ATKINS

Member of the SNC-Lavalin Group

Electrification Cost Reduction: Digital Design and Challenging the Rules

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Talk Contents

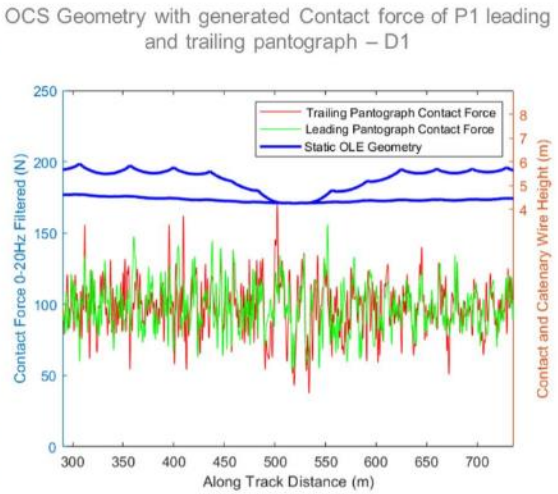
- The need to challenge existing methods
- Atkins first principles capability
- Current R&D projects:
  - Reducing uplift through measurement
  - Gradient modelling
- Applying emerging standards – challenge to designers
- Applying emerging standards – challenge to clients

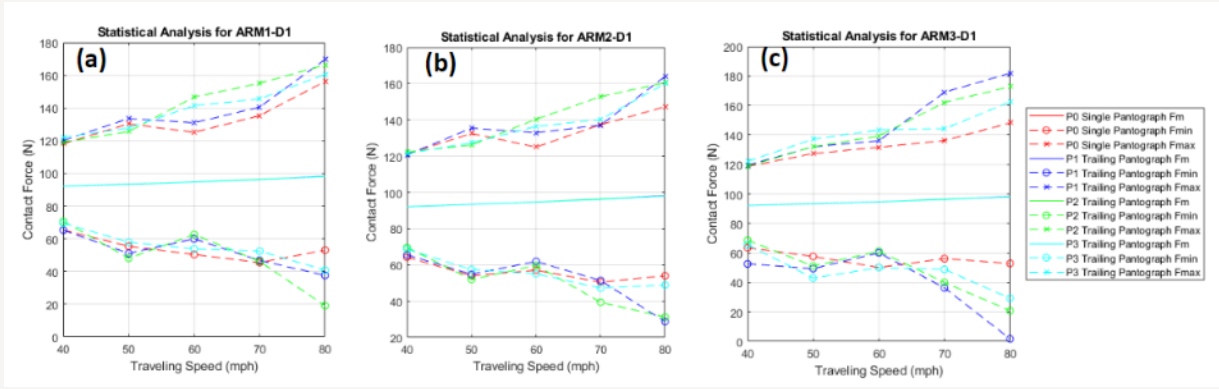
Electrification: The Current Landscape

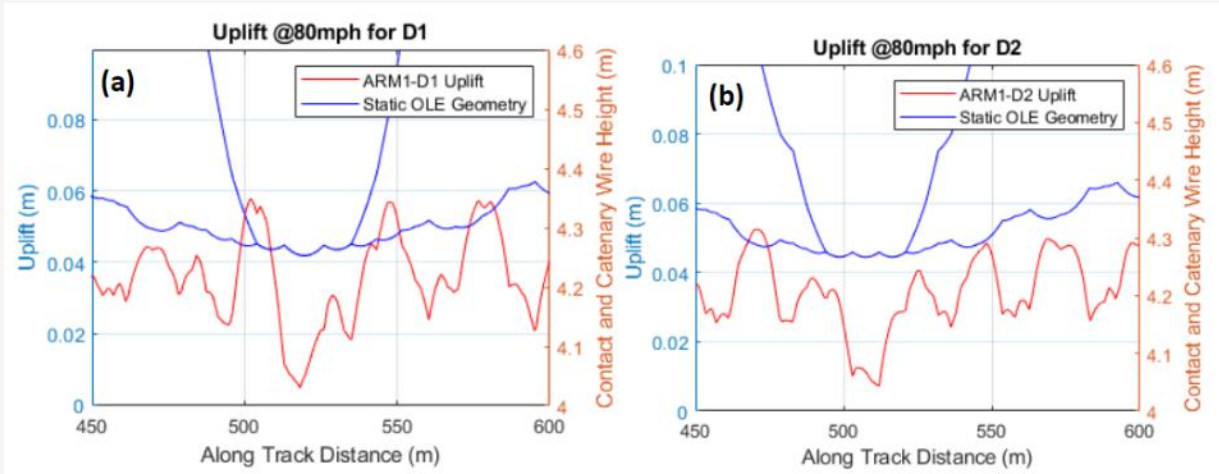
The Atkins First Principles Approach

Current Collection Criteria at the pantograph to OCS interface

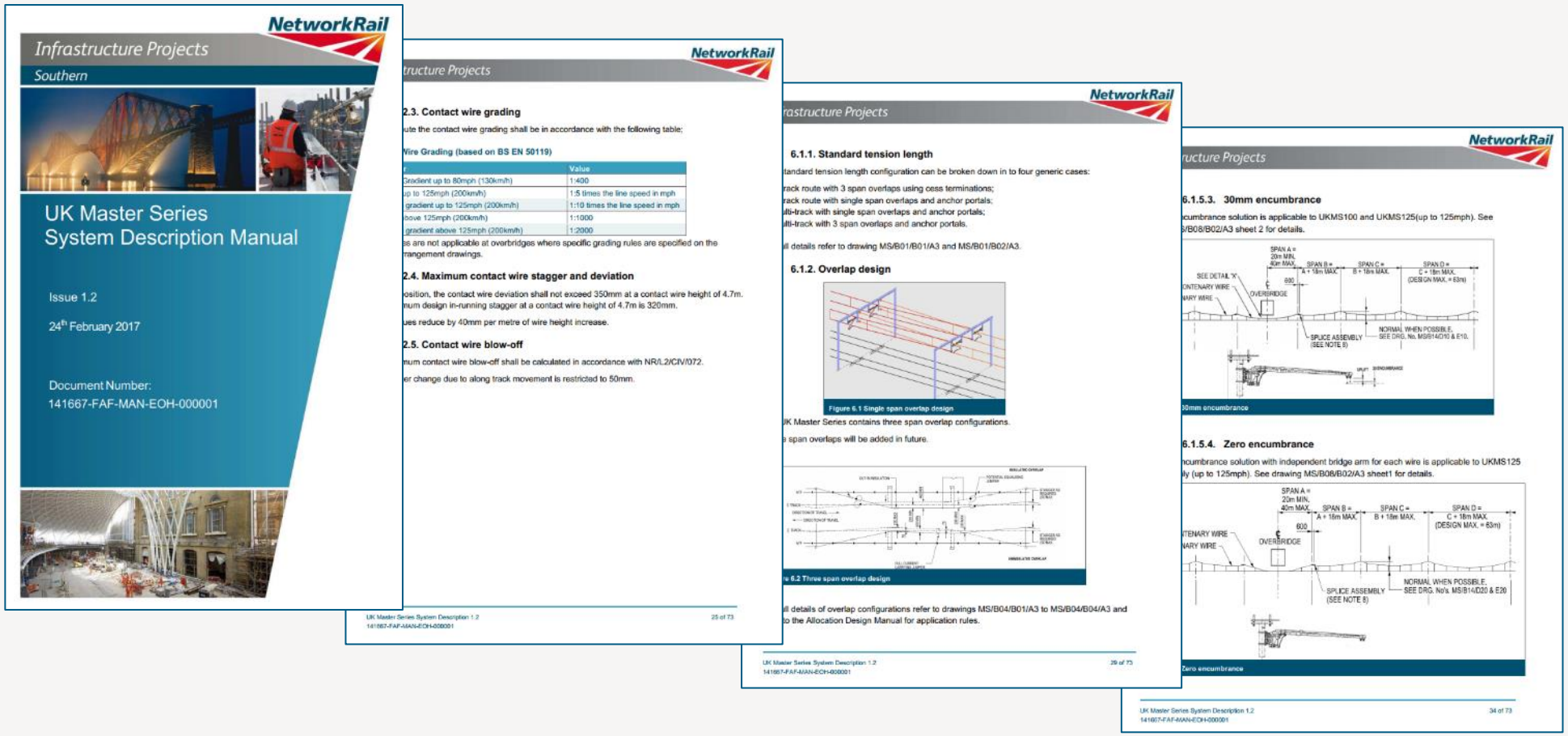
Speed (mph)	80
F_m	98.2
F_{min}	37.68
F_{max}	169.58
σ	17.72
σ/F_m	0.18
$F_m - 3\sigma$	45.03
$F_c < 25N$	0
Uplift max (mm)	67
Uplift BA (mm)	8
NQ (%)	0



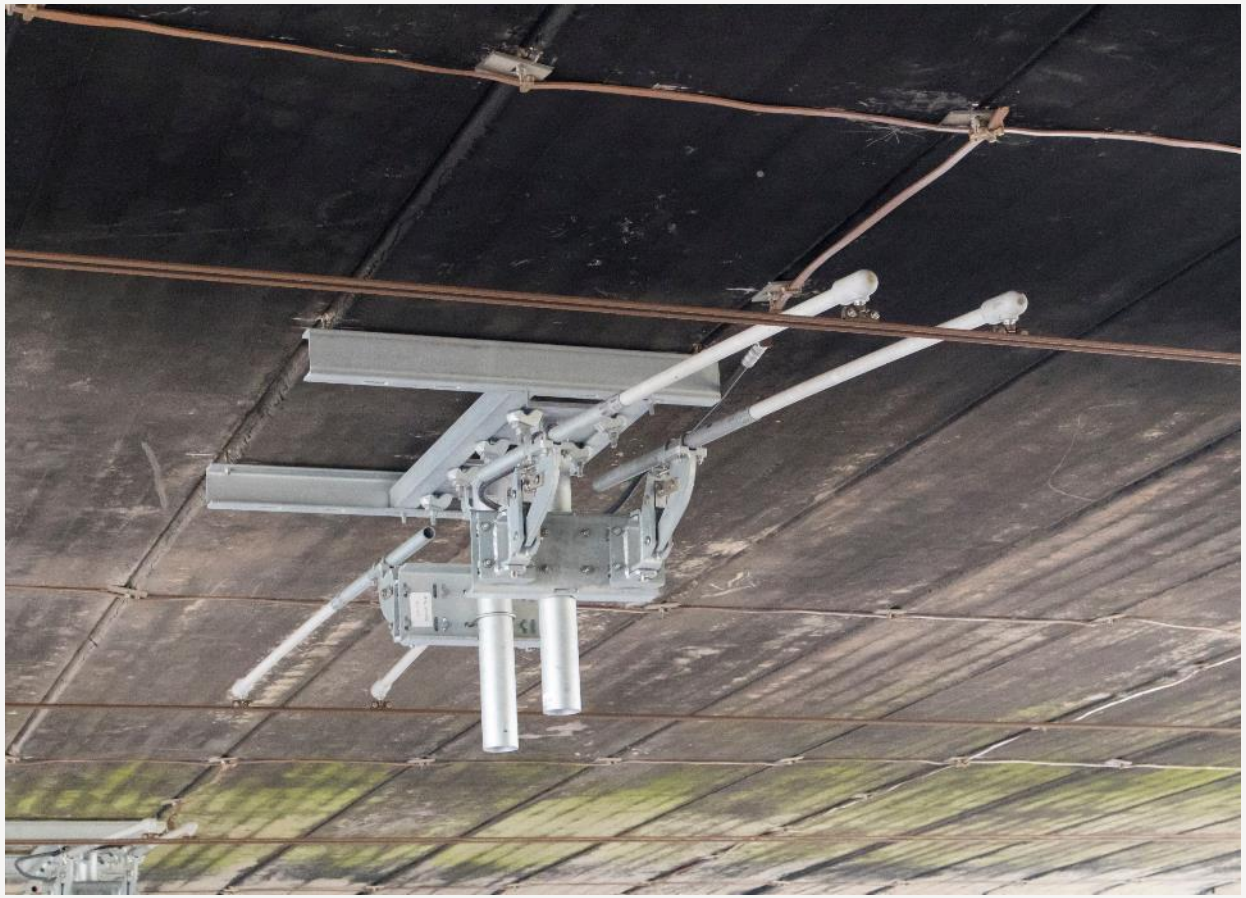


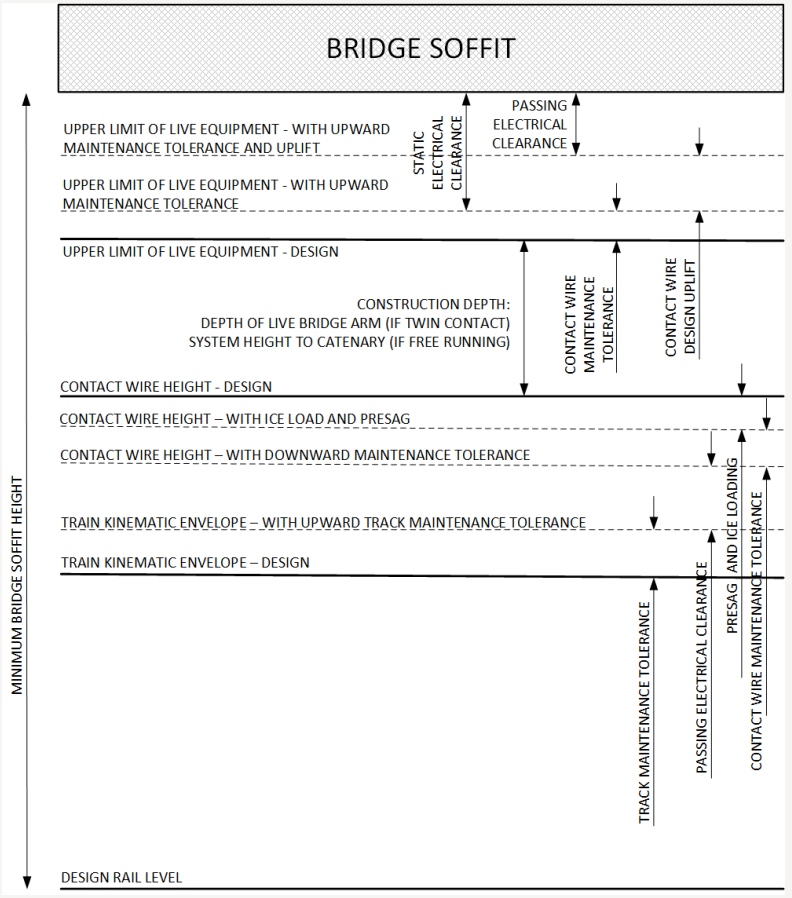


OLE Design Rules – Time For Change

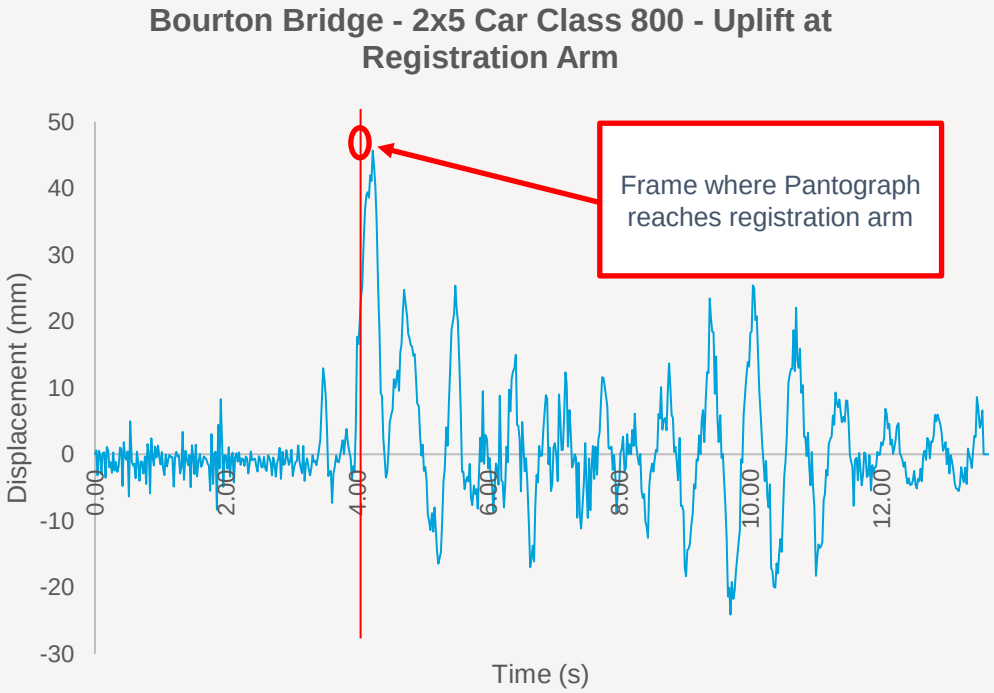


Influencing the New Policies - Uplift Modelling & Measurement

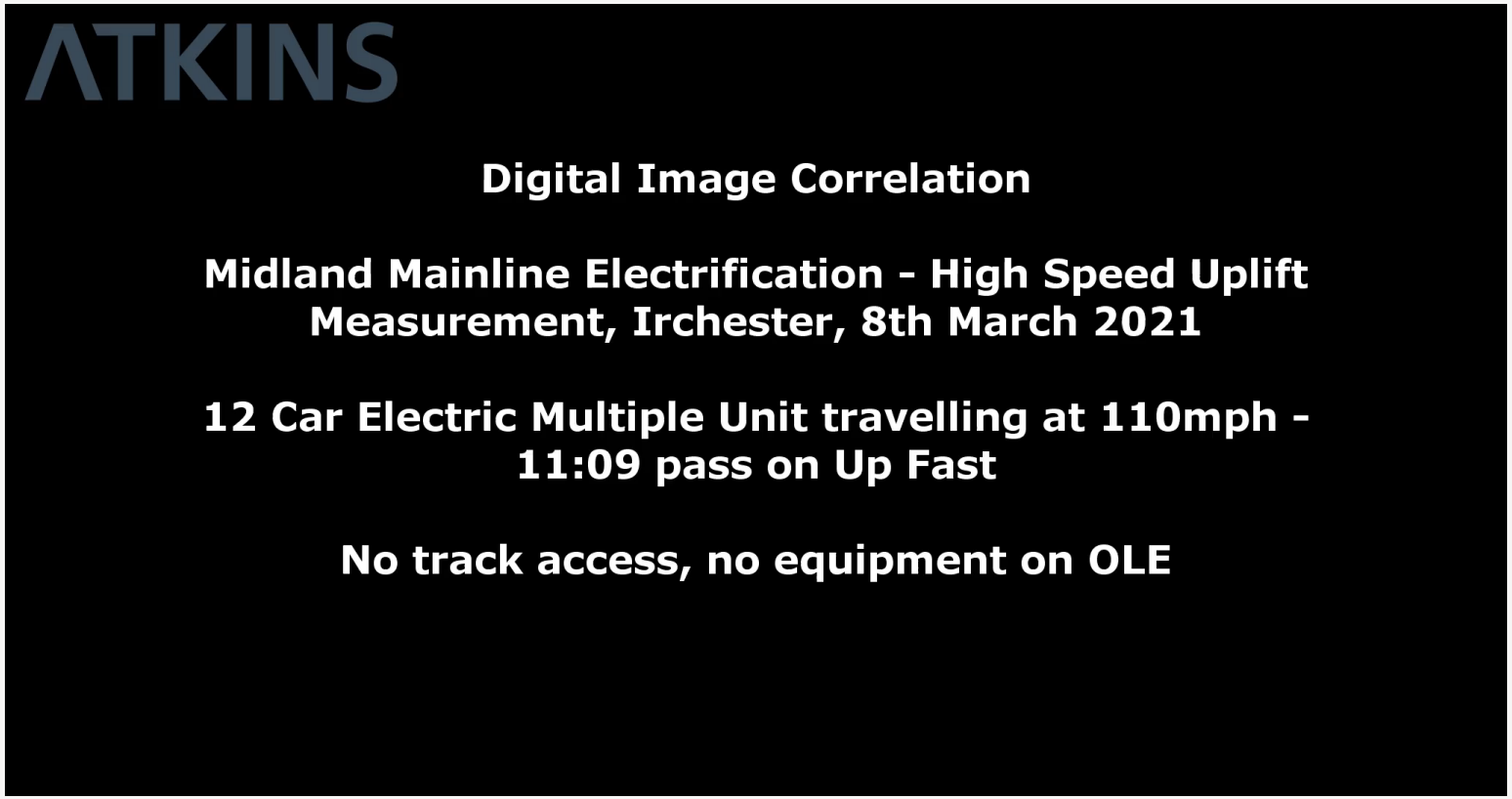




Uplift Measurement – A New Technique



Uplift Measurement – The Results



Uplift Measurement: The Results

Section 8 shows that use of a 45mm design value is in fact moving the industry back towards prior best practice as encapsulated in the 1987 version of drawing 1/111/100, and that the data from Old Dalby also supporting this proposal.

Recommendation 1: The design uplift for all Mark 3b and Rebosio bridge arms should be amended to a value of 45mm. This value should be applied to twin contact bridge arm locations at all speeds up to, and including, 125mph, and should be applied on all current Network Rail auto-tensioned systems. This should be regarded as an interim rule for all speeds, pending further measurement and assessment to allow a speed-uplift relationship to be defined.

The scope of this study does not include Fixed Termination equipment, and it is possible that equipment with a variable tension will experience higher uplift values, especially during periods of high ambient temperatures. This is potentially counterbalanced by the tendency of FT equipment to be operating at lower linespeeds, but at present there is insufficient data to be sure about the magnitude of any reduction from the current design value.

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Ref: 12-21-002-V1a
Date of issue: 17/12/2021
Location: National
Contact: Richard Stainton, Engineering Expert

NetworkRail
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10.6.2 Uplift of the contact wire by the pantograph and dynamic movement of the contact wire (a_6)

10.6.2.1 Requirement

Uplift shall be provided for both the bridge arms and the contact wire.

Values

The following values shall be used.

Component	Value [mm]
Bridge arm	43
Contact wire	77

Table 15 – Uplift values

Probabilistic assumptions

If undertaking a probabilistic assessment of uplift, normal (Gaussian) distribution shall be applied using the values below.

Component	Mean [mm]	Standard deviation [mm]
Bridge arm	+20.7	7.3
Contact wire	+41.8	11.7

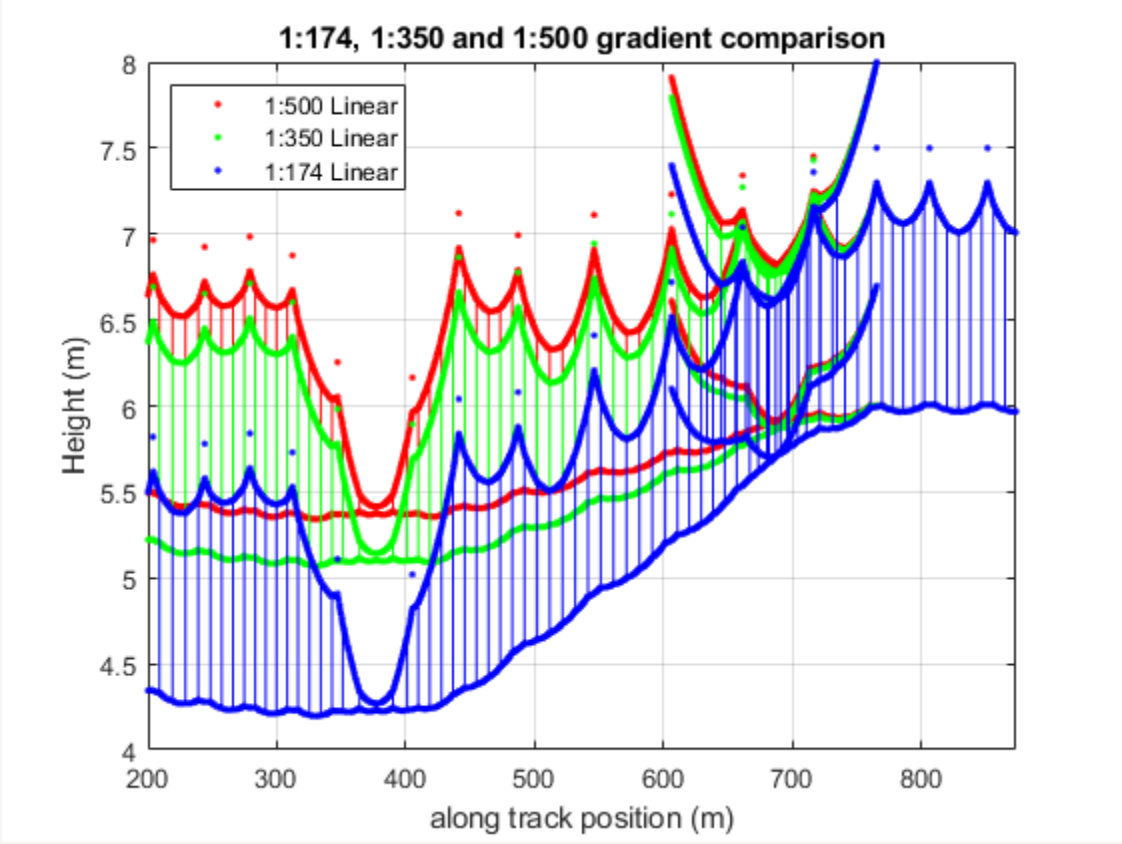
Table 16 – Probabilistic uplift values

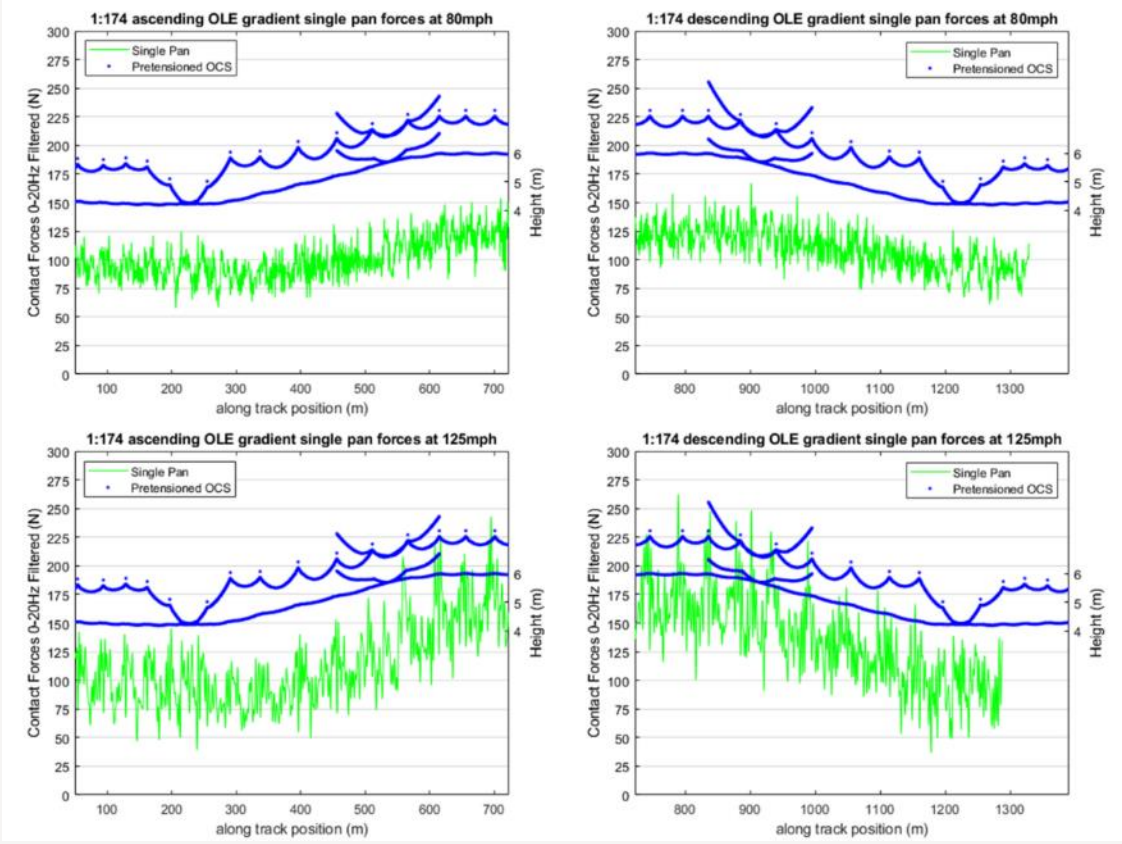
10.6.2.2 Rationale

These values have been determined via measurement of uplift in normal operating conditions as part of the cost-efficient electrification project. This measured a wide range of OCL in various stages of lifecycle.

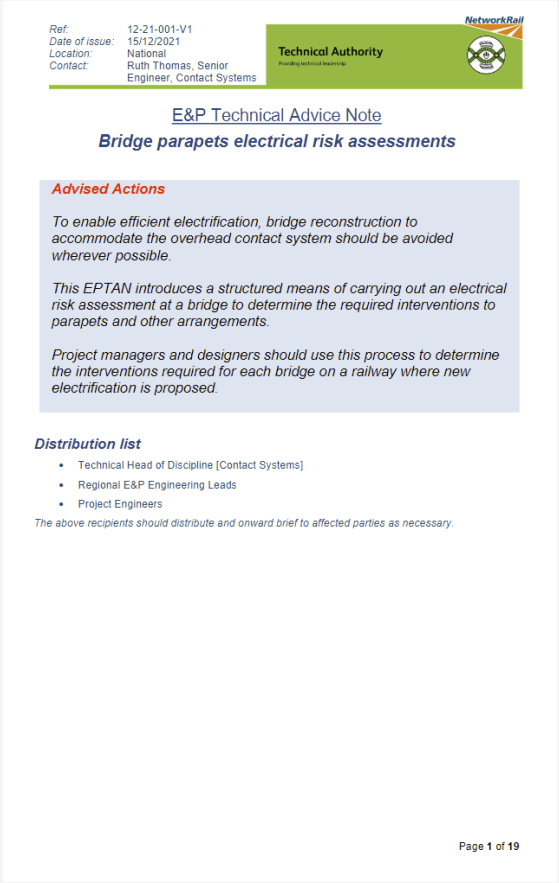
This parameter contributes to SRACs 08.

Influencing the New Policies - Gradients Modelling





Cost Reduction: What can Network Rail and Contractors Do?



Ref: 12-21-001-V1
Date of issue: 15/12/2021
Location: National
Contact: Ruth Thomas, Senior Engineer, Contact Systems

Technical Authority

E&P Technical Advice Note

Bridge parapets electrical risk assessments

Advised Actions

To enable efficient electrification, bridge reconstruction to accommodate the overhead contact system should be avoided wherever possible.

This EPTAN introduces a structured means of carrying out an electrical risk assessment at a bridge to determine the required interventions to parapets and other arrangements.

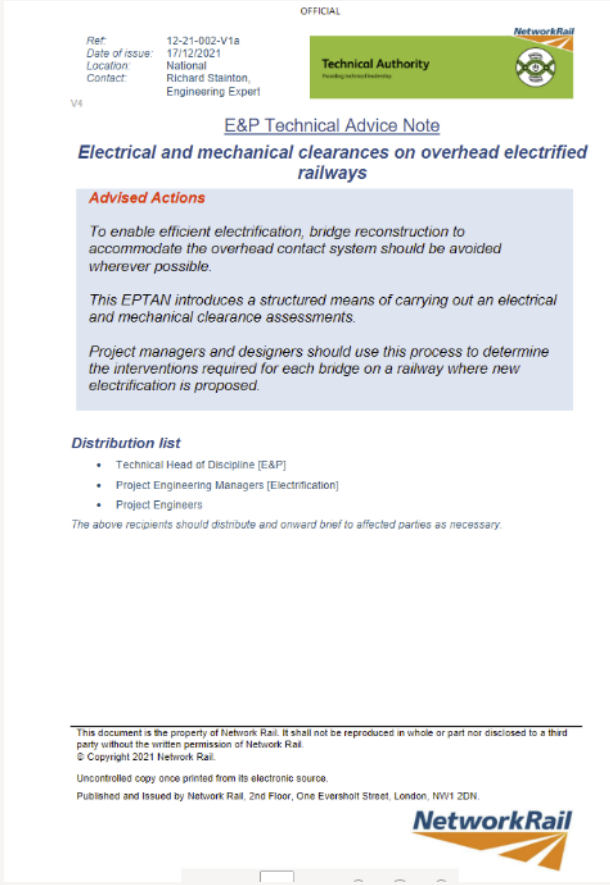
Project managers and designers should use this process to determine the interventions required for each bridge on a railway where new electrification is proposed.

Distribution list

- Technical Head of Discipline [Contact Systems]
- Regional E&P Engineering Leads
- Project Engineers

The above recipients should distribute and onward brief to affected parties as necessary.

Page 1 of 19



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Ref: 12-21-002-V1a
Date of issue: 17/12/2021
Location: National
Contact: Richard Stainton, Engineering Expert

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Technical Authority

E&P Technical Advice Note

Electrical and mechanical clearances on overhead electrified railways

Advised Actions

To enable efficient electrification, bridge reconstruction to accommodate the overhead contact system should be avoided wherever possible.

This EPTAN introduces a structured means of carrying out an electrical and mechanical clearance assessments.

Project managers and designers should use this process to determine the interventions required for each bridge on a railway where new electrification is proposed.

Distribution list

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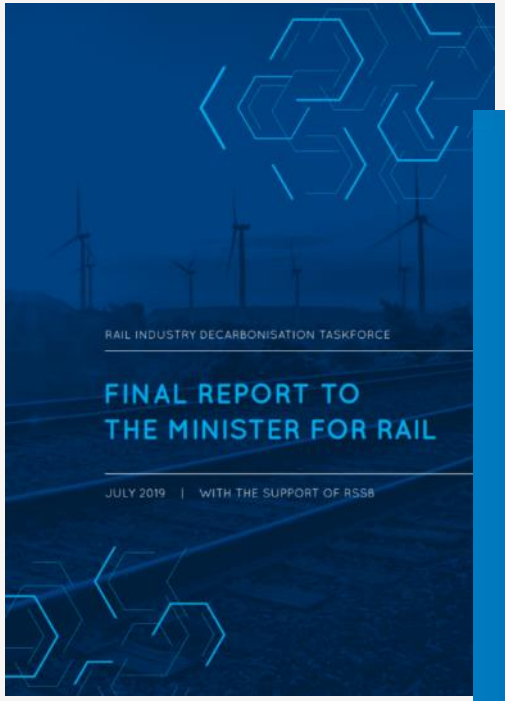
Cost Reduction: What Can Designers and Clients Do?

Conclusion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