Panama Canal expansion project – design and construction of lock complexes

Rüdiger Spengler
Civil Engineer
SACYR Construction
Madrid, Spain
rspengler@sacyr.com

Jesús Imedio
Civil Engineer
SACYR Construction
Madrid, Spain
jimedio@sacyr.com

Rafael Pérez
Chief Engineer
GUPC
Panama City, Panama
rafael.perez@gupc.pa

Federico Casanova
Civil Engineer
GUPC
Panama City, Panama
federico.casanova@gupc.pa

Summary

The third set of lock complexes (one complex at Atlantic site, the other one at Pacific site), were designed to permit Post-Panamax vessels to transit from ocean level to 27m higher Gatun level vice versa.

Governing hydraulic design criteria was to reduce lockage time making usage of water saving basins. Structural design was carried out taking into account usual, unusual and extreme load conditions.

Construction of both complexes is still going on, and, in order to fulfill construction site schedule, 10 to 15 lifts of a daily concrete volume between 3.000 and 5.000m^3 are poured at each site for concreting independent reinforced monoliths.

Keywords: Expansion program, third set of lock complex, hydraulic design, structural design, concrete, earthquake, construction

1. Introduction

The design and construction of a third set of lock complexes (one at Atlantic, the other one at Pacific site) is part of the expansion program of the Panama Canal. The existing canal capacity is mainly limited by the size of vessels that can transit them and the construction of a third set of locks will allow bigger vessel (called Post-Panamax) to transit the canal (see also "Panama Canal expansion project – description third set of locks project").

Each complex will have a total length of about 1770m and is constituted by three chambers (upper, middle and lower) with approximately 427m of length, 55m of width and a maximum height of 33.5m. Four lock heads, each one equipped with two rolling gates, connect ocean with lower chamber, lower chamber and middle chamber, middle chamber and upper chamber and upper chamber with lake exit. Lateral water saving basins are also provided to reduce use of fresh water.

2. Design criteria

2.1 Hydraulic design

The objective to be achieved in the hydraulic design was to develop a filling/emptying system that reduces lockage time, consistent with a safe operation that takes into full account the save movement of design vessels into and out of the locks. Alternatives of each individual component were also modeled in detail to improve the performance of the system [2].

These alternatives needed to be based on the following criteria, namely:

- Minimize the filling/emptying times to increase the vessel throughput capacity of the system
- Maintain hawser forces within the allowed limits and

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