MALIN ABRAM

CONTRACT RECORD M102-LB03-CR-02

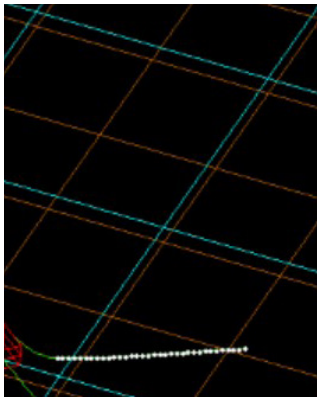
LB03 TRANSPORTATION ENGINEERING

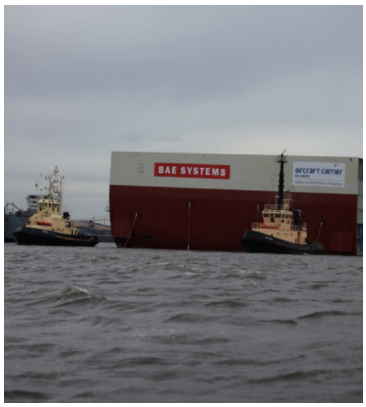
aircraft carrier alliance

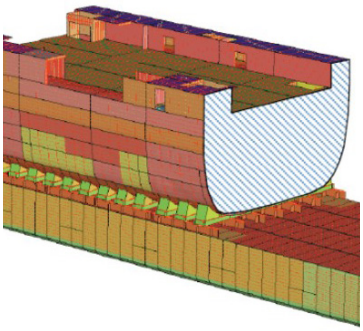
MALIN ABRAM

CONTRACT RECORD M102

- **Scope:** To provide all technical support associated with the delivery of various hull sections from around the UK into Rosyth
- **Client:** Aircraft Carrier Alliance
- **End Client:** UK Ministry of Defence (MOD)
- **Cargo:** LB03 Section
- **Vessel:** Queen Elizabeth Carrier
- **Locations:** Govan, Rosyth, UK
- **Personnal Provided:** **10**
- **Challenges:** The breadth of scope of block types meant the engineering was varied and required a range of skill sets encompassing hydrodynamics, stability analysis, FE analysis, lifting plans, stow plans, 3D draughting, float-off analysis, towage analysis and mooring design. The cargo itself, the quaysides we had to use, the marine plant that carried the cargo and the software we used all had their own unique challenges for us to overcome. The FE analysis of the larger transports was also significant. The scope included checks of the structural integrity of the cargo and the transport barge as well. The clearest way to check both was to build a detailed FE model of them, along with the supports and sea-fastening, to ensure that the load paths and reactions were fully captured with minimum assumptions. This resulted in models of hundreds of thousands of elements, which our software struggled to handle – leading to installation of improved software to overcome this. With the larger blocks we also learned that being too conservative with your load cases and design weights can often push the cargo and the marine plant to it's limits. We had a pragmatic client and warranty surveyor who recognised this and were willing to accept reductions where justification was given.







An example of this is trying to justify the cargo and barge for accelerations associated with forward speed in the design wave. The tug and barge would not be capable of making forward progress in the design wave so runs were done for zero speed accelerations. This allowed us to design to more realistic reaction loads and reduce the amount of additional work required inside the cargo and inside the barge, reducing costs to the project. The unusual shape of the cargo (ship shaped) presented a challenge when it came to float-off stability, leading to the requirement of additional buoyancy. This came in the form of additional boxes, either on the cargo or the barge. The key lesson we took from this was these float-offs had to be designed in a very systematic manner and time between calculated stages had to be sufficiently low to ensure stability would be acceptable during the whole float-off. With respect to quaysides it was not only the quay height that presented challenges it was also mooring points. With some of the yards involved being 'of an age', justifying the existing quayside furniture for modern design guidelines was problematic and often we had to be inventive in how we set up the moorings to avoid overloading the bollards.

Figures:

- View aft on deck grillages prior to loadout at Govan [1]
- AMT Trader moored Offshore - Orcaflex Line Graphic [2]
- AMT Trader moored in open water in the River Forth [3]
- Transportation cradle components delivered for assembly [4]
- FEA model of block and transportation barge [5]

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