# Innovative Concrete Barriers for Forgiving Road Infrastructure

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## Research Abstract

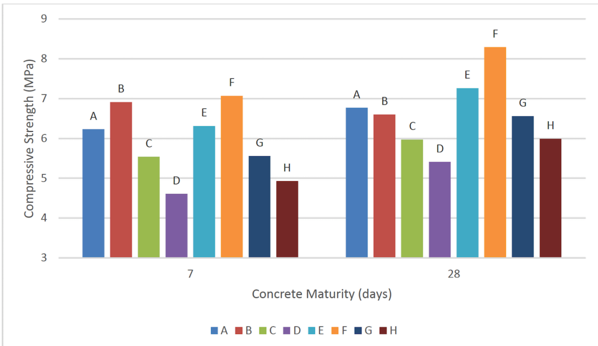
One of the top ten goals set by the White Paper on Transport is to reduce fatalities in road transport The European Union is aiming to halve road casualties by 2020, in line with the long term goal to move close to zero fatalities by 2050.The most vulnerable road users are motorcyclists, who are currently suffering from frequent fatalities in crashes involving road barriers. The European Road Assessment has indicated the critical need to adopt improved barrier designs to protect vulnerable road users. While rubberized concrete has been recommended for road barriers, challenges involving strength and durability of the material have not been addressed.

This research proposes to develop optimised steel fibre-reinforced rubberised concrete mixtures as well as road barrier designs, which will lead to the development of SAFER road barriers with outstanding deformability and structural integrity; thus paving the way for forgiving road infrastructure.

The use of recycled rubber and steel wires (obtained from End-of-life tyres) supports the Horizon 2020 Transport Research and Innovation Act priorities for sustainability and resource efficiency (including the Circular Economy package).

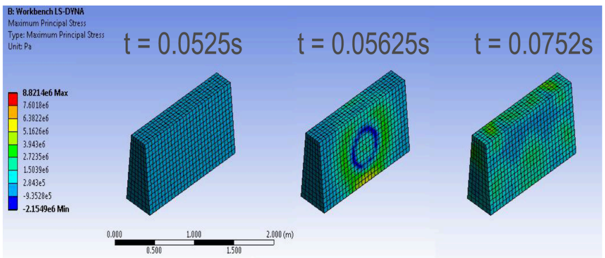
## Mixture Optimisation

| Mix ID | Variable |
|---|---|
| A | Original Mix (Cement only, No PFA or MS) |
| B | Original Mix + 25 kg/m³ SF |
| C | 20% of cement replaced by PFA |
| D | C + 25 kg/m³ SF |
| E | 20% of cement replaced by MS |
| F | E + 25 kg/m³ SF |
| G | 10% of cement replaced by PFA & 10% of cement replaced by MS |
| H | G + 25 kg/m³ SF |

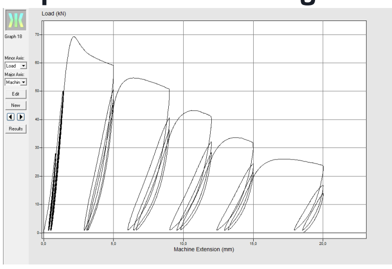



| Mix Constituent | Amount (kg/m³)* *unless otherwise noted |
|---|---|
| Cement | 400.0 |
| Silica Fume (Micro-silica) | 100.0 |
| Fine Natural Aggregate | 310.5 |
| Coarse Natural Aggregate | 378.0 |
| Fine Rubber Particles | 169.7 |
| Coarse Rubber Particles | 207.0 |
| Recycled Steel Fibres | 25.0 |
| Water | 225.0 |
| Super-plasticiser | 3.375 (L/m³) |

## Numerical Analysis




## Experimental Testing



## Discussion

Enhancement of the material bonding action at the cement paste-rubber interface is required. The material response is very promising, since a substantial amount of the impact energy is absorbed by the barrier with limited residual displacement.

## References

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