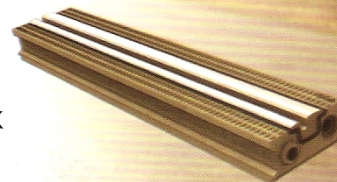




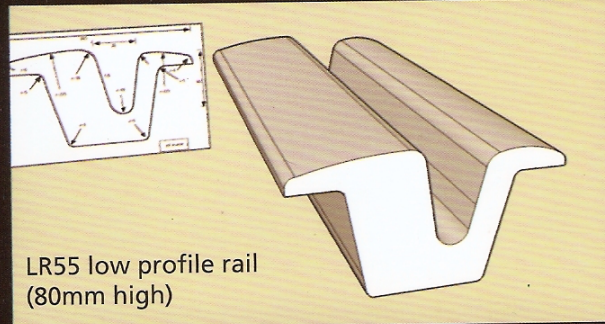
Trampower

Infrastructure
Products

Getting people back on track



Tracks for the people movers

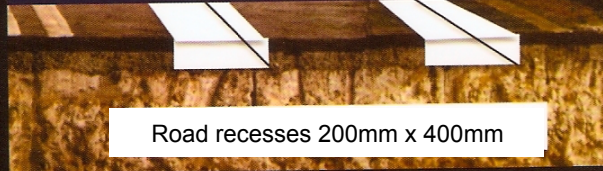


PERFORMANCE

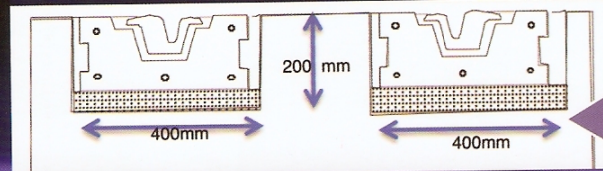
- Robust (up to 80 tonne axles)
- Durable (since 1996 in Sheffield)
- Small footprint (400mm wide/rail)
- Shallow (200mm depth)
- Utilities undisturbed & accessible

LR55 - Simple as A,B,C

STEP A Cut recess in road

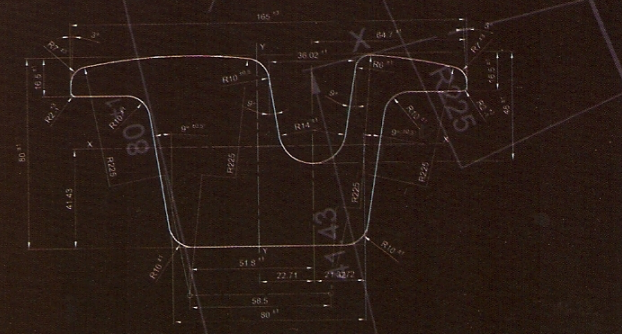


STEP C Glue rails in beams

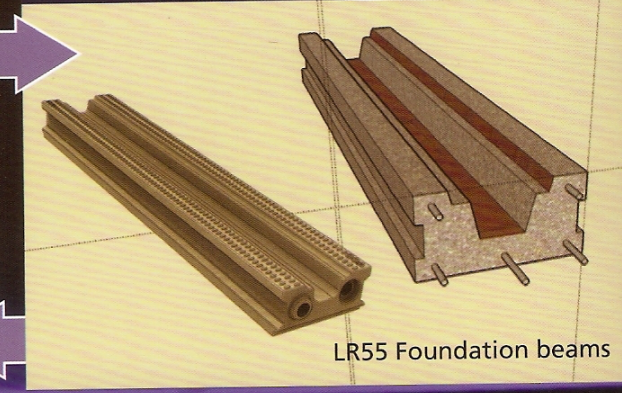


RAPID INSTALLATION (up to 500m/week)

- Reduced costs - less utility diversion
simplified construction
- Less traffic disruption
- Easier utility access
- Less rail noise and vibrations
- Negligible stray currents
- Corrugations much less likely



STEP B Glue beams in road



TESTING

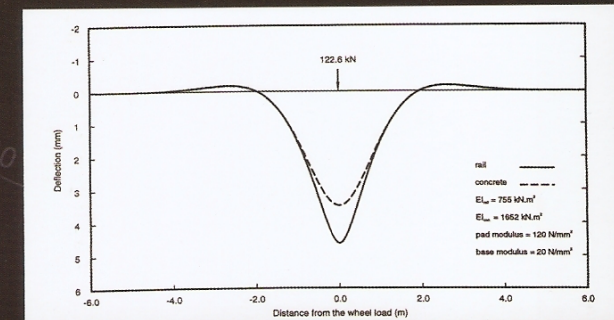
- Laboratory – non destructive
200million cycles
Temperature -10° to +60°C
under water – no debonding
noise reduced by 10dBA
vibrations reduced by 30dB
resistivity > 1000 ohm.km
- Laboratory – destructive
over 1m void fail at 58 tonne axle load
pull out 3tonne force
concrete failed in both tests
Field Rotherham Bus Station >2million buses
Field Sheffield LRVs and HGVs
Trouble free since 1996

OTHER USES

- Increasing tunnel loading gauge
- More stable road crossings
- Increasing headroom under bridges
- Industrial flat floors & mixed use
Rail/road trans-shipment depot



Rotherham Bus Station LR55 installation – 2400 buses a day



Deflection under 25 tonne axle load



LR55 Maintenance free since 1996



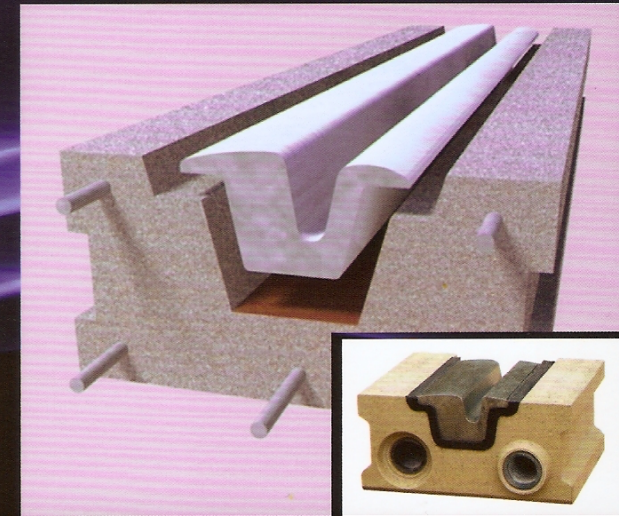
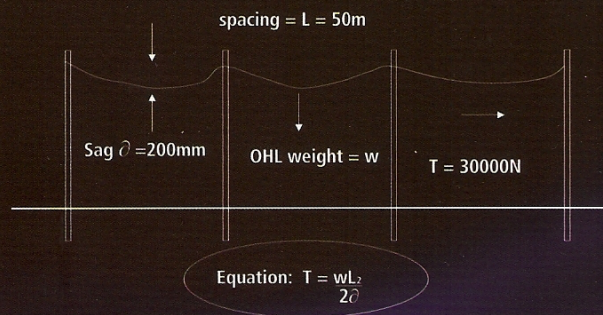
Sheffield LR55 since 1996

The Synergy of Trampower products

- City Class Tram
- LR55 track
- Simplified OHL (European Patent Granted)
- Rail line project evaluation

Lower cost total systems

Faster, less disruptive installation



Power to the people movers

SIMPLIFIED OVER HEAD LINE FUNCTIONS

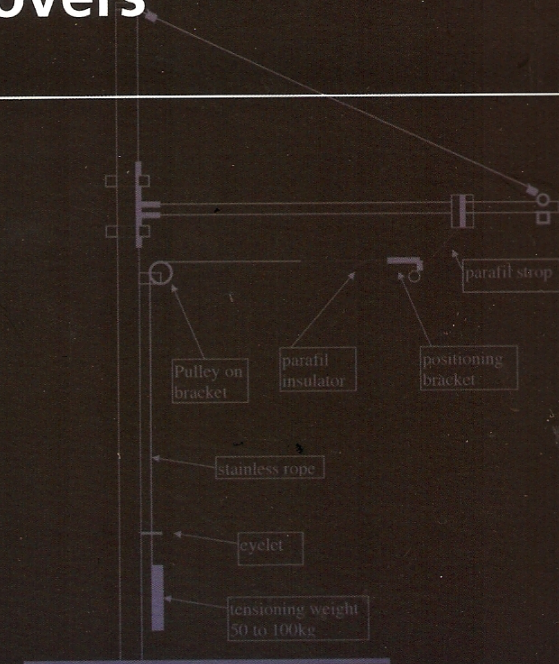
- Electrical – power distribution with minimum losses - lower resistivity from larger X section
- Mechanical – can stand loadings from wind, weather, and pantographs
- Capital cost – reduction through fewer parts

SIMPLIFIED OHL

- OHL can be simplified
- OHL costs can be reduced
- Elastic supported single wire – good for speeds up to 150km/hr
- Low electric resistivity can be achieved
- Jan.2005 severe storms – no damage
- could be used for branch lines
- Reduce cost of new light rail & tram projects ?

MAST AND SUSPENSION DETAIL

- single OHL wire - but sags
- larger diameter (14mm) (150sq.mm) but higher unit weight
- Fewer support masts
- larger sag or higher tension in OHL
- simpler suspension system
- no registration arms
- different tensioning



Practicalities of test installation at Carnforth Railway Centre

- Bad weather – December 2004
- no exclusive track access
- cherrypicker over parked rail vehicles
- getting right alignment
- using temporary ropes to lift and clip
- total installation 40 man days
- final clipping 3 man days
- total costs £100k for 1200m



Now add City Class Trams



10% gradient and 15m curves

Tram Power Ltd.,
Registered Office: 99 Stanley Road, Bootle, Merseyside L20 7DA UK
Lancashire Office: 1 Navigation Business Village, Preston PR2 2YP UK
P: +44 (0)151 521 5509 F: +44 (0)151 521 5509
E: info@trampower.co.uk W: www.trampower.co.uk

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Trampower

Leading to better transit