

# Thermally and Mechanically Balanced Structural Design of Insulated Pavements for Cold Region Applications

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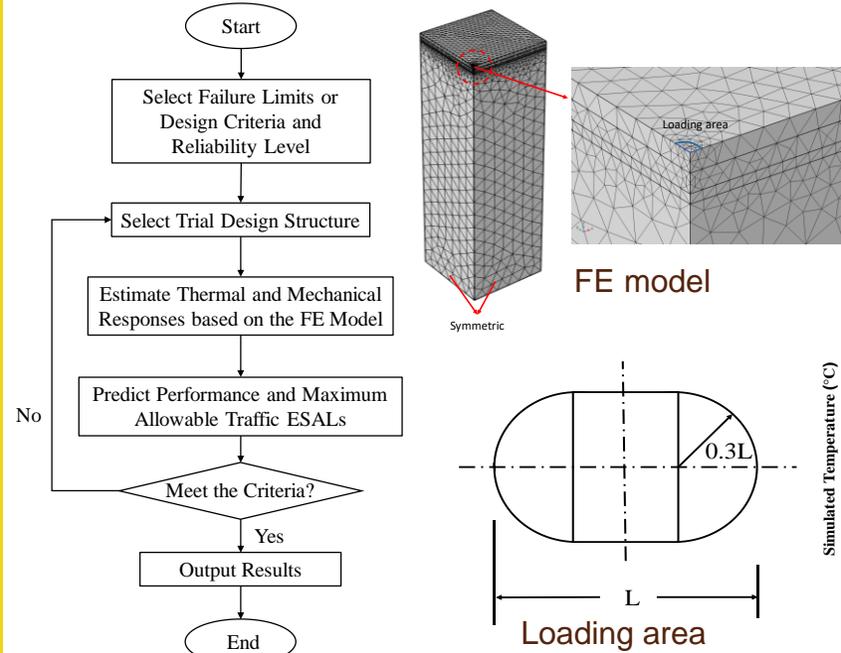


## Background and Objective

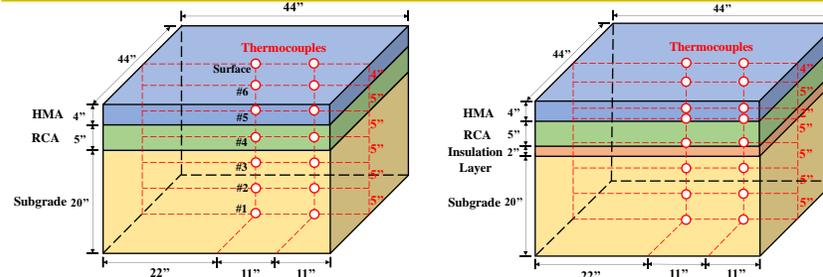
- Add an insulation layer above the frost-susceptible layer have been proved to be an efficient strategy to mitigate frost effect on pavements in cold regions.
- Limited research was conducted on the thermal and mechanical design of insulated pavement

**Objective:** Propose a thermally and mechanically design approach based on a novel finite element model

## Methodology and Finite Element Model

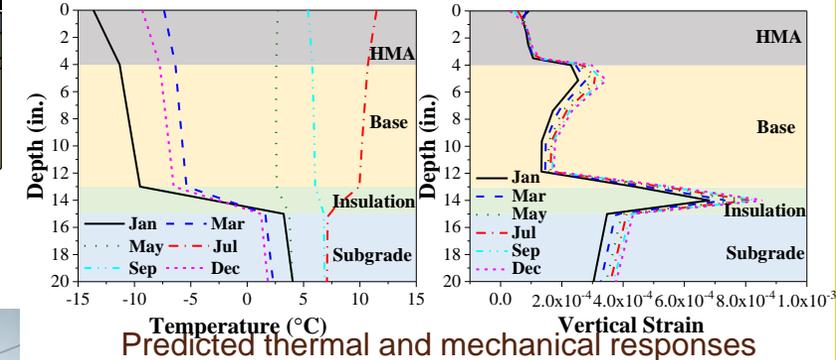


## Experimental Setup



Photos of insulated pavement boxes

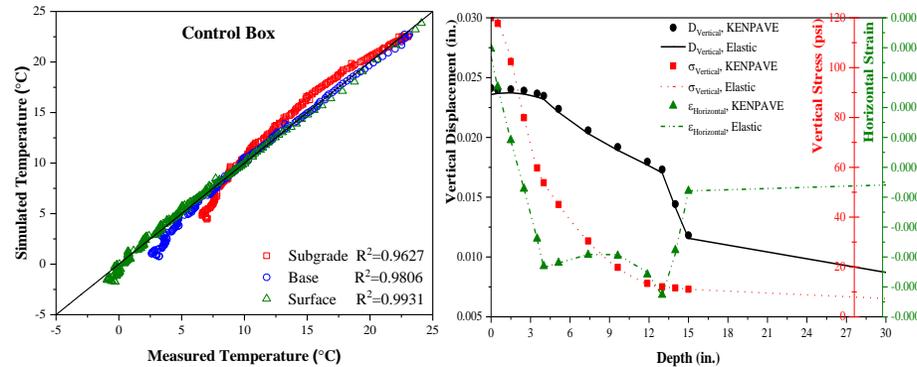
## Results and Discussion



### Maximum Load Repetitions of Insulated Pavement (millions)

$t_{HMA}$ (in.)	4					
$E_{HMA}$ (ksi)	500			1100		
$t_{Base}$ (in.)	5	9	13	5	9	13
$t_{Insulation}$ (in.)	1	6	8	8	21	43
	2	5	7	8	20	32
	3	5	6	7	20	30

## Validating the FE model with Test Results



## Conclusions

- The design of insulated pavements need to consider the differential icing effect and mechanical performance.
- Design tables were formulated based on the FE model and selected criteria.

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