

Case Study

Transport TBM from Shenyang to Liantang, Hong Kong

Brief Description of Project Scope

In 2013 we were approached by our client, whom was to deliver an eighteen meter diameter Tunnel Boring Machine from Shenyang in China to the new land border control point at the border of Heung Yuen Wai in Hong Kong, opposite Liantang in Shenzhen, Mainland China. The Tunnel Boring Machine was the main equipment for the construction of a dual two-lane trunk road in a 4.8 km of tunnel connecting the Fanling Interchange with the Sha Tau Kok Interchange, a HKD 10.314 billion project.



Initially, assisted them with a feasibility study for the movement to the site and checked the following items:

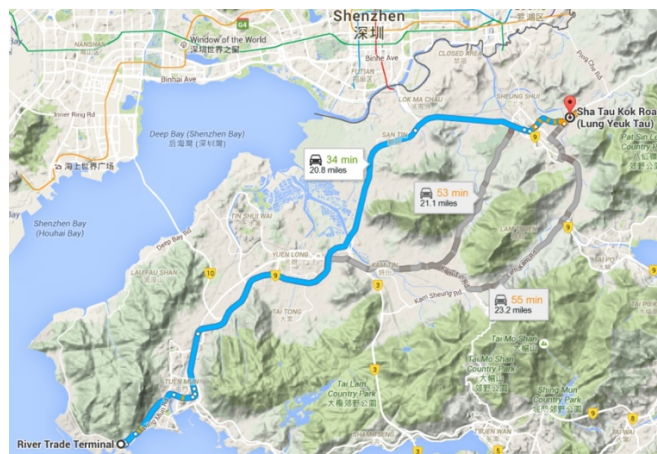
- Project site and surrounding environment
- Physical constraints
- Security risks and regulatory requirements
- Assessment of possible routes
- Identify obstructions, height clearance and restrictions of specific routes
- Identify equipment (quality and availability), local road weight and permitted restrictions
- Permits
- Time Requirements

After a thorough check, we identified the following main issues, which were all for the last part of the journey in Hong Kong (one of the world's most densely populated urban area's):

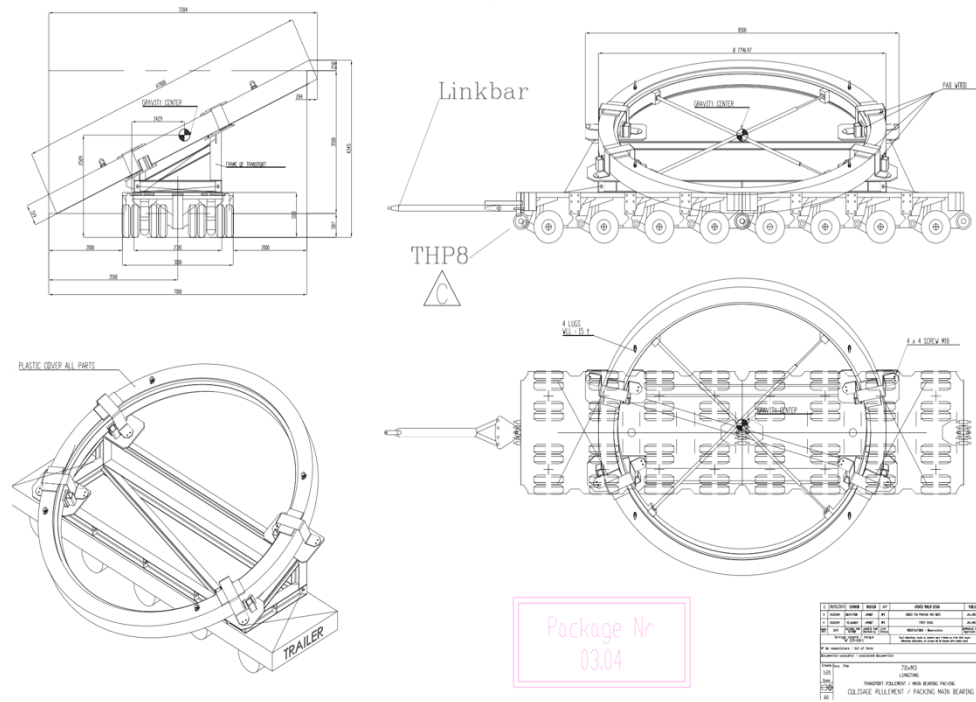
- The final site only allowed for one route in Hong Kong
- The route had restrictions on the dimensions, that needed major road reconstruction work
- The route had five bridges with weight that did not allowed for transport of heavy cargo
- The route was very long and gave additional issues such as:
- Approval from different councils/local government bodies
- Around 156 points en-route that needed corrections/removal of street furniture
- High voltage cables that needed to be shut down (light rail).
- The length of the route made transporting oversized cargo within the transport period from 23h00 to 05h00 very difficult (and had almost no opportunities for waiting area's)
- The period of transporting the units covered about 3 months and it proved to be difficult to find time frames that did not have planned roadwork in that period.



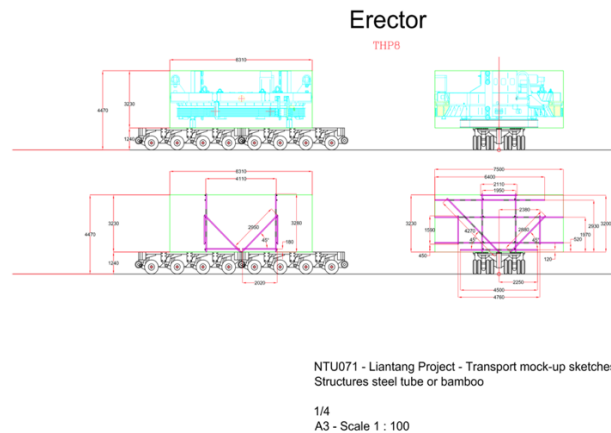
We looked at a multitude of routes (ranging from roro pontoons up the Kamtin River, cross border lifting to trucking a national park), but the only practical route proved to be one of the longest routes across the new territories in Hong Kong.



It was further decided that some of the biggest items would be placed on tailor-made frames to allow for the maximum use of the limitations on dimensions.

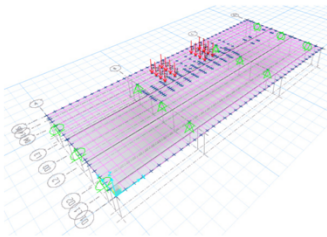


To satisfy government bodies and police departments, it was decided in total five units of cargo were to be built as bamboo mockups in order to test the route and ensure route safety. This was done in two phases, as to allow for the first smaller units to already get permission and be shipped.

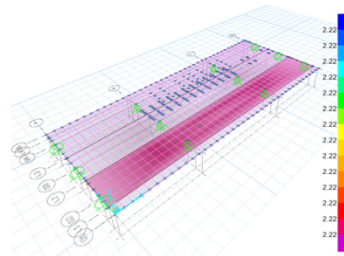


After negotiations, the government departments (who were also end user of the border crossing) would allow a one-time exception for the transport of heavy units over the bridges. However, only after a full structural bridge assessment and photographic check on all bridge sections before and after the transports.

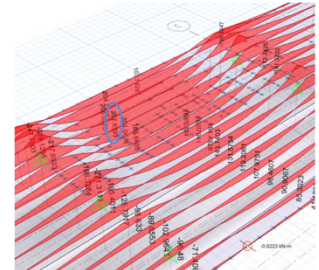
HB1: Lane 3 (30 units)



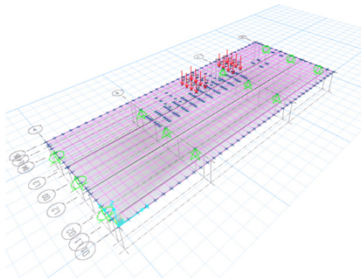
1/3 HA: Lane 1



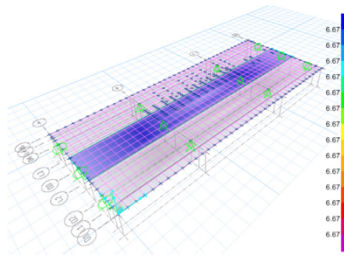
Case 1a: 1/3HA+HA+HB1 (max. moment= 208kNm)



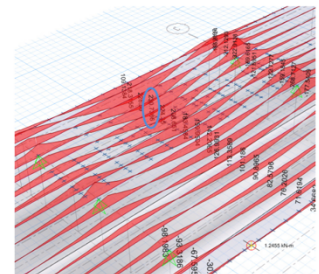
HB2: Lane 3 (30 units)



HA: Lane 2



Case 1b: 1/3HA+HA+HB2 (max. moment= 231kNm)



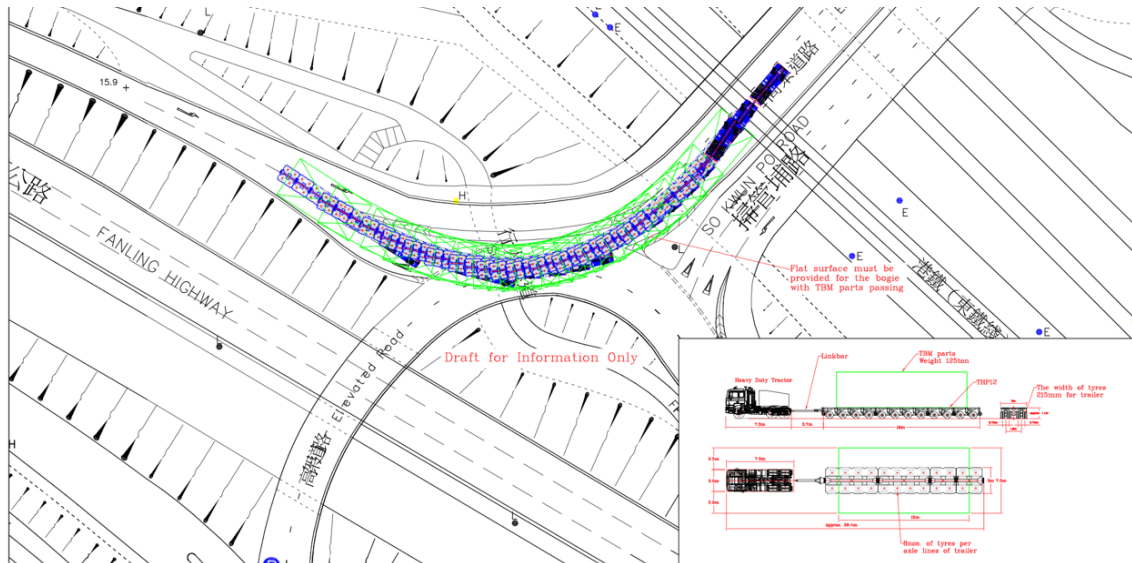
The team investigated the most cost-effective route and corrections that had to be made to allow the transport to take place. Around 156 corrections were done along the entire route (footbridges, and at several locations we applied for permits to take of power from power lines (light rail).



The period of transporting the units covered about 3 months and it proved to be difficult to find time frames that did not have planned roadwork in that period. After consultation with different departments, we found a slot period of one month with only one announced work on the road and negotiated with the contractor to fill up the works with soil/cover with steel sheeting.



The length of the route made transporting oversized cargo within the transport period from 23h00 to 05h00 very difficult (and had almost no opportunities for waiting areas). We ensured swept paths were done on each sections, that there were mechanics (plus spares) and cranes traveling with the convoy, but also put in place restrictions on parking of vehicles at a difficult area of a wholesale market for fresh vegetables (and had this monitored for the entire period).



After 18 months of planning, technical calculations, council meetings and road reconstruction work, we delivered the project from Bayuquan to Site in Hong Kong in five ships over a period of 28 days. The machine broke ground in October this year and is working on the establishment of the border crossing.

The delivery - that consisted of the biggest pieces ever transported on Hong Kong roads over bridges that have never been allowed to be used for overweight cargoes – is presently used as a project case for officers by the Hong Kong Police and the Highway Department.

