2. The external pipe/sleeve may be of steel with full circumferential weld or reinforced concrete pipe. In either case, the casing pipe and the grout shall be regarded as sacrificial and the inner pipe shall be designed as a stand-alone pipe, capable of withstanding installation and grouting forces and soil, traffic and groundwater loads. Where pipe-brackets, spider clamps, are used, rubber packers shall be placed between the steel brackets and pipe.

H. The Contractor shall limit the dimensions of drive and reception pits/shafts to the minimum required to construct the permanent works or to construct the pits/shafts, whichever is larger.

I. The Contractor shall determine the excavated dimensions of the drive and reception pits/shafts as required to suit the site conditions. Minimum pit/shaft dimensions shall be used at all locations where utilities, roads or trees exist adjacent to the required pit/shaft locations.

J. Where it is proposed to use a tail tunnel as the reaction surface the maximum permitted thrust force shall not exceed the lesser of the following.

1. The maximum permissible thrust force.
2. 50% of the sum of the maximum forces recorded at the rigs used to construct the tail tunnel if the over break has not been grouted up.
3. If the over break to the tail tunnel has been grouted up, 100% of the sum of the maximum forces recorded at the rigs used to construct the tail tunnel.

K. Any tail tunnel which has been used as a reaction surface shall pass the specified water tightness test at a time not less than 14 days after the load has been removed.

L. Lubricant fluid holes shall be threaded to enable plugs to be screwed into the socket and withstand the external pressure. Non-return valves shall be fitted where opening a hole would permit ground loss.

M. The Contractor shall confirm the tunnelling route is clear from cavities or obstructions or recommend and design for grouting of cavities and/or dealing with obstructions.

1.2 Part 2 Products

1.2.1 Equipment