

# THE REPAIR OF PASSENGER VESSEL GRAND VOYAGER'S MAIN ENGINE BLOCK

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Engine Details: 4 stroke, In-Line (vertical), 9 cylinder, 460mm x 580mm, 9,450kW (12,847hp) at 500rpm.

## ABSTRACT

In February 2008 MV Grand Voyager's Main Engine # 01, in way of Cylinder # 03 suffered damage in the form of the complete rupture of the Connecting Rod. This paper presents the subsequent repair effected without releasing the vessel from contracted commercial activity and alteration of her established schedule.

The Metalock cold-stitching repair was developed as an alternative to welding repairs in cast iron. The Metalock repair procedure has been applied in Marine, Petroleum and Industrial applications for over 50 years.

The materials utilized are subject to continuous development and improvement. Materials applied consist of:-

- i. Metalock Keys - made in patented alloy material, used to secure 2 adjacent edges of a crack together or 2 adjacent parts together.
- ii. Metalace Screws - patented stainless steel alloy screws, utilised to close cracks and joints between joined components.
- iii. Masterlocks - steel inserts, of varying size, thickness and form, utilized to add proportionally greater strength to load bearing areas of repairs.

In maritime applications the Metalock repair is accepted by the major Classification Societies, with the proviso that the repair is examined periodically until the repair is proven in service. The repair method was applied on site, work being effected in the Engine Room of the vessel.

The engine block and integral crankcase is constructed of nodular cast iron of a rigid design. The engine block, supporting the cylinder liners is reinforced by the integral charge air trunk at exhaust side and by the cam-box on fuel pump side. The integral crankcase consists of a series of columns, the columns transmit the weight of the engine to the crankcase foot and support the main bearings. The main bearing caps of the crankshaft are of the under-slung type with extra rigidity provided by side bolts.

The damage that occurred to the engine, caused by the complete rupture of the Connecting Rod concentrated around Nr. 3 cylinder, affected primarily the (cast iron) panels between the crankcase columns and the cam-box, especially around the crankcase doors, exhaust and camshaft side. The outer skin of the charge air trunk was damaged. The engine foot was damaged at the exhaust side only but the adjacent holding-down bolt brackets (2 pcs) were intact and integral with the column. It can be argued that the damage had minimal effect on the rigidity of the engine block/crankcase. Additionally, the lower liner guide area was damaged.

The cast iron material of the block was ideally suited for the Metalock cold-stitching repair technique.

The repair undertaken was effected in steps. Initially the damaged surfaces were prepared so that wooden models of these parts could be made up. These were used for the preparation of new castings. These were then inserted and stiched in place. In situ machining and manual finishing techniques were then applied.