



REPAIR & STRENGTHENING OF SEA DEFENCES IN THE CHANNEL ISLANDS—LES MINQUERIES

Les Minquiers archipelago is 20 km south of the island of Jersey and is a platform of rock larger than any of the Channel Islands. The reef is one of the Ramsar Convention sites protecting migratory birds and is uninhabited.

A critical localised failure area was the loose stone section of sea defence wall that had collapsed during storms. The SHSC Consultancy was commissioned to assess the failed sea wall site and the site characteristics to then design a robust but environmentally friendly sea wall replacement.

There were no topographical survey or land surveys to provide geometry or level information for the part of the Maîtresse Île requiring the new replacement section of sea wall. As a result Steve Hold Consulting carried out a desk study which focused on the easterly wall cross sections and the geometry from the land photographic survey.

SHSC was then able to issue a report to HM Receiver General in September 2019 that discussed and illustrated several rebuild options.

Option A – rebuild a masonry with copings forming a ‘re-curve’ and anchoring it into the rock.

Option B – a precast concrete block interlocking wall.

Option C – Lightweight pre-cast planks interlocking.

Option D – a standard reinforced concrete sea-defence wall with a ‘re-curve’ at the top.

THERE WERE SIGNIFICANT CONSTRAINTS FOR THE NEW WALL

The heritage and environmental constraints for the design of the wall were;

Use the minimal amount of wet cement because the alkalinity would damage the flora, fauna and insect life.

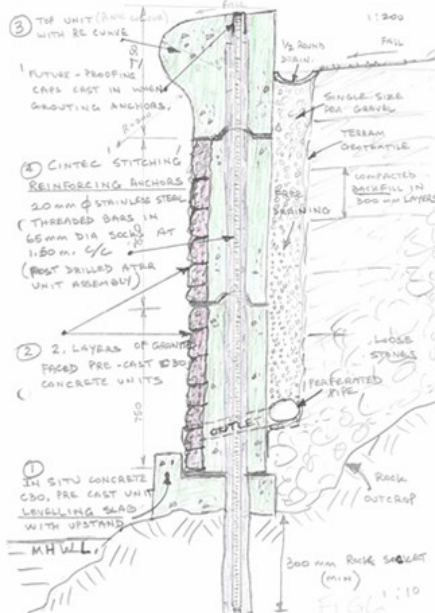
100-year design life requires large resistance to wave impact and overtopping water ‘wash out’ from behind and underneath the wall.

Minimal maintenance because the island is uninhabited for most of the year.

In such an exposed and isolated site reinforced concrete would be unlikely to last 50 years (the target is 100 years) without requiring corrosion of reinforcement induced concrete repairs.

There is no potable water or electricity on the island so generator and fuel storage security would be necessary. Water and fuel would have to be transported from Jersey either daily or regularly in small trips and build up supplies on the island.

To address all of these constraints, SHCCE Ltd. put forward a solution utilizing a section of a pre-cast concrete unit faced in Jersey Granite embedded in the unreinforced concrete. A levelling base of insitu concrete across the undulating rock profile then allows placing of the interlocking units with the granite masonry facing, having a top unit of mass concrete with a ‘re-curve’. These interlocking blocks are tied down with vertical Cintec anchors through the blocks embedded 300mm into the bedrock.



The concept is similar to the WWII parapet raising with a re-curve for the Gunsite Café project on Jersey. However, there is much natural rock armour protection in front of Les Minquiers wall and not a flat sandy beach approach as at the St. Aubin's Bay in Jersey, so the figures and forces used in Les Minquiers design are conservative.

It is also worth noting from an engineering point of view that during the pandemic and travel restrictions, SHSC resorted to graphical ideas and sketches 'in pencil' that achieve a compromise of engineering ideas and concepts between the design engineer and the ECI.

To work on such a difficult and restricted site Geomarine Ltd. put great effort into designing a practical interlocking block that had no ferrous reinforcement and was strong enough (C.40 mix) to be able to withstand not only wave impact and uplift but also the risks associated with transport and handling the blocks

A mock-up of the wall interlocking blocks was made for approvals as seen in on the right and is taken in St. Helier Port Jersey against the background of a Jersey granite building, La Folie, on the St. Helier Harbour quayside. This practical exercise was also necessary to test the handling lifting and efficiency of a small mobile rubber wheeled crane which would be used on the island for lifting and block placement.



This part of the Channel frequently experiences rough seas, so the accumulated knowledge and familiarity of the team with the recent concepts for the heritage masonry sea wall strengthening and repairs was applied the Les Minquiers site and the similar sea state conditions. High and low tides were important, in particular low tides because after a certain level is reached even a relatively flat bottom transport barge would be stranded until the tide turned sufficiently to let the vessel off of the reef through the rocks. After checking the setting out, a levelling foundation beam of C40 concrete was cast with core holes placed for the Cintec anchors and also guided the rock socket drilling.



The Cintec reinforced mass concrete sea wall was constructed during the six weeks from mid-September to mid-October 2021. The wall has performed well in recent storms in the winter of 2021/22 in late 2021 and early 2022

