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**Risk-based approach in design of
slab track for vibration mitigation**
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Risk Management

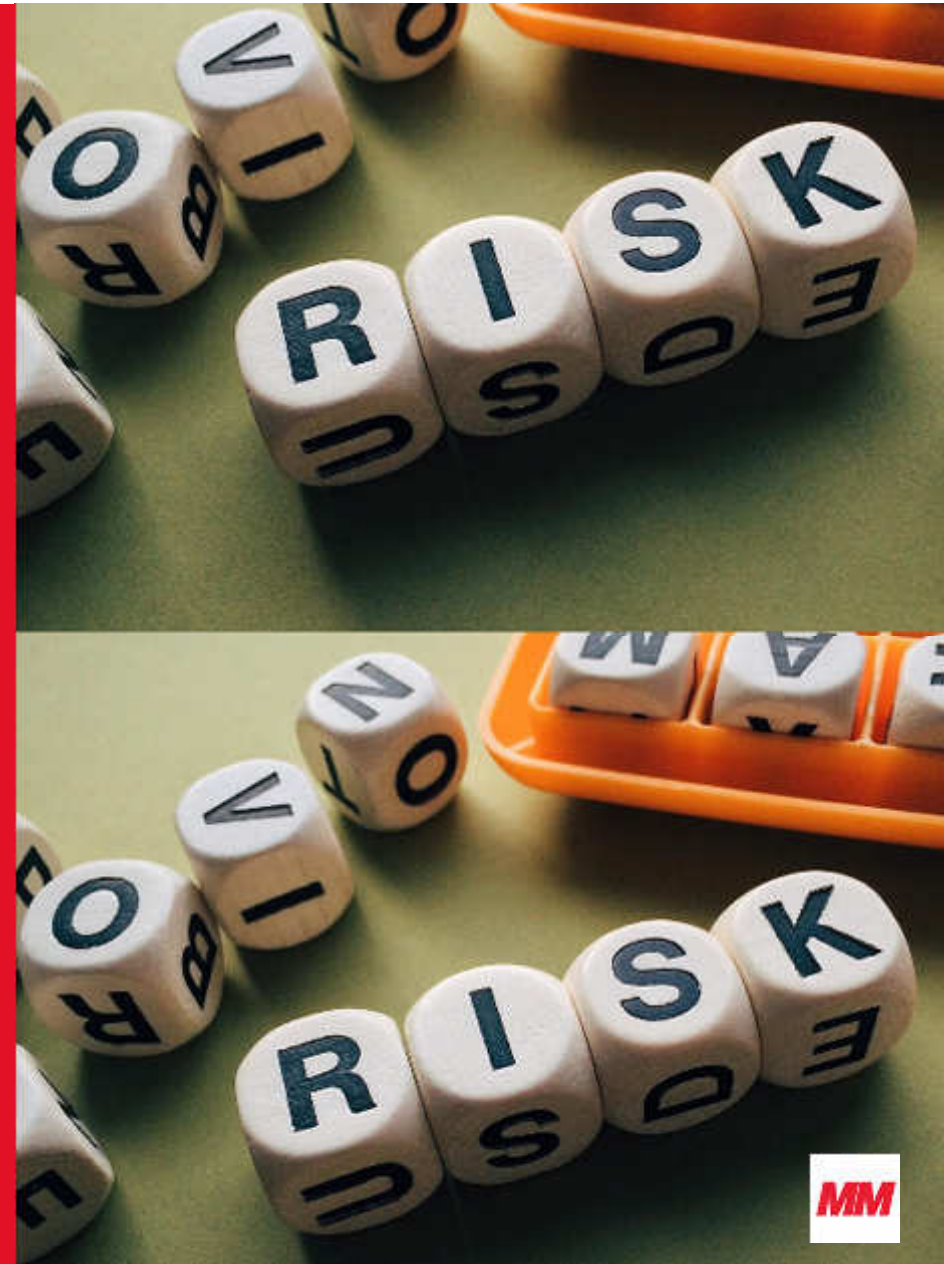


RISK MANAGEMENT

Definitions

Risk management is a continuous process for systematically identifying, analyzing, treating, and monitoring risk throughout the lifecycle of a product

Risk management is the practice of developing a collective understanding among stakeholders to anticipate and manage issues. It fosters proactive implementation of lower-cost preventive actions compared to higher-cost reactions and increases opportunities for business benefit and satisfaction of



RISK REGISTER EXAMPLE

Risk Description	Likelihood	Impact	Risk Score	Response Strategy	Contingency Reserve / Notes
Incorrect installation due to lack of installer familiarity with the system	4	4	16 (High)	Mitigate: Provide O&M-led installation training, supervision, QA inspection.	Include budget for 2 days O&M supervision and rework allowance (≈5% of install cost).
Misalignment of rail during installation due to flexible baseplates	3	3	9 (Medium)	Mitigate: Use alignment jigs, continuous geometry monitoring.	Contingency for track correction post-installation (≈2% of project cost).
Unexpected vibration levels not meeting design targets due to subgrade conditions	3	5	15 (High)	Mitigate: Conduct detailed site vibration modeling before installation.	Reserve for adding damping materials or base slab modifications (≈10%).
Excessive lateral movement or rail roll due to low stiffness	2	4	8 (Medium)	Mitigate: Verify load distribution design; use stiffer variants for curves.	Include inspection every 6 months during first year.
Specialized parts or tools required for inspection/adjustment	4	3	12 (Medium)	Mitigate: Maintain spares and toolkits on-site; train maintainers.	Keep one full set of tools and 5% spare units in stock.
Long lead times for specific components	3	4	12 (Medium)	Transfer/Mitigate: Include supply chain clause in vendor contract.	Stock critical spares; 10% buffer inventory.
Higher initial cost than conventional fastenings	5	3	15 (High)	Accept/Mitigate: Justify through lifecycle cost analysis; phase procurement.	10% project contingency fund for cost overruns.
Unanticipated lifecycle costs (special inspections, proprietary components)	3	4	12 (Medium)	Mitigate: Include O&M cost in early feasibility.	Lifecycle cost review after 2 years.
Inadequate inspection frequency causing undetected degradation	3	4	12 (Medium)	Mitigate: Implement risk-based maintenance schedule.	Include predictive monitoring (accelerometers).
Track uplift or instability under braking/acceleration due to low stiffness	2	5	10 (Medium)	Mitigate: Validate design with simulated dynamic loads.	Extra design verification tests.

RISK REGISTER EXAMPLE

Post-response register

ID	Post-mitigation P	Post-impact (% of project)	Impact (£)	Residual EMV
R1	10%	3%	£300,000	£30,000
R3	10%	5%	£500,000	£50,000
R8	60%	4%	£400,000	£240,000
R7	10%	2%	£200,000	£20,000
R2	5%	1%	£100,000	£5,000

WHICH OPTION IS OPTIMAL?

After having performed risk identification and analysis, and risk response analysis

TOTAL CONTINGENCY RESERVE

- 01** ➤ This parameter represents the total amount of funds set aside to address identified risks. A lower contingency reserve might indicate a more favorable option if it suggests fewer or less severe risks.

TOTAL NUMBER OF RISKS EXCEEDING A CERTAIN IMPACT FACTOR

- 02** ➤ This parameter helps in understanding the severity and frequency of high-impact risks. An option with fewer high-impact risks might be more desirable.

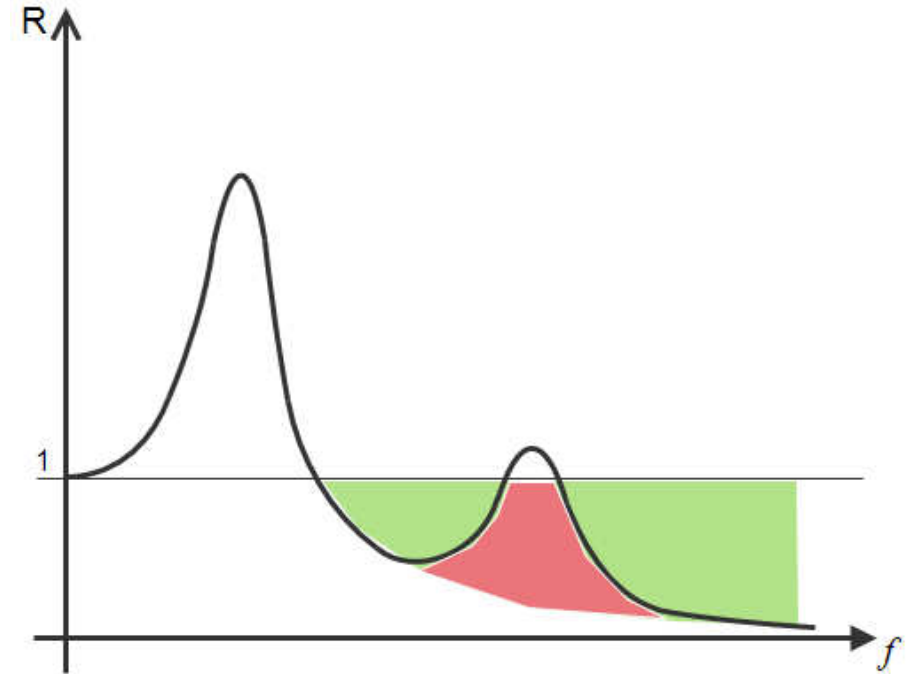
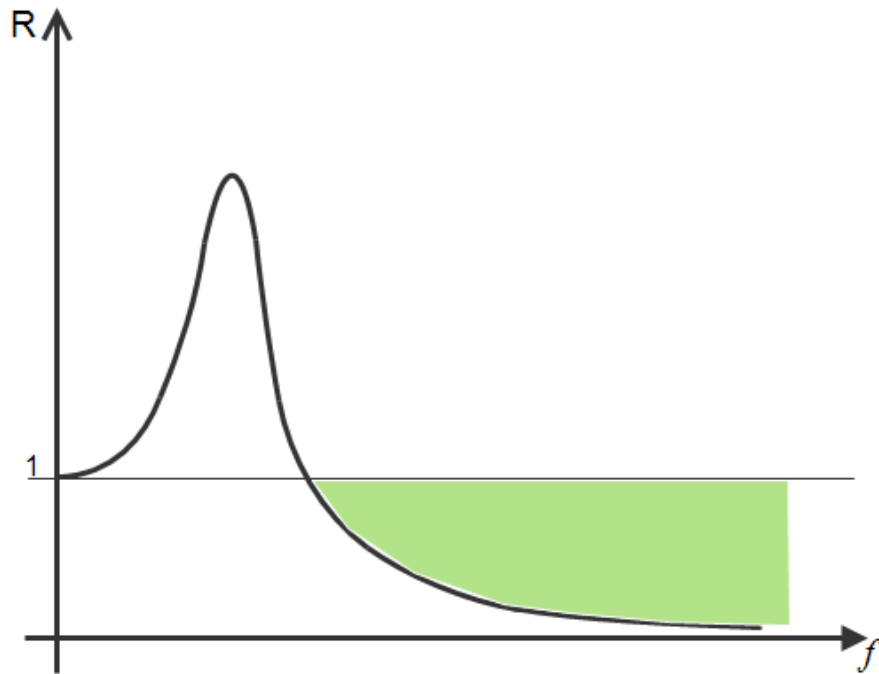
RISK EXPOSURE

- 03** ➤ This is a combination of the probability and impact of all identified risks. An option with lower overall risk exposure might be more optimal.

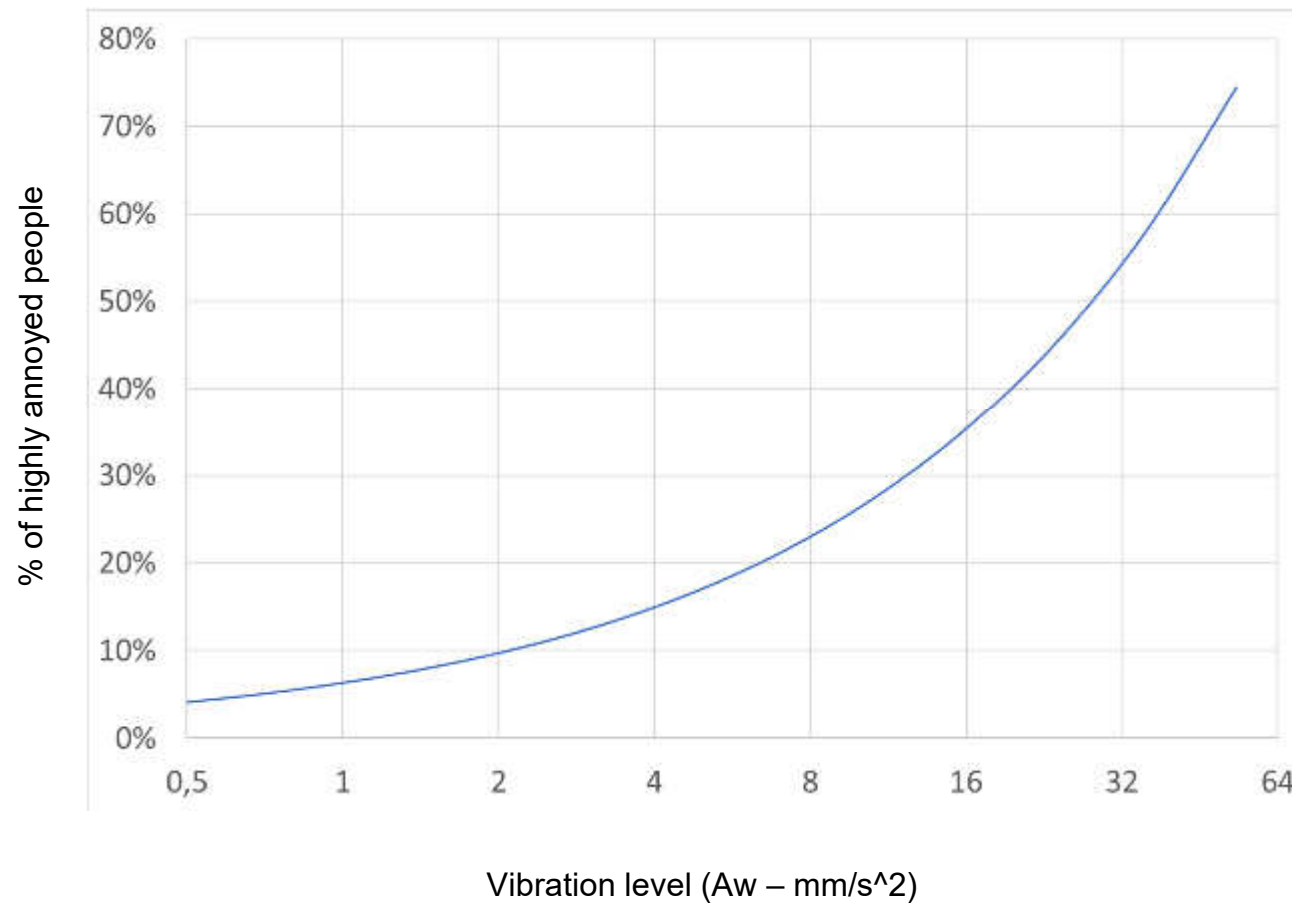
RISK RESPONSE EFFECTIVENESS

- 04** ➤ Assess the effectiveness of the planned risk responses. An option with more effective risk responses might be more favorable.

Risk Ex.: vibration mitigation vs. corrugation propensity



Risk Example: Human sensitivity to vibrations



Risk Management: the real help for track experts!



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