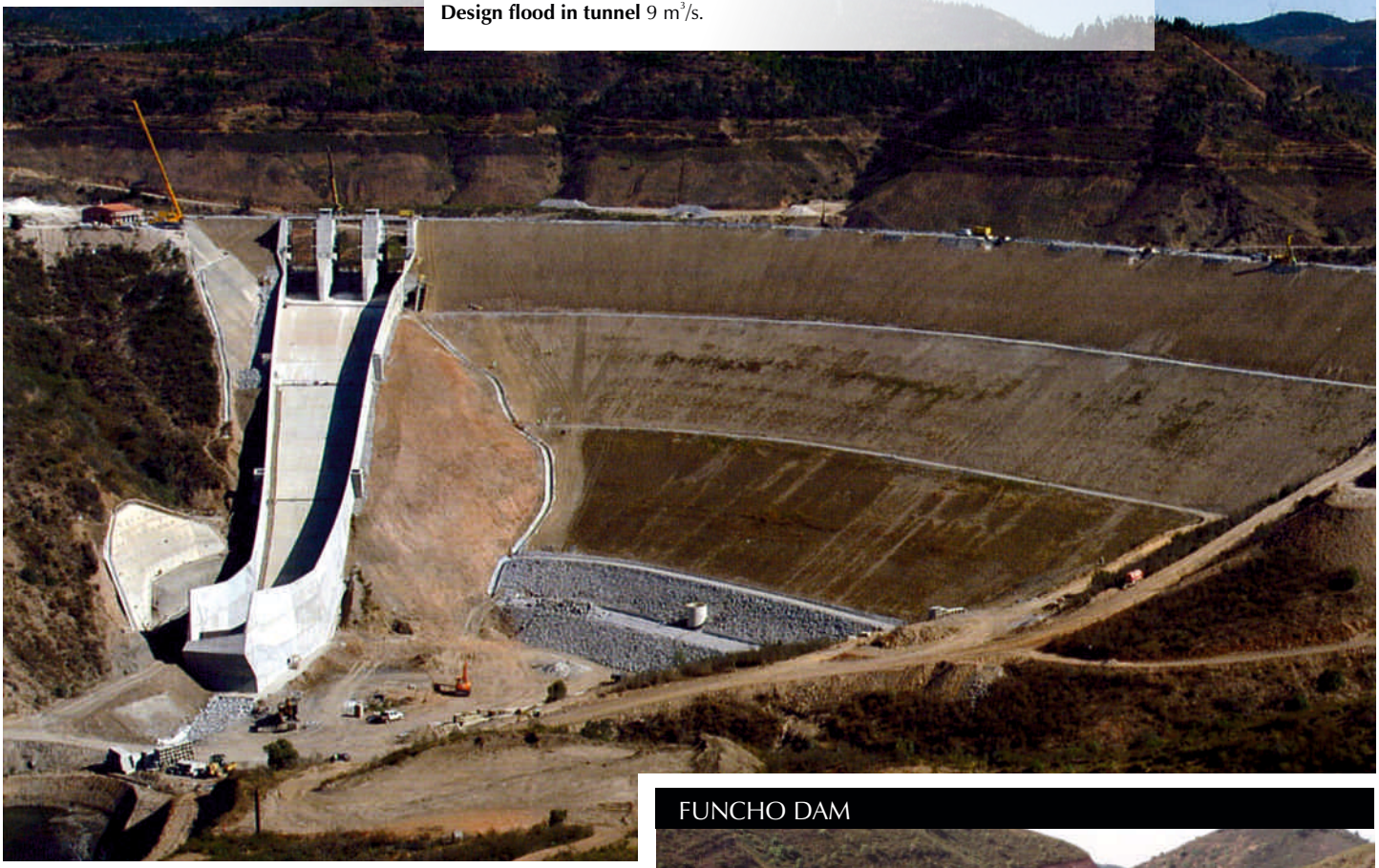
ODELOUCA - FUNCHO HYDRAULIC DEVELOPMENT
ODELOUCA RIVER - PORTUGAL

Final Design: 1999-2001 | **Technical Assistance to the Odelouca-Funcho Interconnection Tunnel:** 2002-2005

ODELOUCA DAM

Type Zoned earthfill dam with clayey core;
Height 76 m;
Crest lenght 415 m
Total amount 2020 x 103 m^3;
Reservoir capacity 157 x 106 m^3;
Maximum flood flow 1513 m^3/s

Spillway 2 205 m^3/s - channel with frontal weir controlled by three gates
Bottom Outlet gallery (Ø 2,0 m) installed in the provisional diversion tunnel
Provisional diversion in tunnel, 435 m long, set up on right bank
ODELOUCA-FUNCHO HYDRAULIC CIRCUIT (TUNNEL)
Lenght 8 150 m;
Diameter 2,4 m;
Total amount of concrete 16 300 m^3;
Design flood in tunnel 9 m^3/s.



The Odelouca dam and the interconnection tunnel comprise key structures of the Odelouca-Funcho System, which largely solved the serious water shortages for public consumption and for irrigation in the Western Region of Algarve.

The first studies of the Odelouca dam were concluded in 1977.

During 1995 and 1996 the design review was completed with the corresponding environmental impact studies. Owing to environmental constraints, the Owner moved the dam site to the Odelouca valley, upstream the confluence with the Monchique stream, in the district of Faro, Algarve region. It was then necessary to undertake a new dam design called Odelouca II.

The project has the essential purpose of public water supply to the municipalities of Vila do Bispo, Lagos, Portimão, Lagoa, Silves, Albufeira and West Loulé.

The Funcho dam aims at the flows regulation of the Arade stream for irrigation and water supply to the "Barlavento Algarvio" (Western region of Algarve)

General Layout: 1972
Design: 1983
Technical Assistance: 1987 - 1993

FUNCHO DAM

Type Arch Dam
Hight 49 m
Crest lenght 210 m
Total amount of concrete 44 x 10^3 m^3
Reservoir capacity 43 x 106 m^3
Maximum flood flow 800 m^3/s
Spillway 75 m^3/s - overflow with gates
Bottom Outlet 2 x 162 m^3/s - 2 orifices

IRAÍ HYDRAULIC DEVELOPMENT
IRAÍ RIVER - BRAZIL

Detailed Design, Environmental Impact Assessment: 1996 | **Technical Assistance and Works Management:** 1996-1999 | **Dam Safety Assessment:** 1999-2002

DAM

Type earthfill
Height 19 m
Crest lenght 1 220 m
Total amount 786 x 10^3 m^3
Reservoir capacity 58 x 10^6 m^3
Maximum flood flow 1 005 m^3
Spillway 80 m^3/s, shaft with non-controlled weir
Bottom Outlet 16,2 m^3/s, gallery

Located in the Curitiba Region, the Iraí dam envisages the reinforcement of the water supply to the Curitiba metropolitan area and the upstream flood control.

The valley is 1220 m-long, 1000 m of which correspond to the plain with surface water tables and difficult geotechnical conditions which have constrained the definition of the typical profile and the works phasing. The rock mass level was identified at a depth of 6 m in the plain's central area, deepening until about 30 m towards the abutments, and therefore it was deemed that the dam foundations must stay on the soils' superior levels, and therefore the dam's foundations were executed on the soil's upper levels, by resorting to stabilizing berms. These conditions made the undertaking's construction difficult and led to a close monitoring by COBA's Technical Assistance and Works' Management and Supervision teams.

One of the main concerns upon developing the Environmental Impact Assessment studies was to keep the water quality in the Iraí reservoir, by adopting effective activity control and management measures, bearing in mind the strong anthropic pressure in the hydrographic basin's area. On the other hand, particular emphasis has been given to the sanitation of pollution sources as well as to the soil use management measures in the hydrographic basin, in order to keep the water quality.

Within the scope of this project, guidelines for a water quality monitoring programme in the reservoir were also developed, as well as the definitions of measures for the control and management of the soil around the reservoir and the other areas of the hydrographic basin.

The elaboration of the Detailed Design and remaining activities the teams were responsible for took place between 1996 and 1999. Upon SANEPAR's request, COBA was responsible for the Monitoring, Inspection and Analysis of the Works' Behaviour in the first filling and subsequent phases, between 1999 and 2002.

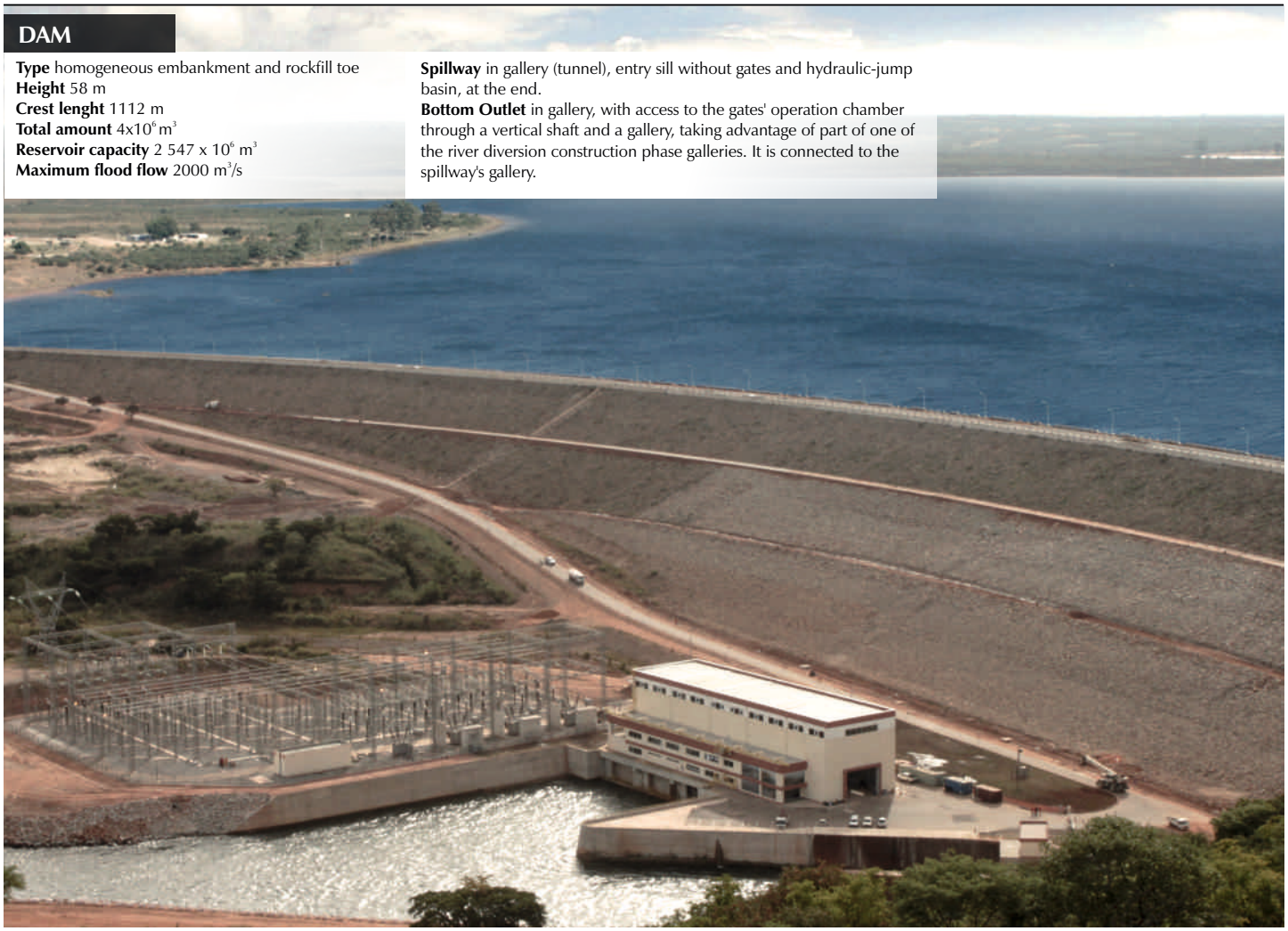
GOVE HYDROPOWER DEVELOPMENT
CUNENE RIVER - ANGOLA

Detailed Design, including Preliminary Studies, Tender Documents and Technical Analysis of Contractors' Bids: 2002-2005
Detailed Design, Technical Assistance, Construction Works' Control & Supervision: 2008-2012

DAM

Type homogeneous embankment and rockfill toe
Height 58 m
Crest lenght 1112 m
Total amount $4x10^6$ m^3
Reservoir capacity 2 547 x 10^6 m^3
Maximum flood flow 2000 m^3/s

Spillway in gallery (tunnel), entry sill without gates and hydraulic-jump basin, at the end.
Bottom Outlet in gallery, with access to the gates' operation chamber through a vertical shaft and a gallery, taking advantage of part of one of the river diversion construction phase galleries. It is connected to the spillway's gallery.



The Gove dam is located in the Huambo Province, some 120 km south of the Province capital. It was built with the main purpose of flood control of the Cunene river flows and was completed in 1975. It covers a hydrographic basin of 4 667 km^2 and the reservoir, with the NWL at (1590.00), has a storage capacity of 2 547 x 10^6 m^3.

The dam was subject to sabotage actions, in 1986 and 1990, resulting in the following main damages: left bank access gallery to the longitudinal gallery, dam crest and body, bottom outlet and half bottom outlet/water intake. For safety reasons, it was necessary to lower the level of reservoir exploitation.

The rehabilitation of the dam and the remaining infrastructures, by the left abutment, had as main purpose to remove/excavate the affected embankment at crest level, over a length of approximately 70 m, which was reinforced with micro-pile injections, the reconstruction of the access gallery and the reconstruction of the embankment section.

With regards to the foundation treatment, the evidence that the cut-off structure would have lost its efficiency led to its reinforcement, by carrying out grouting works and checking of the inherent treatment, after a supplementary site investigation programme.

The treatment of the longitudinal and drainage galleries, given the seepage and obstructions with sandy material, consisted in the unblocking and structural reinforcement when deemed necessary, the waterproofing of the gallery by treating the joints with signs of seepage and/or cracking and by using cement or sandy grout consolidation injection at controlled pressures.

The rehabilitation of the downstream face of the dam was done, since it showed numerous depressions, thus preventing the serious evolution of erosion damage and fines migration from the embankment, as well as the overall rehabilitation of the exterior drainage system of the dam by catching the water from the dam's crest, building outlet infrastructures of the drained flow, increasing the flow capacity of the ditches and structurally reinforcing them. The pumping well was also subject to

rehabilitation works, by draining the downstream base of the dam, heightening of the dam crest in 1 m, resetting the safety freeboard for flood situations.

A monitoring plan was implemented and the corresponding equipment allowing a reliable follow-up of the undertaking at full service exploitation was installed. The structure of the water intake tower was also subject to repair works, the operation of the equipment was reset and the outlet channel was put out of service.

LAÚCA HYDROPOWER DEVELOPMENT
KWANZA RIVER - ANGOLA

Technical Assistance to the Owner, Detailed and Construction Design Review and Construction Works Supervision: 2014-2019

DAM

Type Roller compacted concrete (RCC) Gravity profile
Height 156 m
Length of the Crest 1 200 m
Concrete Total Volume 2 940 000 m^3
Reservoir Capacity 5 482 x 106 m^3
Maximum Flood Flow 10 020 m^3/s

Spillway
Frontal overflow WES type sill, equipped with 3 radial gates of 15,0(w) x 21,9(h) m^2 with energy dissipation through a ski jump

Bottom outlet
Within a dam block, steel lined with a cross section of 5,6(w) x 6,7(h) m^2 and with a discharge flow of 1 310 m^3/s at Full Supply Water Level

The Laúca Hydropower Development is the second scheme of the cascade development in the middle section of the Kwanza River in Angola, located about 300 km from Luanda.

The Laúca dam is an RCC dam with upstream conventional concrete face and has 156 m of maximum height and a concrete volume of about 2 940 000 m^3. The dam's profile is a gravity type profile with a vertical upstream face and the downstream face sloped at 0.85h:1.0v. The dam, with a total length at the crest of about 1 200 m, is divided into 63 blocks with an average width of 19 m.

The spillway, located over the four blocks near the river bed, with a design flow of 10 020 m^3/s, is composed of three bays bounded by four reinforced and prestressed pillars, equipped with 15.0(w) x 21.9(h) m^2 radial gates.

The dam includes a bottom outlet, installed on the block adjacent to the spillway on the left side, with a rectangular cross section of 5,6(w) x 6,7(h) m^2 and 1 310 m^3/s design flow at Full Supply Water Level. The dam still accommodates the water intake of the environmental flow powerplant's waterway, in one block of the right bank.

Besides the dam, the Laúca Hydropower Development also integrates a main underground waterway and power plant equipped with six vertical axis Francis turbines with a total nominal capacity of 2004 MW and a power plant which turbines the environmental flow, equipped with one vertical axis Francis turbine, with a nominal capacity of 66 MW.

Recent and ongoing main projects	Design Phase	Dam		Power (MW)	Ending Date
		Type	Height (m)		
PORTUGAL					
Foz Tua Dam	Construction Design and Technical Assistance		108	—	2017
Repowering Salamonde Hydropower Development - Salamonde II Power Plant	Detailed, Tender and Construction Design and Technical Assistance		—	206	2016
Ribeiradio-Ermida Hydropower Development – Ribeiradio Scheme	Detailed, Tender and Construction Design and Technical Assistance		83	74,5	2015
Ribeiradio-Ermida Hydropower Development – Ermida Scheme	Detailed, Tender and Construction Design and Technical Assistance		35	4	2015
Baixo Sabor Downstream Scheme - Power Plant and Hydraulic Conveyance System	Construction Design and Technical Assistance		—	36,4	2014
Foz Tua Power Plant and Hydraulic Conveyance System	Detailed and Tender Design		—	262	2011
Repowering Alqueva Hydropower Development - Alqueva II Power Plant	Detailed, Tender and Construction Design and Technical Assistance		—	260	2012
Repowering Pedrogão Hydropower Development - Pedrogão II Power Plant	Detailed and Tender Design		—	13,3	2010
Fridão Power Plant and Hydraulic Conveyance System	Preliminary Design		—	241	2009
Alvito Dam	Preliminary Design		88	—	2009
ANGOLA					
Caculo Cabaça Hydropower Development	Detailed and Tender Design and Review and Approval of the Construction Design		103	2172	Ongoing
Laúca Hydropower Development	Review and Approval of the Preliminary and Construction Design and Work Supervision		156	2070	Ongoing
Jamba-ia-Oma Hydraulic Development	Detailed and Tender Design		47	79	2011
Jamba-ia-Mina Hydraulic Development	Detailed and Tender Design		38,5	205	2012
Repowering Luachimo Hydropower Development	Detailed, Tender and Construction Design and Technical Assistance		—	32,8	Ongoing
Chicapa II Hydropower Development	Detailed and Tender Design		31	39	2016
Matala Hydropower Development	Rehabilitation Design		—	41	2013
MOZAMBIQUE					
Mapai Hydraulic Development	Feasibility Study and Preliminary Engineering Design		53	18,4	2018
Moamba Major Hydraulic Development	Detailed, Tender and Construction Design and Technical Assistance		44	15	Ongoing
Mphanda Nkuwa Hydropower Development	Environmental and Social Impact Assessment		103	1500	2012
ALGERIA					
Seklafa Dam	Detailed and Tender Design		47	—	2010
Dermoun Dam	Detailed and Tender Design		40	—	2010
Beni Slimane Dam	Detailed and Tender Design		66	—	2011
Charchar Dam	Detailed and Tender Design		45	—	2016
Koudiat Ben Aida Dam	Preliminary Design		26,5	—	2015
BounachiDam	Detailed and Tender Design		58	—	Ongoing
Ighil Emda Dam	Rehabilitation Design		75	—	2018
Fontaine des Gazelles Dam	Rehabilitation Design		42,5	—	2018
OTHER COUNTRIES					
Kholombidzo Hydropower Development (Malawi)	Feasibility Study and Preliminary Engineering Design		17	218,8	2017
Maranhõn Hydraulic Development (Peru)	Construction Design and Technical Assistance		21,5	90	2014

- Arch Dam - Concrete Gravity Dam - Earth fill Dam

JULY| 2023

coba GROUP

ENGINEERING AND ENVIRONMENTAL CONSULTANTS

PORTUGAL
COBA Portugal
Av. 5 de Outubro, 323, 1649-011 LISBOA
Tel.: (351) 210 125 000
Tel.: (351) 217 925 000
Fax: (351) 217 970 348
Email: coba-pt@cobagroup.com

ANGOLA
COBA Angola
Rua Marechal Brós Tito, Nº 35/37,
Edificio Escom, 14º Andar B - LUANDA
Tel.: (244) 225 300 073
Fax: (244) 225 300 074
E-mail: coba-ao@cobagroup.com

MOZAMBIQUE
COBA Moçambique
Edifício Jat-VI City Mall
Rua dos Desportistas nº 733,
1º Andar, Escritório 55, MAPUTO
Tel.: (258) 21 328 813
Fax: (258) 21 016 165
Email: coba-mz@cobagroup.com

ALGERIA
COBA Algérie
09, Rue des Frères Hocine
El Biar - 16606, ARGEL
Tel.: (213) 21 922 802
Fax: (213) 21 922 802
E-mail: coba-dz@cobagroup.com

COLOMBIA
COBA Colombia
Carrera 47 Nº 103-29
Bogotá D.C. - Colombia
Tel: (57) 314 696 9491
Tel: (57) 601 636 0222
E-mail: d.rocha@cobagroup.com

PERU
COBA Perú
JR BRONZINO 598
Urbanización: San Borja
Distrito. SAN BORJA
Provincia y Departamento: LIMA
E-mail: c.gomes@cobagroup.com