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Roller Compacted Concrete Dams

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Preface

To satisfy the demands for water, which is essential for life and human development, it has been necessary, since more than 5,000 years, the construction of more than 48,000 large dams. These large dams and reservoirs, regulate some 3,500 Km^3 per year, a 28% of the available water resources. All the socioeconomic indicators show that in the future, in the next 25 years, it will be necessary an increase of the water regulated by the reservoirs up to a minimumm of 35%, which would require increasing the storage capacity of the dams and reservoirs by some 2,000 Km^3, about 30% of the actual reservoir storage capacity.

The water regulated by dams and reservoirs produces irreplaceable benefits in the irrigation, water supply, hydropower, flood mitigation, navigation, recreation, tourism, etc. So, the irrigation reaches 17% of the world's arable land, and produces 40% of the total of the world crop. The reservoirs regulate the water around 40% of the irrigated lands, which signifies about 15% of the total of food production. The hydropower signifies the 20% of the total generation of electricity, and 20% of the dams have as one of their purposes the mitigation of the important damages and impacts produced by the floods.

The dam engineering has always paid a very special attention to the issues relative to the safety, economy and speed in the construction of dams. Through the years the dam tipology has gone evolving toward shapes where they use better the resistant qualities of the concrete, like in the arch dams, and also the dam technology has used a more effective setting in work of the materials of the embankment dams.

In the decade of the 80's the first experiences of dams of Roller Compacted Concrete (RCC) dams, began, combining the properties of durability and resistance of the concrete, with its setting in work by means of similar equipment to that used in the embankment dams. From then there has been a wide expansion of the method of the RCC dams throughout the world. At the end of the year 2002 there were in the world 251 RCC large dams in operation, and 34 under construction. The countries with a greater number of RCC dams are: China with 45 dams, Japan 42, USA 36, Brazil 29, and Spain 21 RCC dams.

The RCC dams have the important advantages of being more economical and to be able to be built quickly, with which the objectives of the regulation and production are obtained sonner. In this way it is possible to achieve an adequate balance among economy, safety and environmental respect. In the last years the size of the RCC has been increased in a very significant way, and at the present time some of the largest and highest dams in the world are now being constructed of RCC. In July 2001 the higest RCC gravity dam in the world, Longtan dam in China, with a height of 216.5 m, started to be constructed; its volume of concrete will be 6.8 million m^3, with more than 4.5 million m^3 of the RCC.

In and of itself the SPANISH NATIONAL COMMITTEE ON LARGE DAMS (SPANCOLD) and the CHINESE NATIONAL COMMITTEE ON LARGE DAMS (CHINCOLD), they have believed opportune and necessary to celebrate the IV INTERNATIONAL SYMPOSIUM ON ROLLER COMPACTED COCRETE (RCC) DAMS, to give to know the state of the art of the RCC dams and the development of their concepts and technologies, as well as the innovative methods and techniques in design and construction. This IV International Symposium follow those held in Beijing (China) in 1991, Santander (Spain) in 1995, and Chengdu (China) in 1999. For this event China and Spain, two pioneer and leader countries in RCC dams, have joined their efforts to prepare a meeting with the biggest ambitions, both in contents and in international scope.

This book is the Proceedings of the IV International Symposium on Roller Compacted Concret (RCC) dams, celebrated in Madrid (Spain) from the 17th to the 19th of November, 2003. In it are published the 145 papers presented, which come from 30 countries, and also the nine lectures imparted by world eminent experts in RCC dams. All this constitutes a complete description and analysis of the current state of the art in the field of RCC dams, as well as of the diverse technologies used in different countries that at the present time are building and designing RCC dams. The innovative methods and tecniques in design and construction of RCC dams are also presented, among those that highlight, the grout enriched RCC (GE-RCC), the sloped layer method (SLM) in the placing of the RCC, and the negative pressure chute to transport the mixes.

The works have been divided in the following six topics:

1. Advantages of RCC dams. The use of RCC in dam rehabilitation.
2. Experiences and technologies in different countries.

3. Technological innovations on RCC dams.
4. Planning and design.
5. Materials.
6. Construction and quality control. Equipment and programming.
7. Performance of RCC dams. Experiences on operation.

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