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Advanced Construction Techniques for Heated Pavement

Background / Motivation

- The effective of ice and snow on airport pavement is a critical concern causing flight cancellation and delays
- Traditional de-icing methods have the potential to cause negative environmental and structural impacts

Objective

To develop advanced techniques to best automate and accelerate the construction of large-scale heated pavements at airports

Issues to be addressed

- Material selection
- Joint interfaces
- New equipment necessary for installation elements
- Time factors for installation
- And location of ancillary equipment at the airport



(Source: <http://uk.reuters.com/article/2011/02/16/ukhogrobinson-idUKLNE71F01Z20110216>)



(Source: <http://www.gadling.com/2011/02/04/behind-the-scenes-removing-snow-at-ohare-international-airport/>)

Research Approach

- Step 1: Conduct comprehensive literature review
- Step 2: Develop assessment framework
- Step 3: Develop guidance on evaluating relative costs and benefits
- Step 4: Develop a collection of advanced construction techniques
- Step 5: Final report

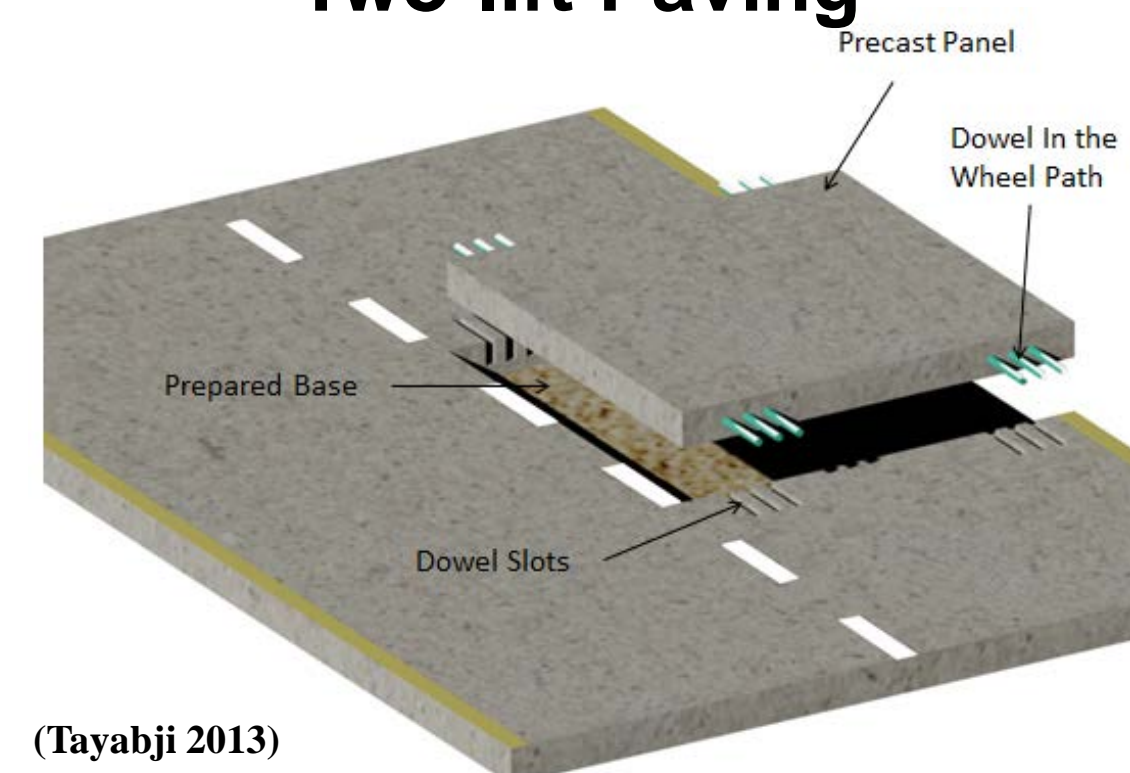
Expected Outcomes

Advanced Concrete Pavement Techniques



(Photo courtesy of CP Tech Center at ISU)

Two-lift Paving



(Tayabji 2013)

Precast Concrete Pavement (PCP)



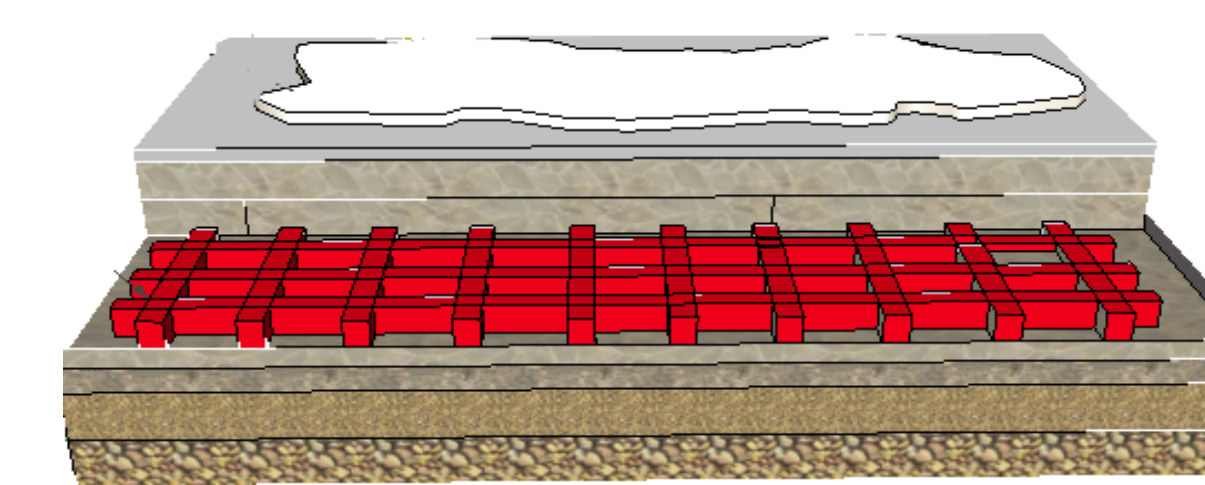
(Photo courtesy of CP Tech Center at ISU)

Concrete Overlay

- Performance
- Advantages and Limitations
- Cost / Benefit Analysis
- Material Selection
- Preliminary Assessment Framework
- Installation Time

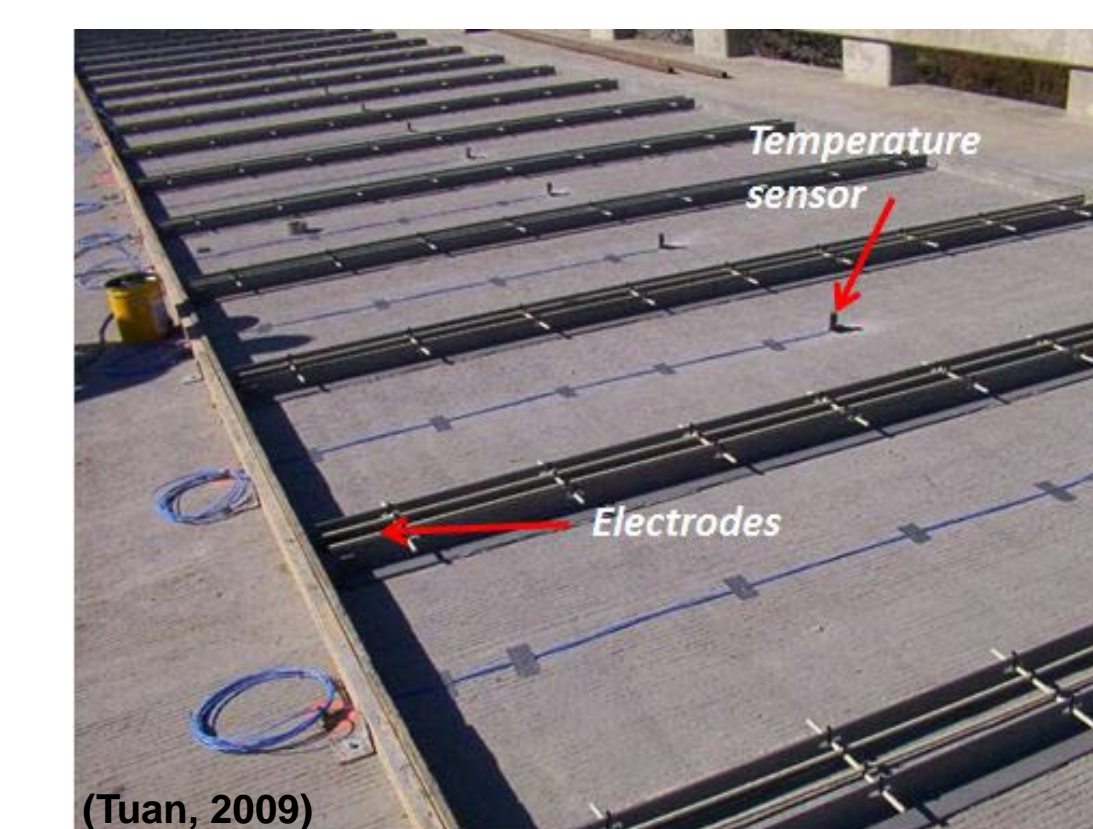
Heated Pavement Systems

Electrical Heated Pavement



(Photo courtesy of Pejman Keikhaei)

Embedded Electric Cable



(Tuan, 2009)

Conductive Concrete

Hydronic Heated Pavement



Hydronic Heating



(Photo courtesy of Binghamton University 2012)

Geothermal-Hydronic

Advanced Construction Techniques for Heated Pavement

Why Two-lift Concrete Paving ?

- Two-lift paving is possible and practical
- Economic paving sections can be achieved
- Improved environmental by recycling
- Exposed aggregate surface is possible and practical

Why Precast Concrete Pavement?

- Better quality concrete
- Better curing conditions
- Minimal weather restrictions on placement
- Reduced delay prior to opening to traffic

Why Concrete Overlay?

- Can be designed to achieve a range of service life – 15 to over 40 years
- Can be constructed rapidly and with effective construction traffic management