

## Improved Landfill Management

### Airspace, Compaction and Daily Cover

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## Airspace

Airspace is taken up by:

- Waste
- Cover material

The amount of waste that can be filled in a given volume of airspace is determined by:

- The nature and density of the waste
- The degree of compaction
- The amount of daily cover applied
- The amount of daily cover recovered

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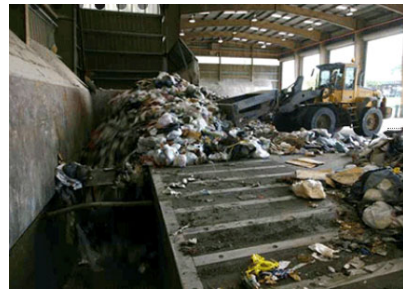
## Transfer station – opportunity to pre-compact



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## Pre-compacting waste at transfer station

- Note steel bars in station floor



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## Airspace

The effectiveness of compaction depends upon:

- The nature of the waste
- The compactor weight
- The number of passes
- Improved compaction can be achieved by:
  - Separation of bulk items
  - Pre-compaction of bulky items
  - Shallow lifts
  - High intensity of machine activity at face

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## Landfill compactors

- Variety of manufacturers e.g. BOMAG, Caterpillar, TANA
- Range of models
- Weights typically 20-55 tonnes
- 2 or 4 wheels or drums
- Crushing teeth, sheep's foot

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TANA E520 Compactor



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Caterpillar 836H Compactor



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### Compaction

- Weight of the machine, heavier the better
- Number of compacting teeth; teeth shred and compact deeper, the more teeth the better
- Drum or wheel diameter, smaller applies weight better
- Drum or wheel width, wider the better
- Waste type, pre-compacted, pre-treated better

Typical compaction densities achieved:  
770kg/m<sup>3</sup>-1,300kg/m<sup>3</sup>, maximum ~1,600kg/m<sup>3</sup>

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Sheep's foot roller



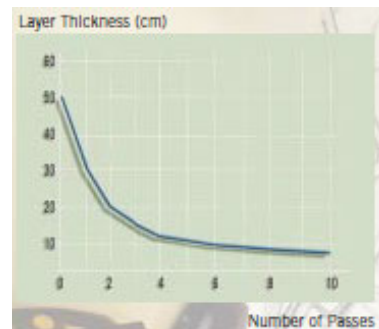
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Landfill equipment – sheep's foot compactor



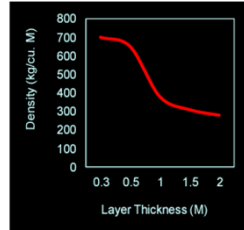
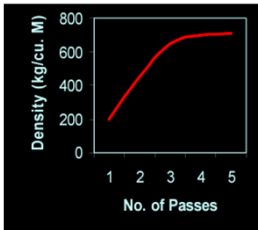
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Compaction vs Number of passes



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## Density vs Number of passes and Layer Thickness



After SWANA/ S Johnson

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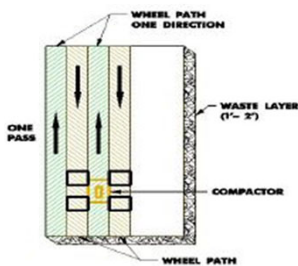
## Compaction

- Spread waste in thin layers
  - Assess blade height. Operators should know approximately the top of blade in relation to cab and the corresponding depth of waste
  - Check lift thickness - GPS on equipment will provide feed back on waste depth
- Compact each layer before placing next one
  - Compact waste in 3–5 passes up and down slope
  - First crushing pass is forward for visibility (watch for problem waste)
  - Alternate wheel paths as per figure – Cross knit waste – run at angle or perpendicular to, for additional 1-2 passes
  - Wheels should be UP, not DOWN on the waste when compacted
  - NOTE: Tana's full width wheel so different compaction technique

After SWANA/ S Johnson

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## Compaction technique



Wheels up

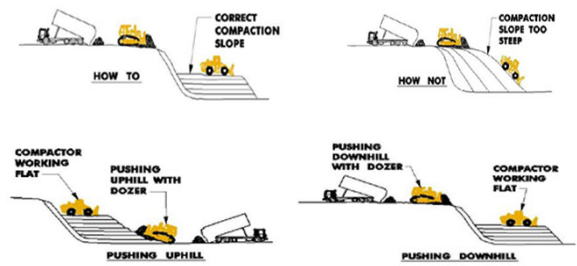


Wheels down

After SWANA/ S Johnson

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## Compaction Do's and Don'ts



<https://www.youtube.com/watch?v=rxfixX8Yq0>

After SWANA/ S Johnson

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## Daily cover

- Earth daily cover typically 0.3m thick
- Proportion of available air space occupied by cover depends on lift thickness
- Maximum lift thickness 2.0m, but best placed in several thinner lifts (0.3m) and progressively compacted to achieve maximum waste density
- Availability/scarcity of daily cover is significant
- Costs of winning, hauling or disposing of earth cover (if excavating cells) is also significant

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## Applying earthen daily cover



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### Applying daily cover

- Typically pushed out from stockpiled windrow beside working face
- Watch out for varying application thickness with wedge thinning out from stockpile
- Compact waste to smooth surface to maximise daily cover recovery
- Doze/scrape off carefully back to stockpile for reuse

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### Daily cover stockpiled beside working face



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### Applying degradable film cover



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### Winning more airspace

- Landfill mining offers potential to reduce waste volume
- Recovery of recyclables, particularly from older fill
- Screening
- Shredding
- Replacement and compaction
- Daily cover recovery potential
- Typically ~50% reduction in waste volume

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### Landfill mining



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### Landfill mining – MSW screening



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