

# Provide a Safe and Efficient Method to Enable Building Facade Inspections Without Impacting on the Operation of the Environs (including inaccessible, hard to reach or hidden elements)

## What is the situation?

Our headline Business Critical Rules are 'Loss of safe environment' and 'Objects Falling from height leading to injury'. These incidents occur at a variety of locations including railway stations, lineside buildings, depots, car parks and other property assets.

Visual inspections are currently ground based, using binoculars and not sufficiently robust.

### The inspection quality problems are:

- Some parts are hidden (in particular, wall tiles).
- A lack of tactile inspection.
- Poor visibility and generally a lack of detail.
- The defect can only be seen from one angle.
- Limited ways to give a condition marking index based on quantitative measures.
- Subject to weather conditions and the ability of the inspector.

### The problems with access solutions are:

- Accessing station buildings is problematic and very few man safe systems are available.
- Some areas are hard to reach even with abseiling
- Working at height should be minimised as it is a safety risk.

A inspection notice was issued in 2015 to try and understand the scale of the problem, which highlighted the difficulty in undertaking these kinds of inspections.



fig. 1

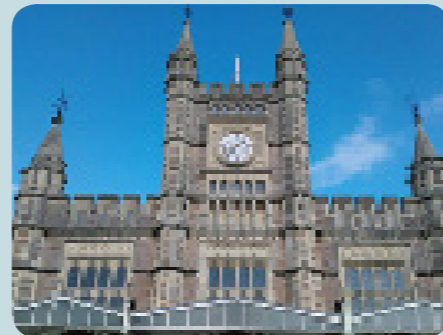
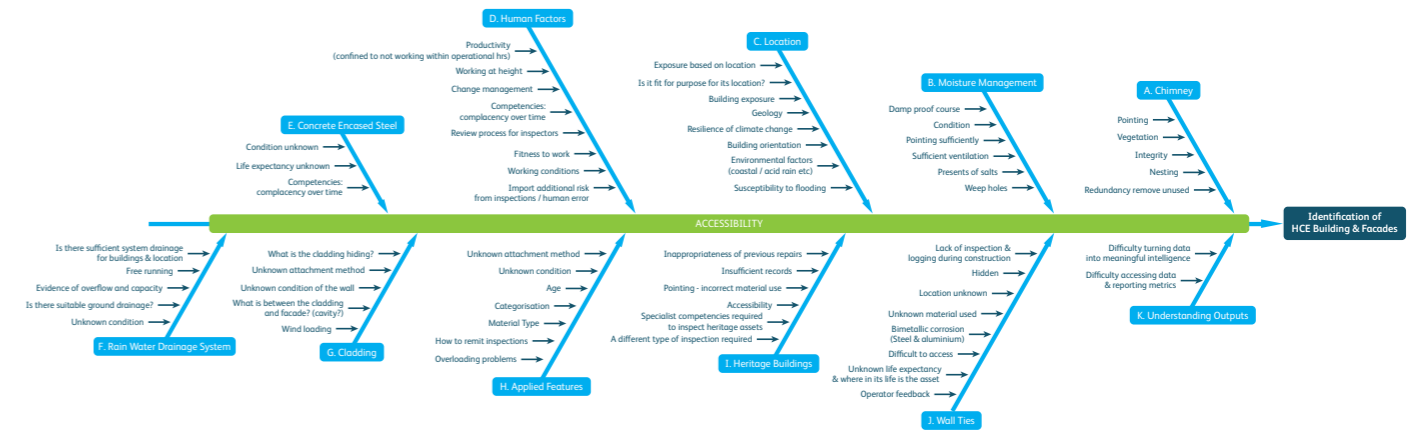


fig. 2



fig. 3

## Analysis of causes



## Specific research needs

To address these challenges it is expected that R&D actions will need to address the following aspects:

### Lack of safe methodologies to inspect

How can we inspect inaccessible building facades? How do we get the facade to the expert instead of the expert to the facade? How can we inspect and make it safe simultaneously? How do we do this when the station is operational?

Remote condition monitoring and early warning detection of asset failure are required especially for hidden critical elements. How can we identify abnormal indicators or precursors of failure.

What do other asset owners do to monitor their assets? Can we adopt any effective methods or techniques from other industries?

What are the common failure modes for particular material types? What are the risks for these failure modes? Are there remote (hands-off proxy) methods for collecting quantitative and consistent data that reduces subjectivity? Is there something already available in other industries that we can implement?

### Insufficient decision support tools

How can top-down, whole-life cost modelling be achieved? What new models need to be developed and combined with existing models to account for factors such as degradation, capability analysis, climate change, weather resilience etc.? How do we implement an asset risk register relating to extreme weather, based on location, asset condition and criticality?

How can the findings be easily and clearly communicated to building surveyors and asset engineers and give time-framed action recommendations?

How can current and new processes be managed better with decision support tools? What is required to develop a live bottom-up work-bank tool and how would this integrate with existing systems? How can intervention scenarios be modelled in order to support business planning?

### Output vision

An inspection methodology that enables quantitative data to be collected so that the condition of hidden or inaccessible elements and hard to reach areas can be more fully understood. This needs to be undertaken in keeping with our safety requirements and whole life cost principles. In maximum safety but with minimum cost and disruption. The output should enable surveyors and asset engineers to clearly understand the condition, enabling them to make time-framed decisions.

## Priority problems

### Specific priority problems

- Safe methodology to obtain the condition data of building facades to reduce safety risks for the workforce and the public.
- To enable short, medium and long-term asset management decisions through accurate data-analysis and intelligence.
- Improved competency for heritage specialisms.

### Related goals

- To inspect 50% of assets with automated technology by CP8.
- To be able to access all assets so as to collect the service and structural condition, whether physically or remotely, by CP7.
- To fully discharge our Heritage obligations by CP6.

### Benefits

- Safe and efficient inspections and monitoring activities will help complete the asset inventory and capture the asset status.
- Timely and effective inspections will help reduce the number of failures, improving the safety of the network.
- Reduced risk of a Heritage fine.