



# SIKA AT WORK

## TONA DAM: FLOW CONTROL OF TONA RIVER, COLOMBIA

Sika® WT TECHNOLOGY

BUILDING TRUST



# TONA DAM FLOW CONTROL TONA RIVER

## PROJECT DESCRIPTION

The reservoir of the Tona river, one of the fundamental constructions for Bucaramanga and its metropolitan area, will guarantee the supply of drinking water over the next 30 years. The project is located 15 kilometers from the center of Bucaramanga in the canyon formed by the river Tona.

This initiative was divided into two stages: the first phase includes the construction of a dam in CFRD (Concrete-faced rockfill dam) with waterproof concrete and a water tunnel of 4 kilometers. The second involves the construction of a drinking water treatment plant, the 17 km waterline from the treatment plant to the main tank of Giron's City and finally the distribution network.



This is the project in numbers:

Dam height	103 m
Mirror	54 hectares of water
Storage capacity	17.6 million m <sup>3</sup>
Girón Line	17 kilometers
Deviation tunnel length	380 meters
Road Tunnel	504 meters
Adduction line	4 kilometers
Investment	COP 236.104.000.000

Construction began in July of 2010 and has been finished in November 2015.

The object of the contract included:

- Construction pre-cofferdam
- Diversion tunnels
- Uptake tunnel
- Road tunnel
- Landfill
- Down take with their respective access gallery
- Water intake structure (vertical well and intake tunnel)
- Connection to the water treatment plant named "Algerinos"
- Slope stabilization
- Alternative roads

## PROJECT REQUIREMENTS

Given the importance of this project, it must follow all necessary precautions to ensure compliance with all the rules associated with specifications, looking for durable and high performance concrete in terms of strength, permeability and sustainability.

Sika admixtures and other products played an important role to achieve the requirements for each part of the structure.

The caregiving of the material after it is poured was done with



Sika curing agents.

On the other hand, it is necessary to have elastic materials to ensure the seal the face of the dam and the watertight structures where it must have perfect installation of the products to avoid water income.

As explained above, the project needed a whole package of solutions in all its processes and for this Sika Colombia S.A. had permanent technical staff on site throughout the construction phase.



## SIKA SOLUTION

Each product was evaluated previously in the laboratory, either in the facilities of Sika and/or in the project and then field testing was performed to demonstrate that was the best alternative technology. These tests were executed carefully following the specifications of the project.

### 1. Alkali-Silica-Reaction resistant shotcrete

The Alkali-Silica-Reaction, which can occur with aggregates, presents a particular challenge and can affect the durability of concrete. The addition of e.g. Silica fume can suppress the Alkali-Silica-Reaction and hence improve the durability of the concrete.

In the case of shotcrete, Sika proposed SikaFume® in order to mitigate the effect of alkali-aggregate reaction.

### 2. Conventional concrete

Thanks to using admixtures with high power of water reduction (SikaPlast®-326 and SikaPlast®-328), could be achieved optimized concrete with a reduction of cement in each of the designs in 40 kg. These also gave long slump times without significant alteration in the hardening of concrete. It enabled Sika, in the advanced stages of the construction, to be total supplier of admixtures for the specific project.

### 3. Waterproof concrete

In the dam's face, where the strength of 3000 psi (approx. 20 MPa) was specified with low permeability, it must be designed a concrete with 0.5 water cement ratio (w/c-ratio), and that led to a 385 kg of cement concrete to achieve slump and strength.

Sika proposed Sika® WT 100 lowering to 345 kg of cement with a higher w/c-ratio of 0.55. Both mix designs incorporated approx. 30 % of flying ash replacement.



	Original mix design [kg/m <sup>3</sup> ]		Sika Solution [kg/m <sup>3</sup> ]	
Cement	270		242	
Fly ash	116		104	
Water	96.3		100	
Ice	96.3		100	
Sand	734		793	
Gravel 16 mm	428		458	
Gravel 36 mm	538		562	
Admixture	Retarder	1.35	Plastiment	1.17
	Mid-range water reducer	5.01	SikaPlast®-328	0.79
			Sika® WT 100	6.90



## SIKA PRODUCTS

The following Sika product has been used:

- Sigunit® L-54 AF MO
- SikaPlast®-328
- SikaPlast®-326
- Plastiment® AD-30
- SikaTard® 930 CO
- Sika® WT 100
- Banda Lisa PVC
- Sika Waterstop
- Antisol® blanco
- Antisol® Rojo
- Antisol® Blanco pigmentado
- SikaGrout 212
- SikaTop® 122
- Sikadur®-35 HI MOD LV
- Sikadur® Anchorfix 4
- Sikadur®-42 Anclaje
- Sikadur®-32 Primer
- SikaFume®

## PROJECT PARTICIPANTS

Owner: AMB

Contractor: CONALVIAS CONSTRUCCIONES S.A.

Interventoría: CONSORCIO INAR

Acknowledgement: Javier Escolar and Jorge Rodríguez, Sika Colombia S.A.

Our most current General Sales Conditions shall apply. Please consult the most current local Product Data Sheet prior to any use.



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