

# Infrared Heating of Longitudinal Pavement Joints

**Partners:** University of New Hampshire, NHDOT Bureau of Materials and Research, NHDOT Bureau of Construction



Pre-heaters travel 10-100 feet ahead of the paver

## BACKGROUND:

Cracking along longitudinal joints in asphalt pavement is a common problem in New Hampshire. One cause of this cracking may be that current construction methods fail to obtain adequate material density at the joint. The edge of the initial pavement mat is not fully compacted because it is not confined by adjacent material. When placing the adjoining mat, the paving train fails to achieve the additional joint compaction necessary because the initial mat has cooled. This problem can be exacerbated by stage construction that often results in longitudinal cold joints remaining open for weeks, allowing the joint to become contaminated with dust and debris.

## GOAL:

The objective of this research was to evaluate the benefits of using infrared heaters to pre-heat longitudinal cold joints when paving to allow improved compaction of the joint material. The Ray-Tech Infrared Joint Heater, manufactured in Charlestown, NH, had demonstrated promising results in an earlier trial on the F.E. Everett Turnpike in Nashua, NH. In that trial, the joint heater was used to heat the longitudinal joint of a 1000-foot test section prior to placement of adjacent pavement. Visual observations of the Nashua trial suggested that additional evaluation of this construction method was warranted.



Heater is mounted between the paver and the grade ski.



Paver-mounted heater

## WHAT WE DID:

The Plymouth-Campton-Thornton 13139A roadway rehabilitation project was selected as a test site for this research. The scope of work for this project included full-depth reclamation of the existing pavement and the construction of new base, binder and wearing courses. Full depth paving would assure that reflective cracking of underlying layers would not effect the observed results of this experiment. Project specifications required that the mile-long test and control sections be paved using the same equipment and crew, and be paved during the same construction season to reduce variables. The evaluation consisted of:

- Determination of percent air voids and bond strength of the joint by testing cores taken along the joint and within the pavement mat.
- Assessment of the constructability, safety, and cost of this type of joint construction.
- Measurement of heat penetration through the use of thermocouples placed in each layer of the test section joint.
- Measurement of joint permeability through the use of an experimental "Permeameter."
- Comparison of the measured length of longitudinal joint cracking between test and control sections.

## CONCLUSIONS:

Although density and strength analysis of cores showed some improvement with the use of joint heating, it is not clear to what degree the indicated improvement will affect the long-term performance of the joint.

The use of pre-heaters adds significantly to the length of the paving train. The pre-heater unit, consisting of a tow tractor and 3 pre-heaters, is approximately 60 feet long. It typically travels 60 to 100 feet ahead of the paver. Although this increased length did not appear to be a factor on this project, it may be difficult to use this equipment on a road with tight curves, numerous tapers, or intersections. There are also concerns that the proximity of joint heating equipment to passing traffic and trucks entering the area in front of the paver is a safety hazard. The use of additional traffic control, including uniformed officers, can help but will not completely eliminate this issue.

The most significant indications that the infrared joint heater has improved the longitudinal joint are the field crack survey results and observations that showed 93% of the control section joint had cracked one year after construction while only 17% of the infrared heater test section had cracked. Annual crack surveys will be performed to evaluate the long-term performance of this joint. A significant improvement in joint longevity will have to be realized to justify the specification of joint heating. Projects specifying use of the joint heater will have to be carefully chosen to minimize safety and constructability issues.



Pre-heaters travel between passing traffic and the paving train.



Infrared pre-heater and paver-mounted heater

## ACKNOWLEDGEMENTS

Jim Hersey, Construction Bureau	Jo Daniel, UNH
Jamie Sikora, FHWA	Gary Fuchs, UNH
Don Coleman, Construction Bureau	Felix Rivera, UNH
Bill Real, Materials & Research	Nicholas Pulire, UNH
Chuck Dusseault, Materials & Research	Nicholas Flogg, UNH
Alan Perkins, Materials & Research	Wolcott Construction, Inc.
Alan Rawson, Materials & Research	Weaver Brothers Construction, Inc.
Russ Lemire, Materials & Research	Pike Industries
Jim Mogege, Materials & Research	

**For more information:** Contact the NHDOT Research Section at (603) 271-3151 or visit [www.nh.gov/dot/research](http://www.nh.gov/dot/research)