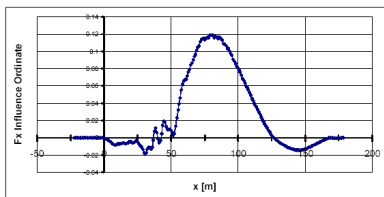
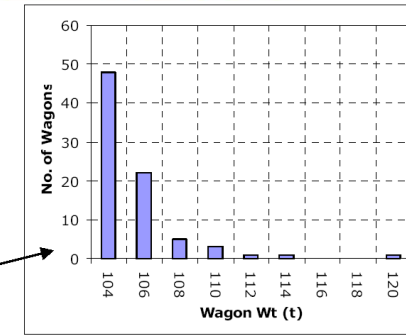
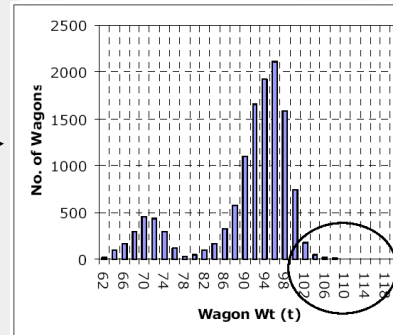
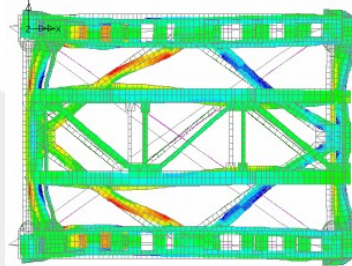
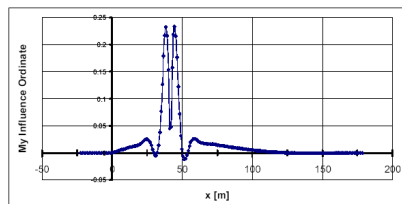


Task 2.1: Infrastructure Safety Framework

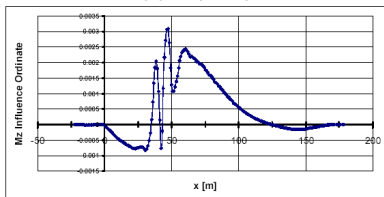
Optimisation of Whole Life Performance of Infrastructural Elements/Networks Novel Approach



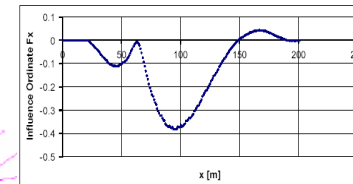
(a) F_x (16%)



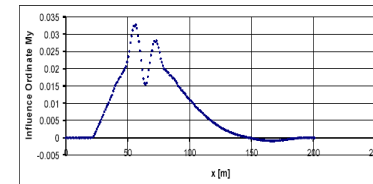
(b) M_y (65%)



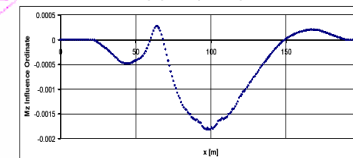
(c) M_z (19%)



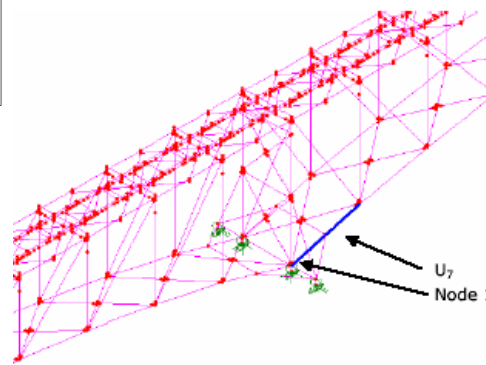
(a) F_x (68%)



(b) M_y (31%)



(c) M_z (1%)



Bergeforsen Railway Bridge, Sweden



Bridge constructed in 1923
 Superstructure span configuration: 42+84+42 = 168m
 Side spans 22.5m + 11.6m
 Total bridge length = 202.1m
 Required to probabilistically assess for **Heavier Trains**

Elements

- $\beta_{U_7} = 5.67 > 4.8$
- $\beta_{U_8} = 5.19 > 4.8$
- $\beta_{SLB, posn7} = 4.66 < 4.8$ ($M_2 = 0$, $\beta_{SLB, posn7} = 5.85$)
- $\beta_{TB, posn7} = 4.81 > 4.8$

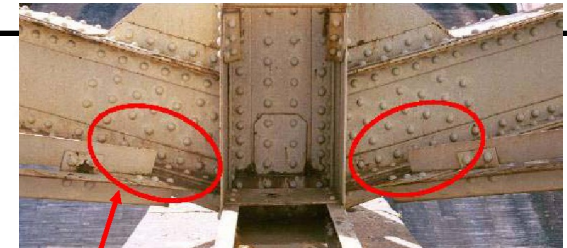
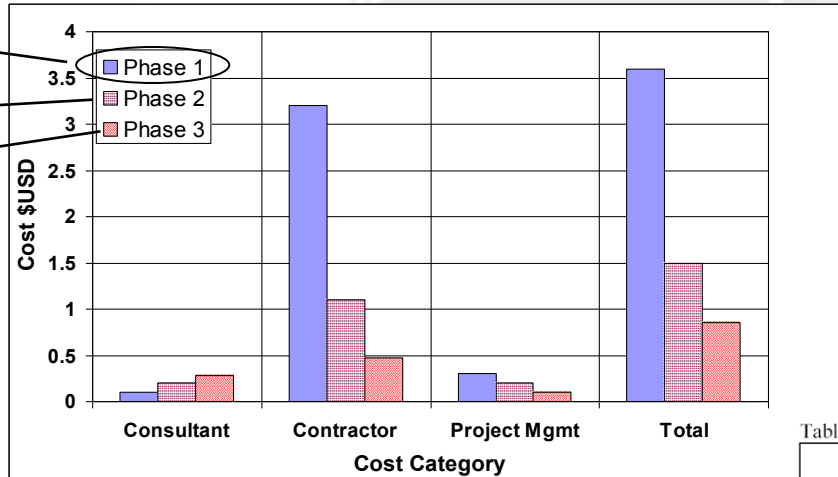
Joints

- $\beta_{6-U_6} = 6.38 > 4.8$
- $\beta_{7-U_6} = 4.51 < 4.8$ (Remedial action necessary, Proposal A $\beta_{7-U_6} = 6.05$, Proposal B $\beta_{7-U_6} = 7.80$)
- $\beta_{7-U_7} = 4.06 < 4.8$ (Remedial action necessary, Proposal A $\beta_{7-U_7} = 5.62$, Proposal B $\beta_{7-U_7} = 7.11$)
- $\beta_{8-U_7} = 6.01 > 4.8$
- $\beta_{7-V_7} = 6.31 > 4.8$
- $\beta_{2-D_2} = 4.42 < 4.8$ (Remedial action necessary, Proposal A $\beta_{2-D_2} = 6.25$)
- $\beta_{3-D_2} = 4.56 < 4.8$ (Remedial action necessary, Proposal A $\beta_{3-D_2} > 4.8$)
- $\beta_{3-D_3} = 5.18 > 4.8$
- $\beta_{4-D_3} = 5.32 > 4.8$

Deterministic Assessment

Rainflow for FLS

Full Probabilistic for Assessment & Repair Planning



Connection U₇

Table 7 - Results of deterministic and probabilistic assessment; O'Connor et al (2004).

	Phase 1 Deterministic Assessment (\$USD)	Phase 2 Advanced Deterministic Assessment (\$USD)	Phase 3 Probability Based Assessment (\$USD)
Consultant Fee	\$0.1ml	\$0.2ml	\$0.28ml
Contractor Fee	\$3.2ml	\$1.1ml	\$0.47ml
Project Management	\$0.3ml	\$0.2ml	\$0.1ml
Total Cost	\$3.6ml	\$1.5ml	\$0.85ml

Task 2.1: Infrastructure Safety Framework

Optimisation of Whole Life Performance of Infrastructural Elements/Networks Novel Approach

Broadmeadow Railway Bridge, Sweden

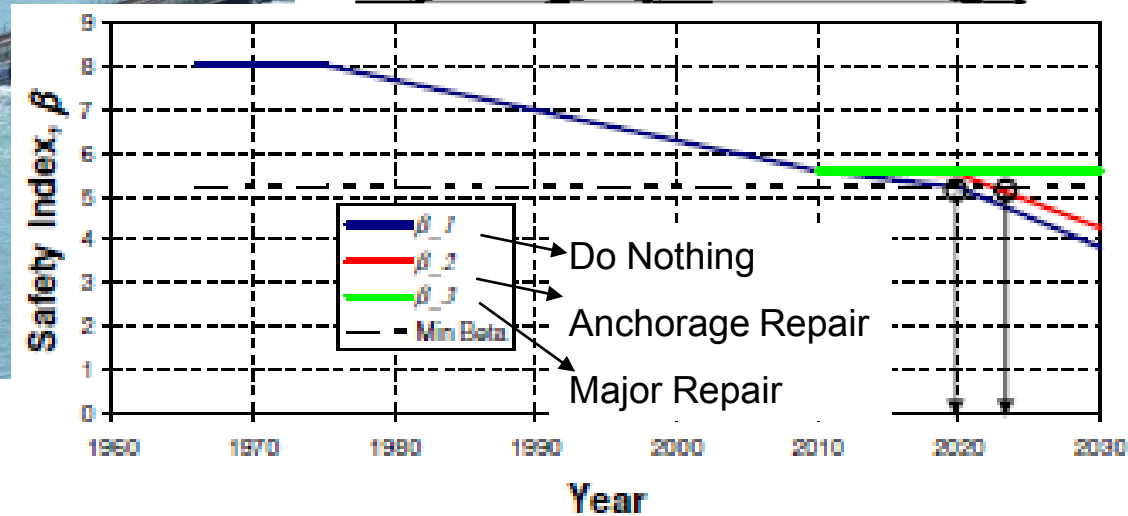
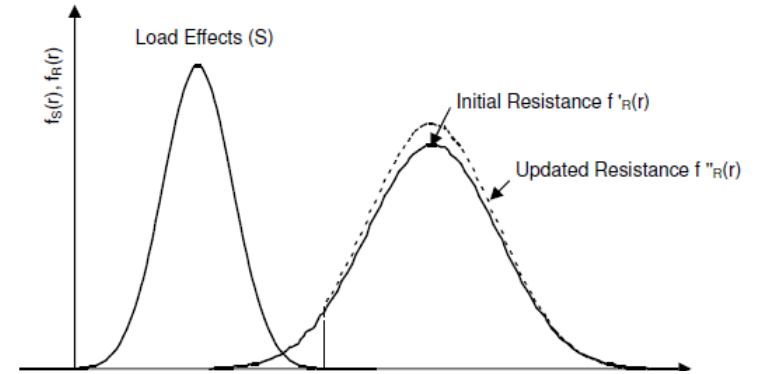


Figure 11. Safety Index vs. Time