

An Indian-Australian research partnership

**Project Title:**

**Project Number**

**Monash Main Supervisor**

(Name, Email Id, Phone)

*Full name, Email*

**Monash Co-supervisor(s)**

(Name, Email Id, Phone)

**Monash Department:**

**Monash ADRT**

(Name, Email)

*Full name, email*

**IITB Main Supervisor**

(Name, Email Id, Phone)

*Full name, Email*

**IITB Co-supervisor(s)**

(Name, Email Id, Phone)

**IITB Department:**

## Research Academy Themes:

**Highlight which of the Academy's Theme(s) this project will address?**

*(Feel free to nominate more than one. For more information, see [www.iitbmonash.org](http://www.iitbmonash.org))*

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

## The research problem

*Define the problem*

Highway bridge infrastructure systems, primarily constructed in the decades following World War II, have thus far enabled the rapid socio-economic growth of the developed world. However, several of these critical elements of the transportation network are reaching the end of their design lives and with a replacement cost of 30% of the Gross Domestic Product (GDP), it is often not feasible to replace them. For example, Europe has over 1 million highway bridges. A recent study found that almost 50% of these bridges were built before 1965 and hence are nearing the end of their 50-year design lives. Meanwhile, freight transport activity is projected to increase by around 80% by 2050 compared to 2005. As a result, it is imperative that a way of extending the lives of existing highway infrastructure is found and implemented in the face of corroding infrastructure.

## Project aims

*Define the aims of the project*

This project will develop the use of infrastructure monitoring so that corroding RC structures can be retained in safe service. Indicators of damage severity will be evaluated, as well as the actual loading that structures are exposed to. With these inputs, the true safety level of the structure can be determined and compared to target levels of safety. In this manner, intervention and repair measures can be better targeted and economized.

## Expected outcomes

*Highlight the expected outcomes of the project*

This project will result in a Ph.D. graduate with industry-relevant skills in physical and computational modelling. The graduate will have knowledge of three domains: structural health monitoring, highway bridge instrumentation, and structural reliability assessment.

The key technical outcomes will of the project will include:

- Improved targeting of suitable sensor systems for corroding RC structures;
- Improved assessment of the actual loading such structures are exposed to;
- Bayesian updating of structural capacity of deterioration affected bridge components
- Improved structural reliability/safety assessment of corroding RC structures.

## How will the project address the Goals of the above Themes?

*Describe how the project will address the goals of one or more of the 6 Themes listed above.*

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This project directly identifies a real problem area and will examine improved measures for the remaining life assessment (and possible life extension) of highway bridges that operate in a multi-hazard scenario constituting of environmental stressors and increasing traffic loads.

## Capabilities and Degrees Required

*List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.*

Essential:

- A Bachelors Degree in Civil Engineering with a High Distinction or equivalent from a reputable (IIT or equivalent) institute in India or a Masters Degree in Civil Engineering from a reputable institute in India.
- Relevant courses in Structural Engineering with evidence of performance at the highest level.
- Understanding of the basic concepts in Statistics and Probability.
- Demonstrable excellent oral/written communication skills in English.
- Relevant skills in programming in a computer language.

Desirable:

- Ability to fluently program in MATLAB with good debugging skills.
- TOEFL or IELTS scores to demonstrate English language proficiency.

Conference/journal publications

## Potential Collaborators

*Please visit the IITB website [www.iitb.ac.in](http://www.iitb.ac.in) OR Monash Website [www.monash.edu](http://www.monash.edu) to highlight some potential collaborators that would be best suited for the area of research you are intending to float.*

Please provide a few key words relating to this project to make it easier for the students to apply.

**Highways**

**Bridges**

**Monitoring**

**Corrosion**

**Life extension**