

## New Removable Bridge over the Bay of Cadiz

**Manuel ESCAMILLA**  
Civil Eng./Assoc. Professor  
ACL/University of Cadiz  
Cadiz, Spain  
*mescamilla@acl-estructuras.com*

**Marcos MARTIN**  
Managing Director  
Civil Works Department  
Sevilla, Spain  
*mngomez@fomento.es*

**Julio CAYETANO**  
Technical Assistance Chief  
Ginprosa  
Madrid, Spain  
*j.cayetano@ginprosa.es*

**Marta SACALUGA**  
Civil Engineer  
Ginprosa  
Madrid, Spain  
*m.sacaluga@ginprosa.es*

**Gonzalo OSBORNE**  
Civil Engineer  
ACL  
Cadiz, Spain  
*gosborne@acl-estructuras.com*

**Veronica VEGA**  
Industrial Engineer  
Carlos Fernandez Casado  
Madrid, Spain  
*vvega@cfcs.com*

### Summary

The construction of the new Bridge over the Bay of Cadiz is necessary to break the secular isolation of the city. This brand new infrastructure must also be respectful and compatible with the local shipyard industry, which has many high-tech facilities inside the bay, employing nowadays more than 6000 workers. Regarding the possibility of the construction of ships or offshore structures with extraordinary dimensions, the new bridge will have a removable span, with 140 m horizontal clearance and no vertical clearance limitations. This original structure, which is in a very advanced stage of construction, will have a single 150 m long steel span with variable depth (between 3 and 8 m) and a 33,2 m wide orthotropic plate. The structural detail design and construction of the bridge is presenting many challenges in relation to its dynamic behaviour, fatigue control, durability and quality control of the manufacturing processes.

**Keywords:** Removable Bridge, orthotropic plate, lifting, Cadiz, welding.

### 1. Introduction

Cadiz, the oldest occidental city, has a 3000 year history strictly conditioned by its natural environment. Being completely surrounded by the sea, having a strategic location, near the Strait of Gibraltar and with the natural seaport configured by its bay, Cadiz has developed an incessant maritime activity, constrained however, by the restricted connections with the nearest land.

The project of the New Cadiz Link has to deal, consciously, with very sensitive environmental, social and economic boundary conditions, which deeply influenced and even determined some of the main features of the final selected design. The site through which the east end of the main bridge is being developed is an industrial area, administered by The Cadiz Bay Port Authority, and strongly related with the shipyard and offshore industry. Some of the most important European companies in this sector have developed their projects in this place for decades. This gives continuity to the old naval and sailing heritage that has characterized this city.

The expected improvement of the roadway and tramway accessibility and its subsequent economic and social benefits wouldn't of benefit if the new bridge imposed some restrictions to the navigation of big vessels, and subsequently to the shipyard industrial facilities. This aspect was taken into account in order to determine the location, dimensions and proportions given to both substructure and superstructure of the new bridge:

- The bridge won't interfere with the operations at the Cadiz Bay Port, neither in its main facilities (situated in the city, outside the new link area) nor in the grain and mineral dock, sited just below the east half of the cable-stayed deck. The eastern tower is being constructed inside that dock, but away from the operational area, and the deck is so high at this point that the port cranes can pass below it.
- The main span (the central span of the cable-stayed bridge), will be located above the main vessel shipping canal of the Bay, and with its 540 m length will respect the width of the existing waterway. The vertical clearance below the deck at this point is variable, with a