

# Tunnelling and Pipejacking: Guidance for Designers



This document is a best practice consensus agreed between the Health & Safety Executive, British Tunnelling Society and the Pipe Jacking Association.



## Internal dimensions for pipejacks and tunnels below 3.m diameter and indicative drive lengths

Excavation technique	<0.9m	0.9m	1.0m	1.2m	1.35m	1.5m	1.8m	>1.8m
Pipejack – machine; remote operation from surface	Acceptable (See Table 2)							
Pipejack – machine; operator controlled below ground	Not Acceptable			Acceptable				
Pipejack – hand dig	Not Acceptable			Avoid				
Tunnel – machine operator controlled + mechanical erector	Not Acceptable					Avoid		Acceptable
Tunnel – hand dig + mechanical erector	Not Acceptable					Avoid		
Timber heading – hand dig	Not Acceptable			Avoid				

Excavation technique	<0.9m	0.9m	1.0m	1.2m	1.35m	1.5m	1.8m	>1.8m
Pipejack – machine; remote operation from surface	Drive length limited only by capacity of jacking system			250m	400m	500m	>500m (See note 7)	>500m (See note 7)
	Man entry not acceptable		Avoid man entry					
Pipejack – machine; operator controlled below ground	Not Acceptable			125m	200m	300m	500m	>500m (See note 7)
Pipejack – hand dig (See note 6)	Not Acceptable			*25m – 2 drive lengths	*50m – 2 drive lengths	*75m – 2 drive lengths	*100m – 1 drive length. Plan to use minidigger if over 2.1m dia	
Tunnel – machine operator controlled + mechanical erector	Not Acceptable					*250m	*500m	>500m (See note 7)
Tunnel – hand dig + mechanical erector (See note 6)	Not Acceptable					*50m – 1 drive length	*100m – 1 drive length. Plan to use minidigger if over 2.1m dia	
Timber heading – hand dig (See note 6)	Not Acceptable			*25m – 2 drive lengths Minimum cross section inside frames 1.2m high x 1.0m wide				

## Notes

- 1) This guidance should be read in conjunction with BS 6164:2001. It is intended to be used only by those competent to design pipejacks and tunnels.
- 2) This guidance for designers has been agreed by HSE and the tunnelling industry (BTS/PJA). It is based on experience of the occupational health and safety risks arising from heavy physical work, including the use of vibrating tools, in a confined space along with the need to be able to evacuate quickly/effect a rescue in a range of reasonably foreseeable situations.
- 3) Complying with the guidance does not relieve the designer of the duty to consider the risks arising from the foreseeable hazards of pipejacking/tunnelling including manual handling, noise, heat, vibration and confined space working. Neither does it relieve the designer of the duty to ensure there is potentially adequate space to allow a safe means of access and egress along with adequate working space within the tunnel/pipejack. The minimum diameter required for construction may in some cases be determined by the criteria above rather than by consideration of the hydraulic requirements for or the intended use of the pipejack/tunnel.
- 4) Indicative drive length and the number of drives of that length, have been determined from consideration of access and escape requirements. Again, complying with the guidance does not relieve the designer of the duty to consider the risks arising from the range of foreseeable emergency events which could arise and which could necessitate escape or rescue of those underground.
- 5) The drive lengths given in Table 2 are indicative. Designers should note that for entries not marked \* it is **acceptable** to exceed the indicative drive lengths by up to 25% however exceeding these lengths by over 25% should be **avoided**. Exceeding the indicative lengths by over 75% should be considered to be **not acceptable**.
- 6) All hand dig is categorised as **"not acceptable"** or **"avoid"** – the lengths given in Table 2 for items marked \* are indicative and are already in the category **"avoid"**.
- 7) Drive lengths exceeding 1000m should be considered **not acceptable** unless the pipe/tunnel is of sufficiently large cross section to allow the contractor to incorporate an access envelope 0.9m wide by 2.0m high within the pipe/tunnel and clear of services including ventilation duct and spoil conveyor.
- 8) For guidance on side connections see relevant PJA publication

## Definitions

**ACCEPTABLE** – designers should undertake an assessment of the risks normally associated with small size pipejacking/tunnelling and specify the appropriate mitigation measures.

**AVOID** – designers should undertake a robust technical assessment and risk assessment to justify their decisions to deviate from "acceptable" criteria. Designers should identify appropriate risk mitigation measures. They should seek the advice of the Planning Supervisor/Co-ordinator and only proceed if the Planning Supervisor/Co-ordinator is satisfied that due attention has been paid to health and safety in undertaking the design and that appropriate risk mitigation measures have been identified. Contractors being asked to construct a pipejack/tunnel in this category should also seek advice from the planning supervisor/co-ordinator on the adequacy of their risk mitigation measures.

**NOT ACCEPTABLE** – designers should not specify the use of pipejacking/tunnelling of this size and construction method. An alternative design solution should be sought.