



ACOUSTIC
CONSULTANCY
SERVICES

RAILWAY NOISE & VIBRATION TRAFFIC, MAINTENANCE & DEPOTS

Rick Methold

Director, Southdowns Environmental Consultants Ltd

CIEH Buckinghamshire Branch
Noise Training Day
8th December 2009



OUR PROJECT INVOLVEMENT

Promoters / Contractors

- High Speed 1 (Channel Tunnel Rail Link)
- West Coast Route Modernisation
- Docklands Light Railway (City Apt, Woolwich Ext.)
- Southern Railway, Stabling Facilities
- NR Lincoln Station
- St Pancras International
- LU Tottenham Court Road Station Upgrade
- LU Cooling the Tube
- Dublin Interconnector (DART)
- Crossrail

OUR PROJECT INVOLVEMENT

Local Authorities

- East London Line Extension – LB Lewisham
– LB Hackney
- Crossrail – Westminster City Council
 - LB Camden
 - LB Islington
 - LB Tower Hamlets
 - City of London
 - LB Havering
 - LB Kensington Chelsea
 - LB Newham
 - Brentwood BC

CONTENTS

- Noise - Linear Infrastructure
- Noise - Fixed Installations
- Vibration
- Groundborne Noise
- Depots / Stabling
- Curving Noise
- Maintenance
- Rail Industry Initiatives
- END - Action Plans



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NOISE – LINEAR INFRASTRUCTURE

- Rolling Noise
- Locomotive Noise
- Aerodynamic Noise
- Structure Radiated Noise
- Construction / Maintenance Noise



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NOISE – FIXED INSTALLATIONS

- Tunnel Ventilation Shafts
- Portals
- Stations
- Lineside Equipment
- Depots
- Stabling Sidings



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VIBRATION

- Track Type
- Rail Quality
- Wheel Quality
- Rolling Stock
- Braking Type
- Supporting / Surrounding Ground Type
- Construction Vibration

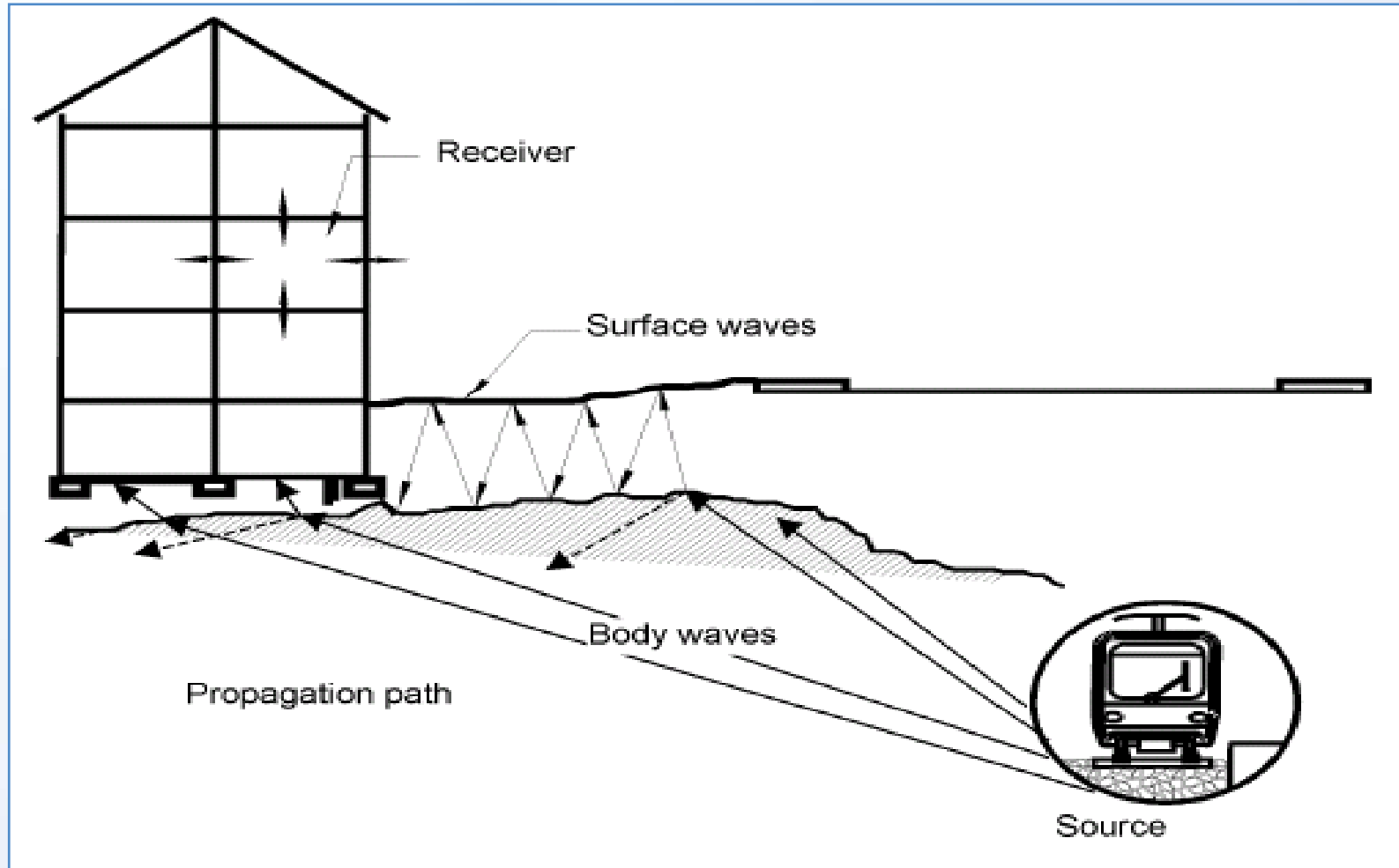


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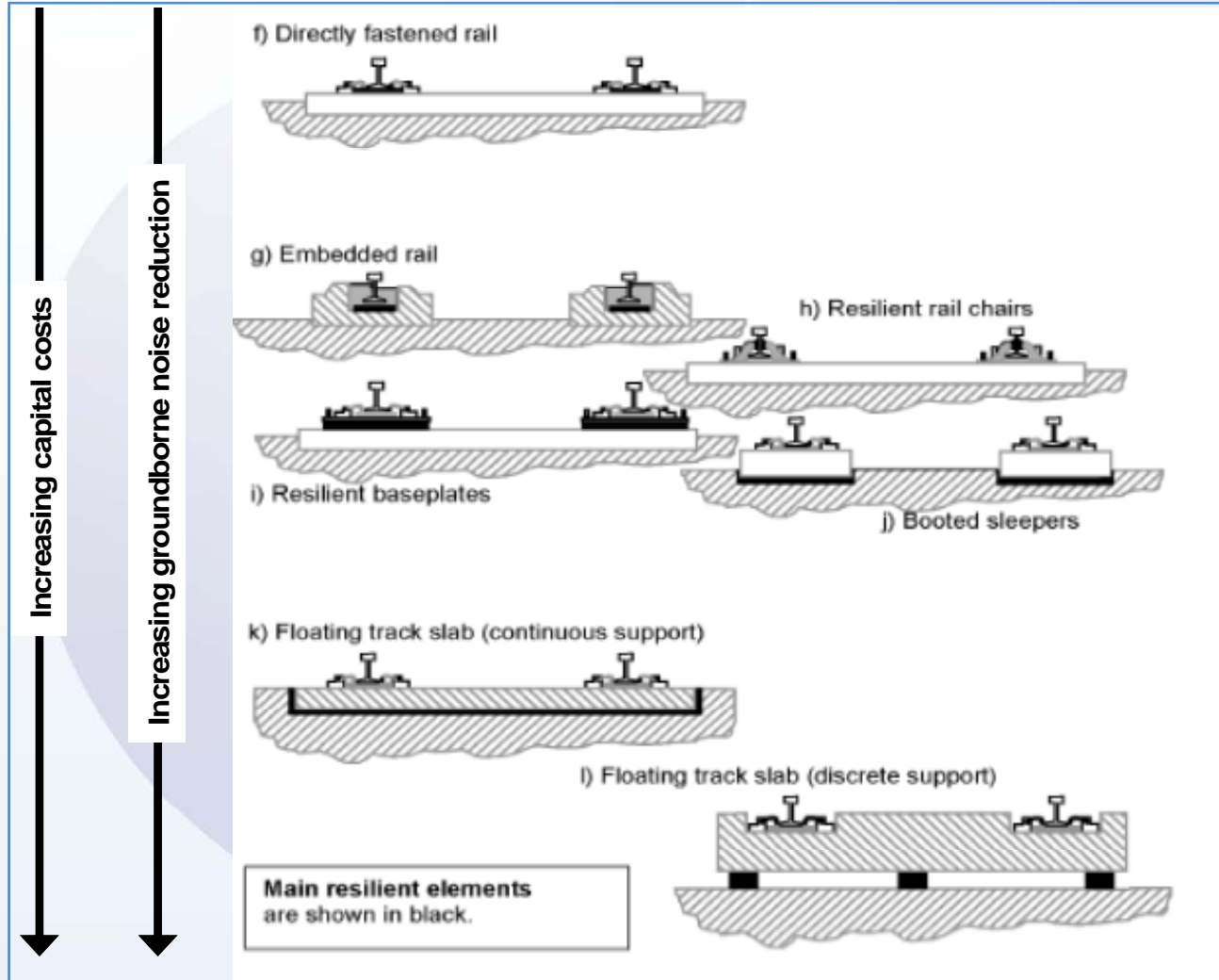
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GROUNDBORNE NOISE

- Audible 'Rumble' Noise
- Can Affect Large Populations
- High Risk / Capital Cost for Mitigation
- Major Design Issue for Sub-surface Railways



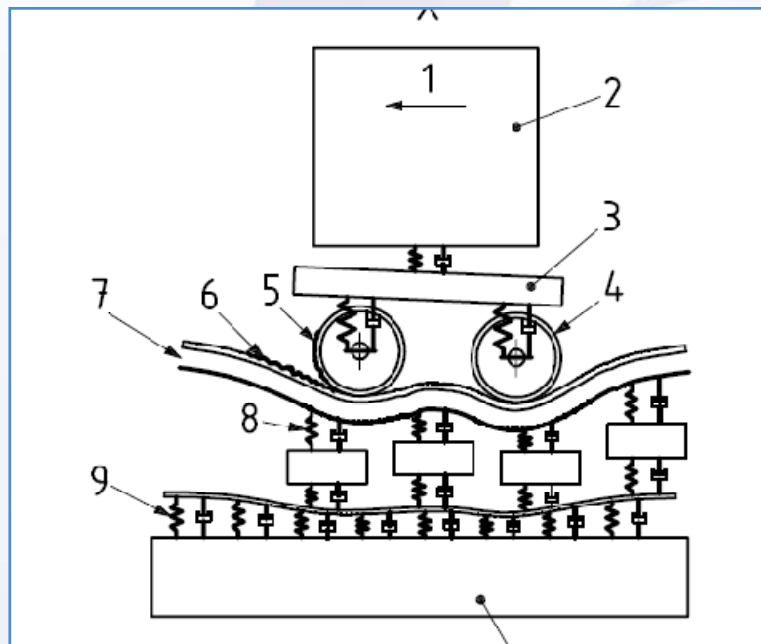
WHAT IS GROUNDBORNE NOISE?



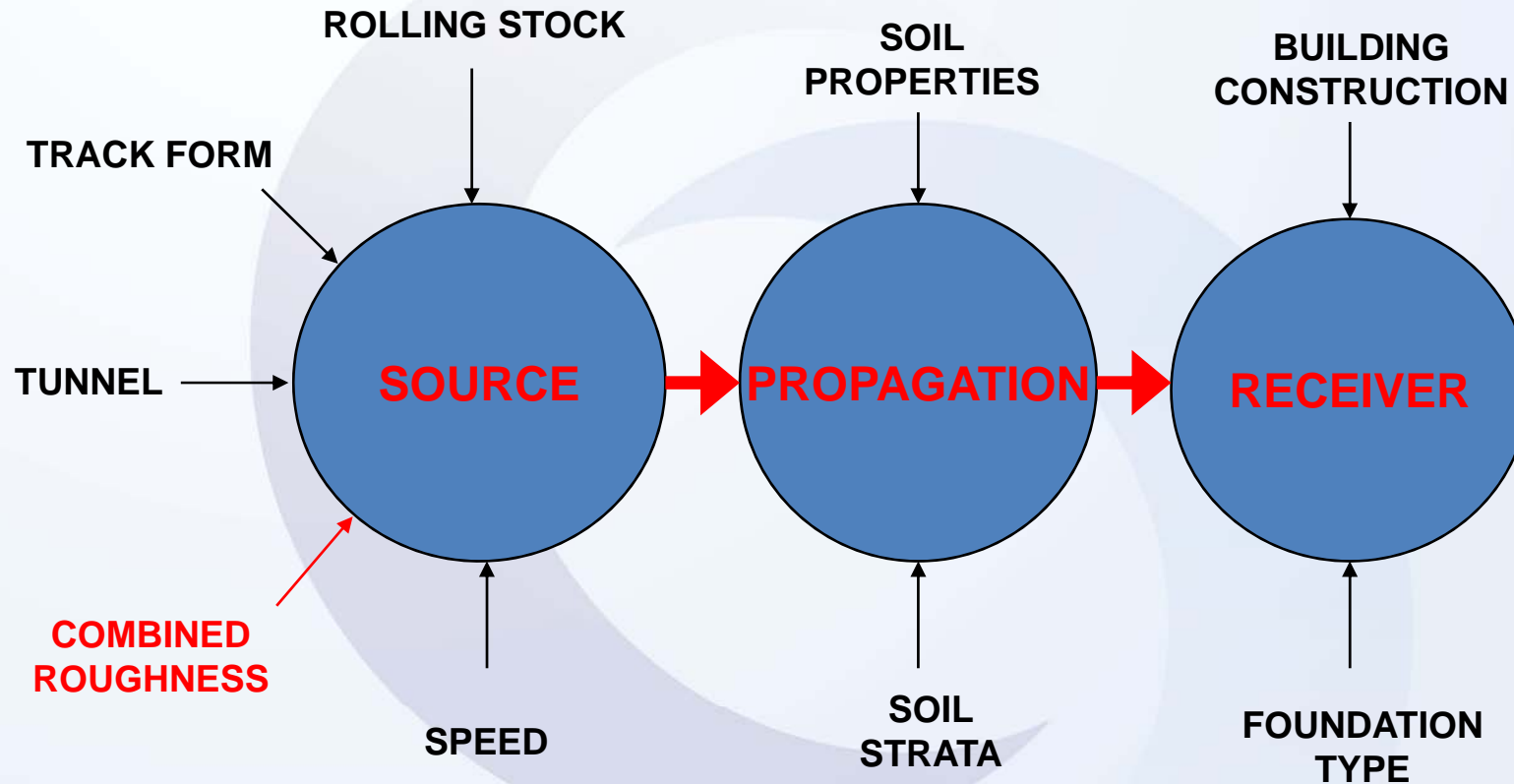
CONTROLLING GROUNDBORNE NOISE & VIBRATION BY DESIGN

RAIL / WHEEL ROUGHNESS

- Wheels rolling over rails causes excitation
- Condition of wheel tread and rail important in predictions



ROUGHNESS



PREDICTION OF GROUNDBORNE NOISE & VIBRATION

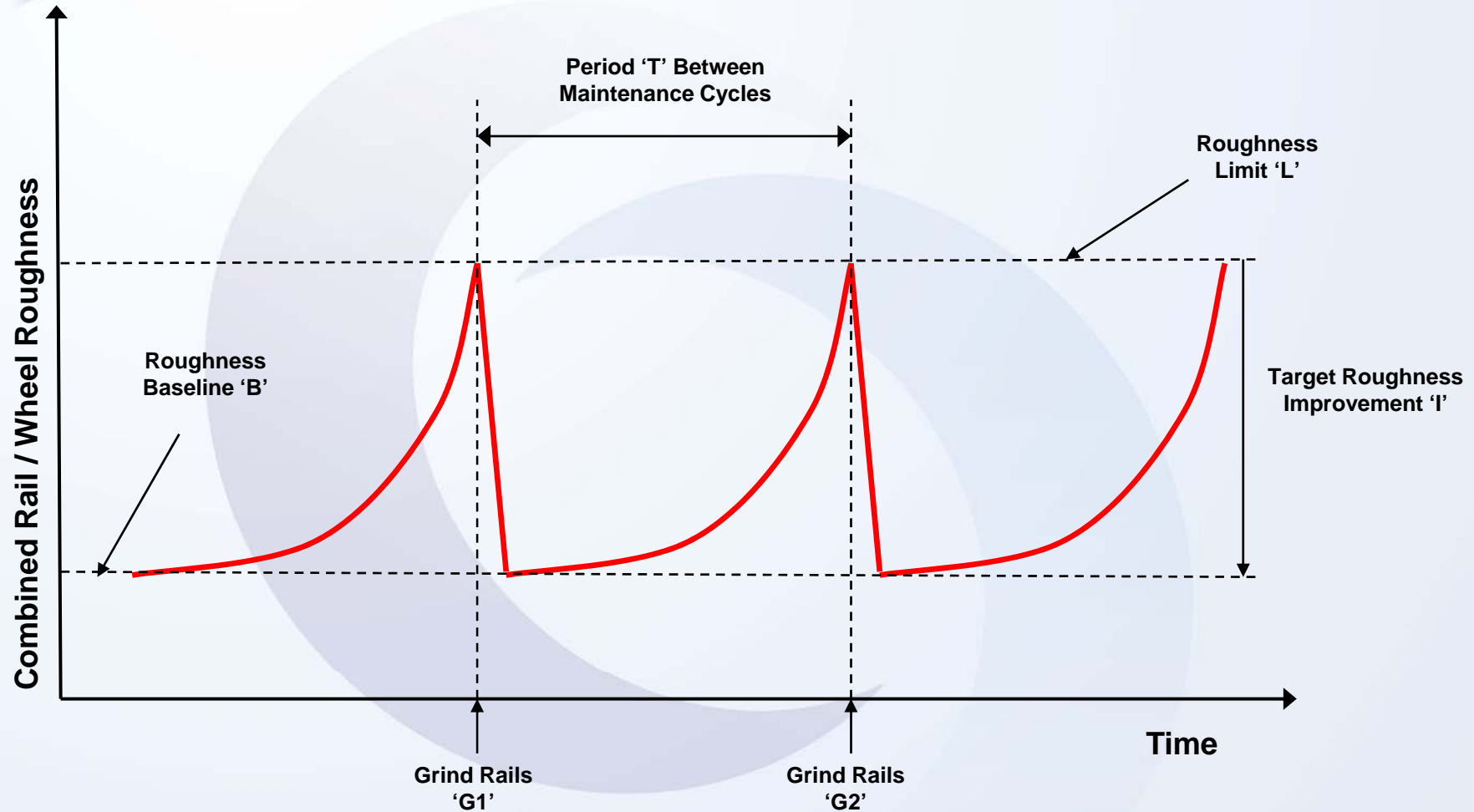


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Rail Corrugation





CONTROL OF ROUGHNESS THROUGH MAINTENANCE

CROSSRAIL RAIL/WHEEL CARE COMMITMENTS

- Ensure newly laid rails within tunnels are smooth
- Comply with roughness limit throughout life of railway
- Develop management system for monitoring, detection and amelioration
- Provide details of management system to Local Authorities

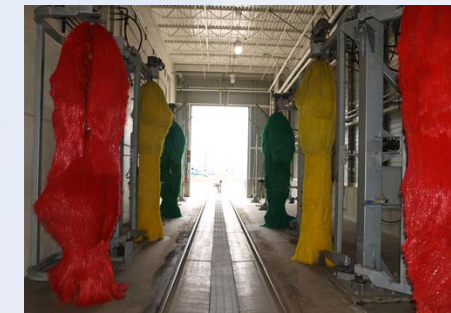




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TRAIN CARE FACILITIES



TRAIN CARE FACILITY NOISE SOURCES

- Slow Moving / Stationary Trains
- Train Horns
- Wheel Lathe
- Carriage Wash
- Stabling Sidings
- Lineside Electrification Equipment
- Building Services
- Maintenance Buildings
- Depot Warning Systems



CONTROL MEASURES

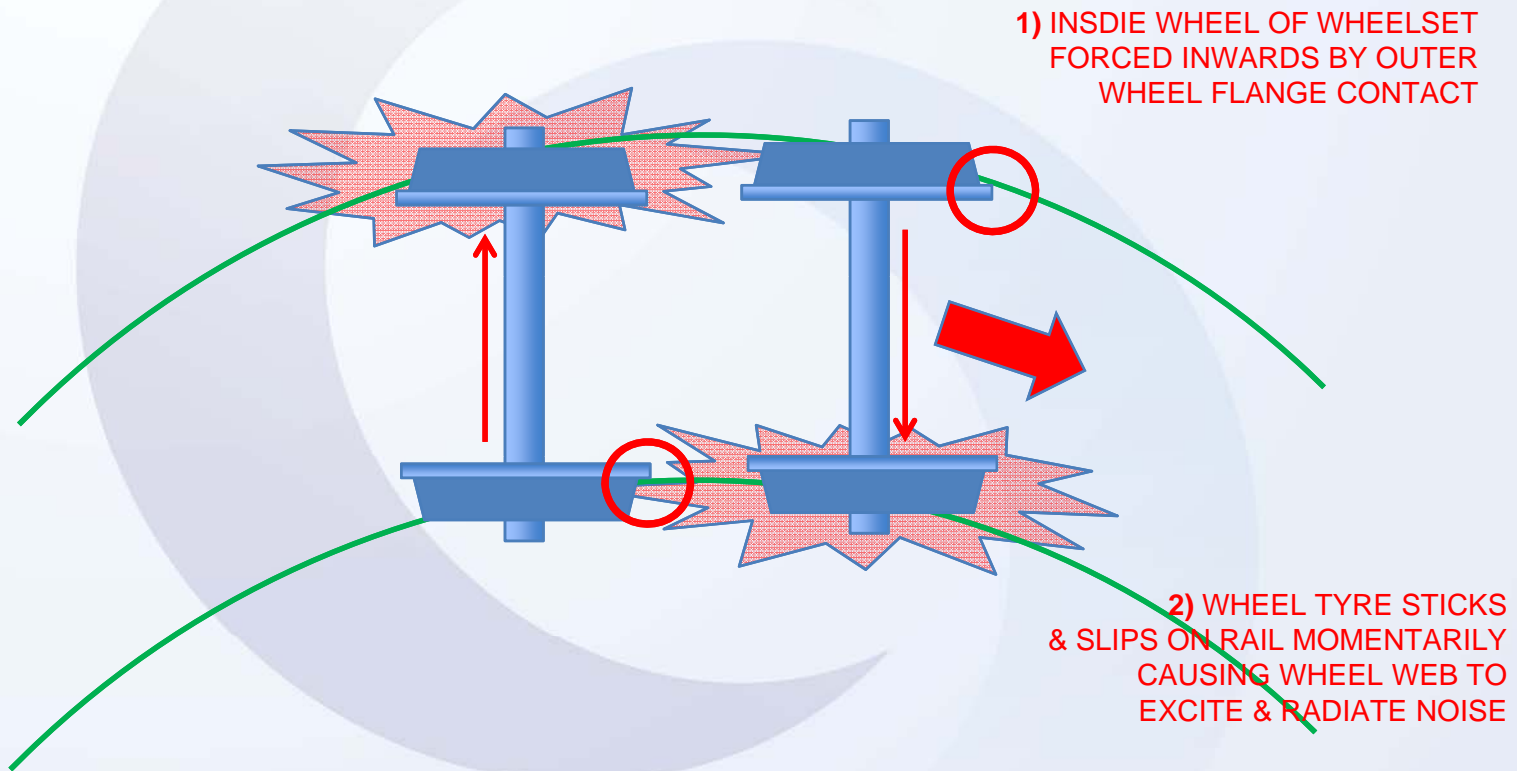
- Site Layout
- Enclosures
- Noise Barriers
- Rail Lubrication / Friction Modification
- Non-audible warning Systems
- Site Management
 - Hours of operation
 - Stationary trains
 - Berthing plans
 - Public Liaison

CURVING NOISE (WHEEL SQUEAL)

- Common cause of complaint in UK
- Caused by tight radii curves
 - <250 m – probable
 - 250 to 500 m – possible
- Difficult to predict
- Two Main Mechanisms
 - Micro ‘slip-stick’
 - Flange Contact
- Control measures exist
- Normally applied re-actively in UK



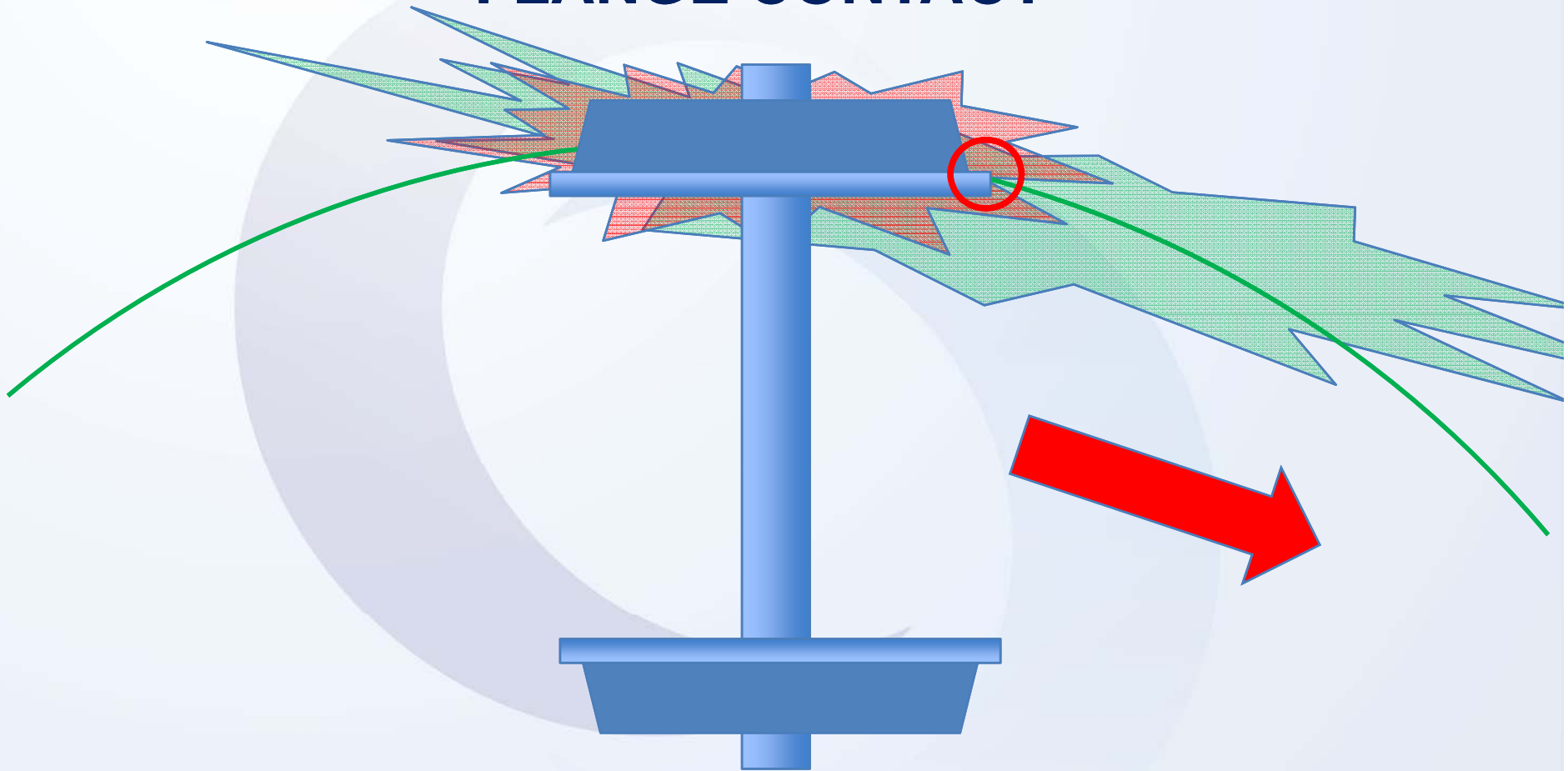
MICRO SLIP-STICK



CURVING NOISE



FLANGE CONTACT



CURVING NOISE

TOP OF RAIL FRICTION MODIFIER



Water Based Polymer

RAIL GAUGE FACE LUBRICATOR



Grease



TYPICAL MAINTENANCE ACTIVITIES

- Tamping
- Dynamic Track Stabilisation
- Rail grinding - profiling
- Wheel truing – removal of irregularities
- Re-railing
- Replacement track



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MAINTENANCE

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INITIATIVES – RAIL CARE (Providing Acoustical Benefits)

- High speed passive grinding
 - can be done during revenue service
 - economical
 - reduces night-time operations
 - maintains a roughness profile
 - could reduce crack formation
 - increases rail life longevity
- Friction Modification
 - could suppress corrugation growth
 - could suppress roughness growth
 - could slow down crack formation



INITIATIVES – OTHER (Providing Acoustical Benefits)

- Train Horns
 - Railways Standards amended to include max limit
 - 'Rule Book' amended to restrict use
- Public Address Systems
 - limited announcements
 - ambient noise sensing units
- Continuously Welded Rail (CWR)
- Resilient Track Forms
- EC Noise TSI - Rolling Stock
 - Pass-by, stationary, start-up limits

ENVIRONMENTAL NOISE REGULATIONS 2006

- Transposed from Environmental Noise Directive 2002/49/EC
- Agglomerations, Major Roads, Major Railways
- > 60,000 rail passages per year
- Noise Maps Produced
- Consultation on Draft Action Plans - Ended
- For Railways:
 - Defra to co-ordinate with Rail Authorities (DfT, ORR)
 - 'Important Areas' 1% of dwellings with highest noise levels
 - 'First priority', at least 73 dB LAeq,18hr
 - Based upon day-time noise levels
 - Local Authority Involvement (Planning, EH)



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END