

FINAL DESIGN OF WATER TRANSMISSION AND DISTRIBUTION SYSTEMS

Goals of the Final Design Engineering

The Final Design Engineering supports and advises the Contractor in the realization of an EPC Project. The Contractor being in charge of Engineering, Procurement and Construction (EPC) will subcontract the engineering part to the **Final Design Engineer** (e.g. IBG Ltd.).

Comprehensive advice in terms of an interdisciplinary approach is mandatory in the Final Design Engineering. The focus is on establishing a robust technical solution at the least possible construction cost.

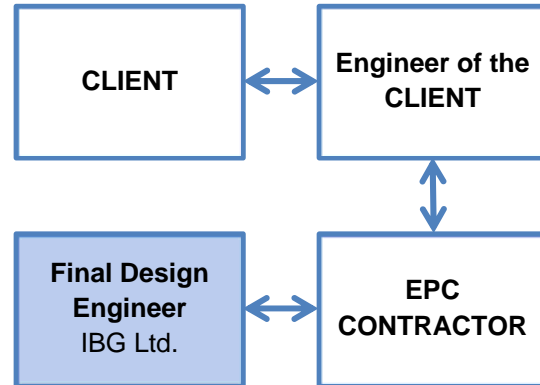


Fig.: EPC Project Organization.

Final Design Engineering in Water Transmission and Distribution Systems

The basis of the Final Design Engineering consists of the project tender documents and the local standards and guidelines. It is important to have the Final Design from one provider in order to benefit from a fast internal as well as an interdisciplinary expertise. The Final Design consists of the subsequently explained services.

The **Hydraulic Modelling** aims at getting the planned flow condition (i.e. the flow rate) at the least possible cost. Furthermore, it serves as proof for a safe operation of the pipeline system (under steady and transient load conditions) and specifies the **operation philosophy**. The flow design within tanks and reservoirs is optimized by means of computational fluid dynamic (CFD) analyses.

The **Process & Instrumentation Diagrams** (PID) illustrate the principal **functionality of a system**. It is mandatory that all the components of the system work together smoothly.

The **General Plot Plans** have a coordinating role and show a top view of the station incl. all installation and infrastructure such as buildings, shafts, piping, etc.

The **Guide Drawings** demonstrate the Final Design of buildings such as pump houses,

electrical, chemical or cooling water buildings and shafts.

The **Construction Documents** comprise the static design calculations, reinforcement and framework drawings and corresponding lists for all concrete structures. The steel tanks and special fittings (e.g. Wye pieces) are designed by means of a static 3D Finite Element Analysis (FEA).

The **Station Piping Documents** include an isometric drawing of the piping and hydraulic equipment, the pipe stress analysis and a full equipment list. The stress analysis aims at designing a piping system able to bear all operating forces such as gravity, design pressure, temperature influence and local seismic activity.

The **Pipeline Alignment Sheets** show the detailed routing of the pipeline between stations (e.g. length, profile, depth of pipe).

A **3D model for visualization** of the station (incl. the terrain, buildings and all infrastructures) completes the Final Design.

Finally, **start-up and commissioning** services are provided at site up to Final Acceptance Certificate and project hand-over to the client.

How can IBG contribute?

Thanks to our wide experience in the Final Design Engineering of water transmission and distribution systems, we are specialized in the design, optimization and control of simple to complex pipeline systems. In particular, we are able to offer interdisciplinary

expertise (e.g. hydraulic, electrical, mechanical, civil, control & supervision) from one provider. Thus, we are able to develop the best solution regarding customer-specific requirements and cost-benefit considerations.

Final Design Engineering of a Water Transmission System:

Hydraulic Modelling

Station Piping Stress Analysis

Static Civil Design

PID

Guide Drawings

CFD-Analysis

3D Model (for visualization)

Tank Farm Riyadh