

Screw-jack elevators in the orchestra pit of the Grand Theatre, Swansea in Wales.



Photo: Peter Knowles

Screw-jacks are relatively inefficient, perhaps 25% compared with up to 92% in other systems, with consequently high input power requirements. This low efficiency ensures that the drives are quiet, which is generally a safety feature in that in the event of motor or control failure the lift will remain in its current position or lower at a controlled speed.

All types of elevator mechanism are described and specific types examined in more detail, especially the proprietary types, Spiralift and Linklift. The authors are all knowledgeable about their subjects and are questioned particularly about loads and noise.

As alternatives to basic screw-jacks are used, in many schemes, these are more expensive. Amongst the alternatives are:

- (a) Chain and wire-rope lifts
- (b) Screw systems, using rotating screws, either top or bottom mounted
- (c) Rack and pinion lifts
- (d) Scissor lifts
- (e) Ramps and wedge mechanisms
- (f) Tubular thrust screws (Spiralift)
- (g) Rigid chain systems (LinkLift).

The last two alternatives, (f) and (g), are covered in this session by other speakers and so now the principles behind (a) to (e) will be considered in some detail.

To provide a common base reference when reviewing the various alternatives, a platform with a size of 14 metres x 2.5 metres (45'-11" x 8'-3") giving a plan area of 35 m² (377 sq.ft) with static loading of 5 kN/m² (100 lbf/sq.ft) and dynamic (in motion) loading of 2.5 kN/m² (50 lbf/sq.ft) will be considered in each case.

Chain and wire-rope lifts

Figure 3 shows the way in which chains or wire-ropes can be used for a simple arrangement of a platform which moves between, say, a storage level and stage level. The elevator platform is suspended from ropes or chains, which are powered from a drive system in the base of the pit. External guides are required (not shown in the diagrams, for clarity) to ensure accurate travel alignment.

The attachment points of the platform for the ropes/chains have to remain below the top suspension pulley, with an allowance made for over-travel of the mechanism. The minimum pit depth required in this example is, therefore, made up of the depth of floor above the top pulley, the combined diameters of the pulleys, wire-rope and chain tensioning devices, and over-travel and clearances. A pit depth of perhaps 1.2 metres (4 ft) would typically be required.

It is interesting to note how the pit depth increases if the platform is required to travel 1.1 metres (3'-7") above stage level, with protection in the form of fascias fitted on one or more faces. The required pit depth increases by the depth of the fascia, to 2.3 metres (7'-7"). This is shown in Figure 4.

One difficulty sometimes experienced with this type of drive is unequal stretch in the wire-ropes or chains due to unequal loads.

Chain and wire-rope elevator systems.

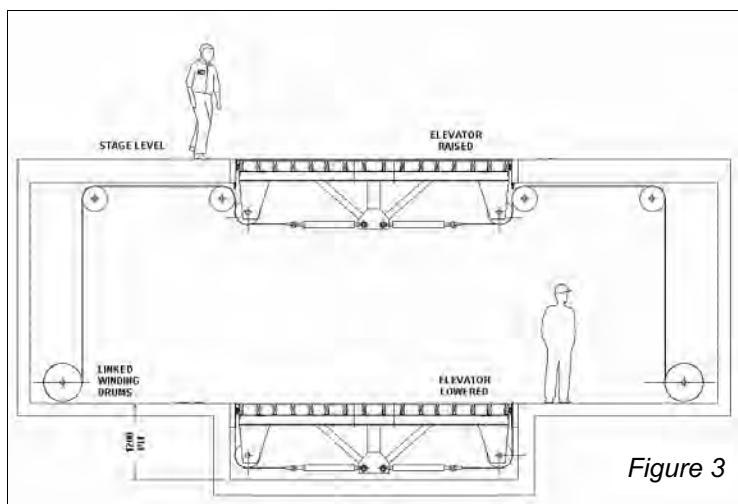


Figure 3

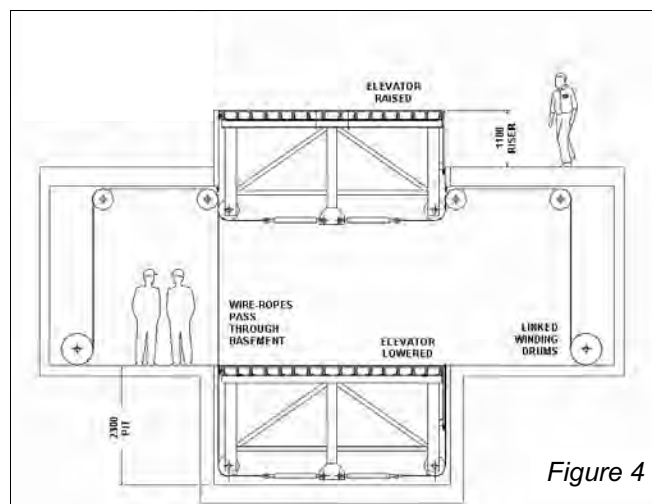


Figure 4