

# Concrete Frames in Arctic Temperatures

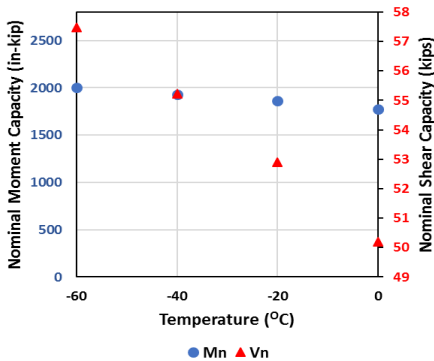
Cleary, Riddell, and Lomboy: 3 CEE



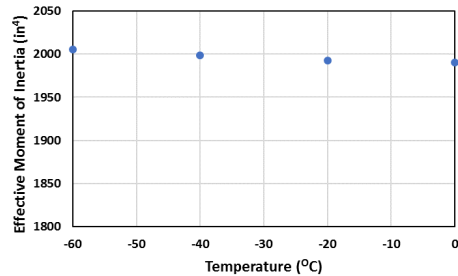
Arctic temperatures affect properties of building materials such as concrete and rebar. Structures properly designed for moderate temperatures might behave differently at cold temperatures. In previous projects we have measured the properties of concrete and reinforcing steel in conditions down to  $-60^{\circ}\text{C}$  and evaluated how the changes in material properties affect the behavior of a sample reinforced concrete beam and reinforced concrete column.

For the next step in this work we plan to:

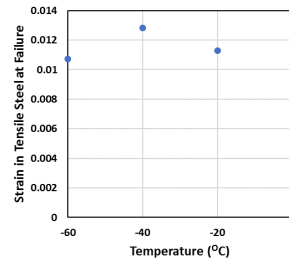
1. Expand the range of geometries considered for reinforced concrete beams and columns and
2. Consider how changing beam and column properties impact frame behavior with particular emphasis on displacements and demand on connections.



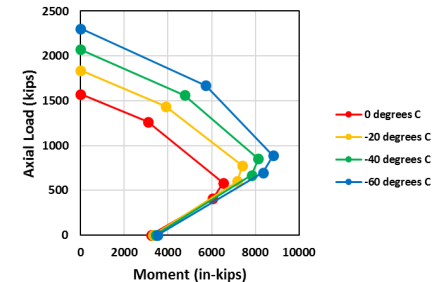
Nominal moment and shear capacity of sample reinforced concrete beam at reduced temperatures.



Effective moment of inertia of sample reinforced concrete beam at reduced temperatures.



Strain in flexural reinforcing steel of sample reinforced concrete beam at failure at reduced temperatures.



Interaction failure curves for sample reinforced concrete column at reduced temperatures.

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## THIS PROJECT DOES NOT INCLUDE LABORATORY WORK

- We will have regular team meetings to discuss progress and answer questions.
- If you have questions about the project please contact Dr. Cleary [cleary@rowan.edu](mailto:cleary@rowan.edu) before selecting this project as one of your options.

## WHAT WE WILL BE DOING –

- Review literature and building plans to develop a range of typical reinforced concrete beam and column geometries.
- Develop spreadsheets (or other automated means) to analyze the reinforced concrete sections.
- Characterize change in member behavior with change in temperature.
- Develop relatively simple frame models to evaluate the impact of changes in the beam and column properties on frame behavior.
- Prepare graphical and written presentations of the results of the study for publication.

**I realize seniors are just now taking Reinforced Concrete Design and juniors are just now taking Structural Analysis. This project will likely help you in those courses.**