



SIKA AT WORK

Expansion & reconstruction of Lixouri port, Kefalonia, Greece

CONCRETE PRODUCTION WITH MACROFIBERS SikaFiber® PP-540/52

BUILDING TRUST



EXPANSION & RECONSTRUCTION OF LIXOURI PORT, KEFALONIA



PROJECT DESCRIPTION

On 26th of January 2014, a powerful surface earthquake Mw 6.1 (HRV) centered on the southwest coast of Kefalonia and about 9km southwest of Lixouri struck the island. This main earthquake was followed by decreasing frequency aftershocks. On February 3rd 2014, a new powerful earthquake of Mw: 5.8 (HRV) with a focus on the western coast of Kefalonia was recorded. It is noteworthy that the seismic acceleration caused was one of the largest recorded.

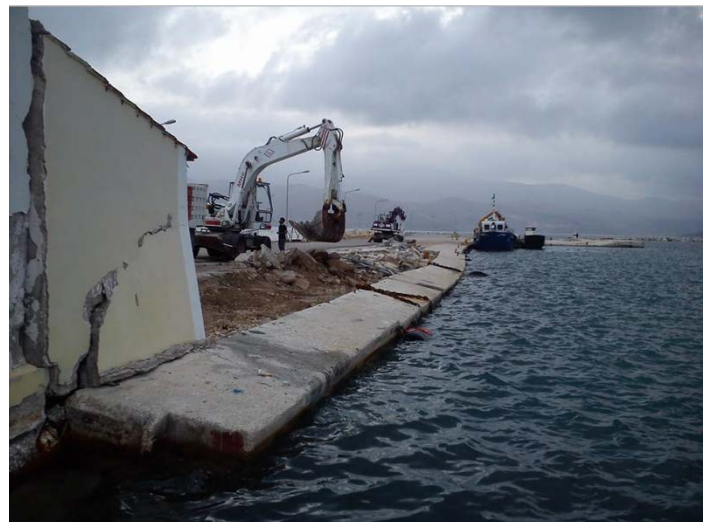
The magnitude of the earthquake in Richter is not directly correlated with the damage that will occur to a construction. The main factors determining the extent of the damage are the terrestrial acceleration in the foundation of the structure, the duration of the earthquake and the type of grounding foundations.

In order to assess the magnitude of the earthquake and the effect it may have on the constructions, the accelerometer recordings were converted into acceleration response spectra and compared with the design spectra of the modern anti-seismic regulations EAK2000 and EC8-1.

The comparison showed that in many areas of the island the earthquakes on 26/01 and 03/02 were up to 3,2 times larger than the design earthquake. The seismic potential of the area appeared much higher than predicted and what proved to be a salvation to limit the extent of damage to the island was the short duration of seismic vibrations.

PROJECT DEMANDS

Kefalonia is a particularly popular tourist destination, with more than 300.000 tourists per year. Consequently, infrastructure - road and port - which can respond to this volume of tourist traffic contributes greatly to the quality of the services provided as a whole. Seismic vibrations have caused great problems, both in building construction on the island, as well as on the road network and in ports, with the port of Lixouri presenting an inappropriate and dangerous image for the travel public.



In addition, the port had to be expanded, as port redesign would help to better serve both ships and passengers as the approach and de-boarding process could be done more securely and in shorter time.

SIKA PROPOSAL

The port repair imposes strict requirements, as such construction is exposed to particularly aggressive environments and use (concrete resistant to surface wear/abrasion & for marine structures according to EN 206-1).



The use of **SikaFiber® PP-540/52** synthetic macrofibers was proposed to be incorporated in the concrete mix, as their use offers immense benefits such as:

- Reduction or total replacement of conventional reinforcement in ground slabs
- Higher load bearing and ductility
- Less shrinkage cracks at the early stage
- Better cohesion for fresh concrete
- Increased resistance against abrasion
- Protection against freeze / thaw cycles
- Faster completion of the project, as grid placement work is not required (on slabs on ground)
- Lower project costs due to reduced material and labor costs

One of their most important advantage is that they limit cracking and the extent of formed cracks. This produces a concrete that requires considerably less steel reinforcement than a conventional reinforced concrete, but it is still as durable if not more.

SikaFiber® PP-540/52 macrofibers are used in many types of floor screeds to improve the workability of fresh concrete, while in the hardened phase they increase quality and durability by controlling crack distribution and reducing shrinkage. In the hardened phase, no individual wide range cracks occur, but they are rather divided into many, smaller and finer with significantly reduced risk of damage. Fiber reinforcing also significantly improves the strength of the mortar in terms of impact and fracture.

The use of fibers in concrete slabs in general significantly reduces shrinkage at an early stage and assists in the stability of the mixture. The fibers also result in improved flexural strength and increased impact resistance.

As a result, the reinforcement can be reduced and the distance between the required joints increased. The fibers also help reduce the brittleness of the edges of the construction. Therefore, the durability of the floors produced with reinforced concrete is considerably increased.

SIKA SOLUTION

SikaFiber® PP-540/52 macrofibers were incorporated in the properly designed concrete mix at a dosage of 2,5kg/m³.



SikaFiber® PP-540/52 macrofibers are based on patented e3® technology. They are manufactured with optimum grading and precise orientation, allowing them to have a greater contact surface with the concrete and thus increase interfacial adhesion, bending strength and construction efficiency. **SikaFiber® PP-540/52** graded e3® based macrofibers are designed to optimize uniform distribution and therefore resistance to fiber reinforced concrete. Each **SikaFiber® PP-540/52** fiber pack contains fibers graded according to their length, thickness and percentage in the blend. The result is the ideal combination of crack control for optimum concrete performance.

SALES IN VOLUMES:

Synthetic, graded macrofibers **SikaFiber® PP-540/52**: 3 tn

PROJECT PARTICIPANTS:

Contractor:
IONIOS S.A.





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