

## The Storebaelt Tunnel

### Connecting Europe and Scandinavia

As part of the high speed rail link between Scandinavia and Europe, the Danish Government built two high speed rail tunnels below the Storebaelt (Great Belt), a stretch of deep water that connects the North Sea to the Baltic. The tunnels had a bored diameter of 8.72m diameter and a total length of 7.5 kilometres. A total of four Earth Pressure Balance (EPB) Tunnel Boring machines were used, which required the dismantling of all the TBMs within the finished tunnel diameter. The twin tunnels were connected by 30 cross passages that acted as both equipment rooms and emergency egress routes.

The first involvement of M G Bennett & Associates was a design audit of the Tunnel Boring Machine and the systems during the design and manufacturing phase. This involved Finite Element Analysis of the major structural components of the TBM. Bennett Associates also provided technical support during the first months of operation of the TBM.

To strengthen the client's team on site, Dr Chris Bird was seconded full time to the project for a period of 3 years, with the primary function of overseeing tunnel safety and providing additional technical advice. In the latter part of the project, additional responsibility was taken on for the technical management of the TBMs, both in the operational and dismantling phase of the project and the safety supervision of the contractors boring the tunnel and installing the fixed equipment simultaneously.

The works supervised with respect to tunnel safety included:

- Chairman of the Safety Coordination Meetings between Contractors, Emergency Services and the Factory Inspector
- Chairman of HAZOP work groups following the fire
- General Tunnel Conditions
- Risk Assessment
- Safety and Emergency Procedures

The technical aspects included:

- TBM Operation
- Rolling stock
- Ground freezing
- Large scale dewatering
- TBM dismantling

Bennett Associates (originally founded in 1984) was acquired in 2008 by Atkins; bringing their proven technical expertise to the UK's leading engineering consultancy.

