



## Impact of Inset Lighting Installation on Airfield Pavement





## ▶ Presenters

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***TRISTAR***

*Electric Inc.*

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(GTAA)





# Agenda

## ■ Airfield Pavement

- Overview
- Problems
  - Inset Can Installations
  - Conduit Chases and Trenches
- Causes / Results
  - Poor Inset Can and Conduit Support
  - Insufficient Design Details
  - Concentrated Stresses
- Solutions
  - Better Base and Surrounding Support
  - Design Details that Work
  - Rounded Corners in PCC Trenching
  - Directional Boring
- Inset Light Protection
- Comments and Questions



# Overview:

- Electrical contractors;
- Civil work;
- Mechanical preparation.



## ▶ Airfield Pavement - Problems

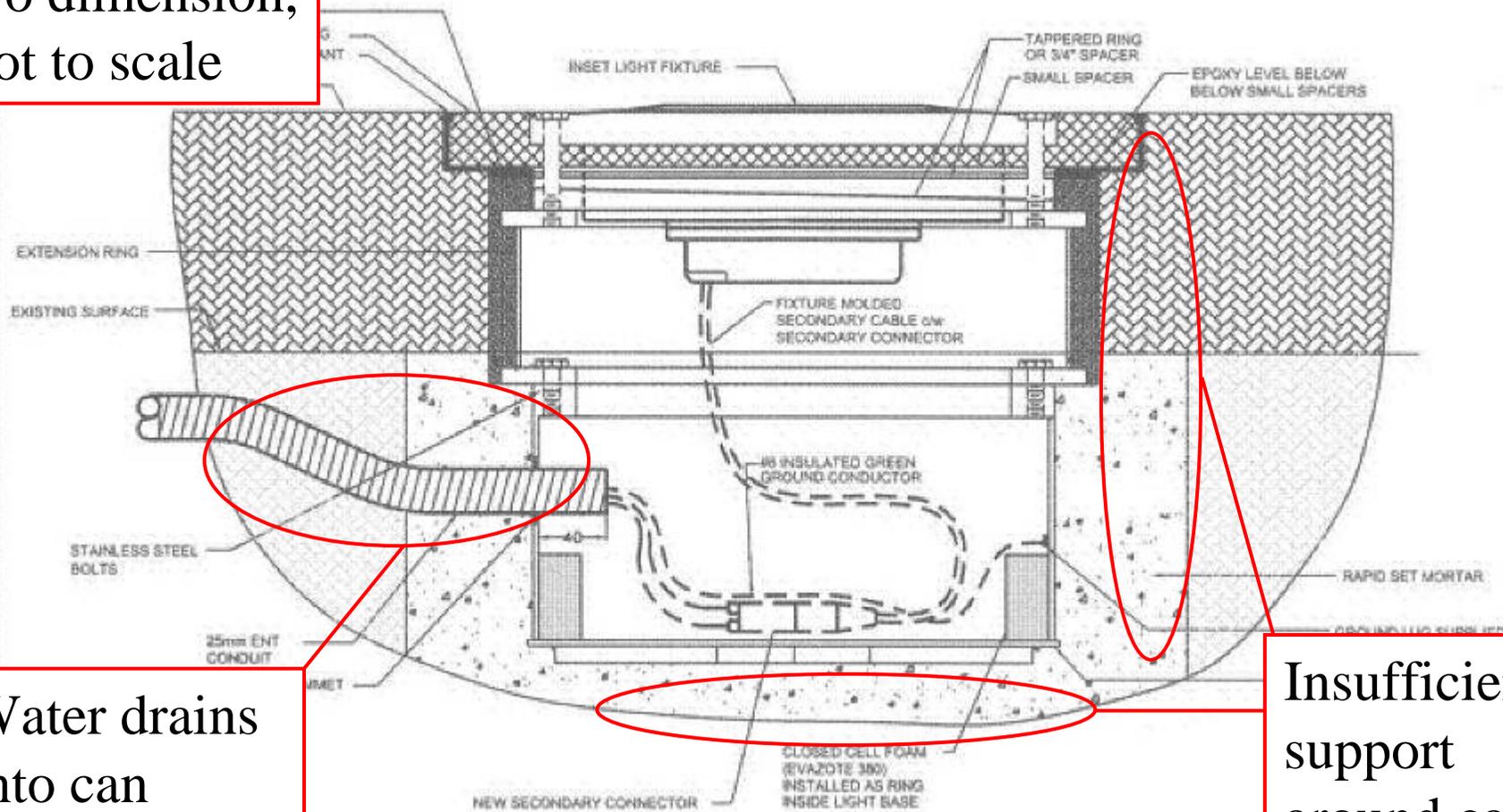
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### ■ Inset Can Installations

- Poor installation details
- Lack of dimensions → Contractor's decision
- Details do not work in every situation

## Impact of Inset Lighting Installation on Airfield Pavement

No dimension,  
not to scale



Water drains  
into can

Insufficient  
support  
around can

**Typical Industry Detail**

# ▶ Airfield Pavement - Problems

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## ■ Inset Can Installations

- Insufficient underlying and surrounding support  
→ Settlement
- Cure time is not enough for achieving full strength → Sinking inset can

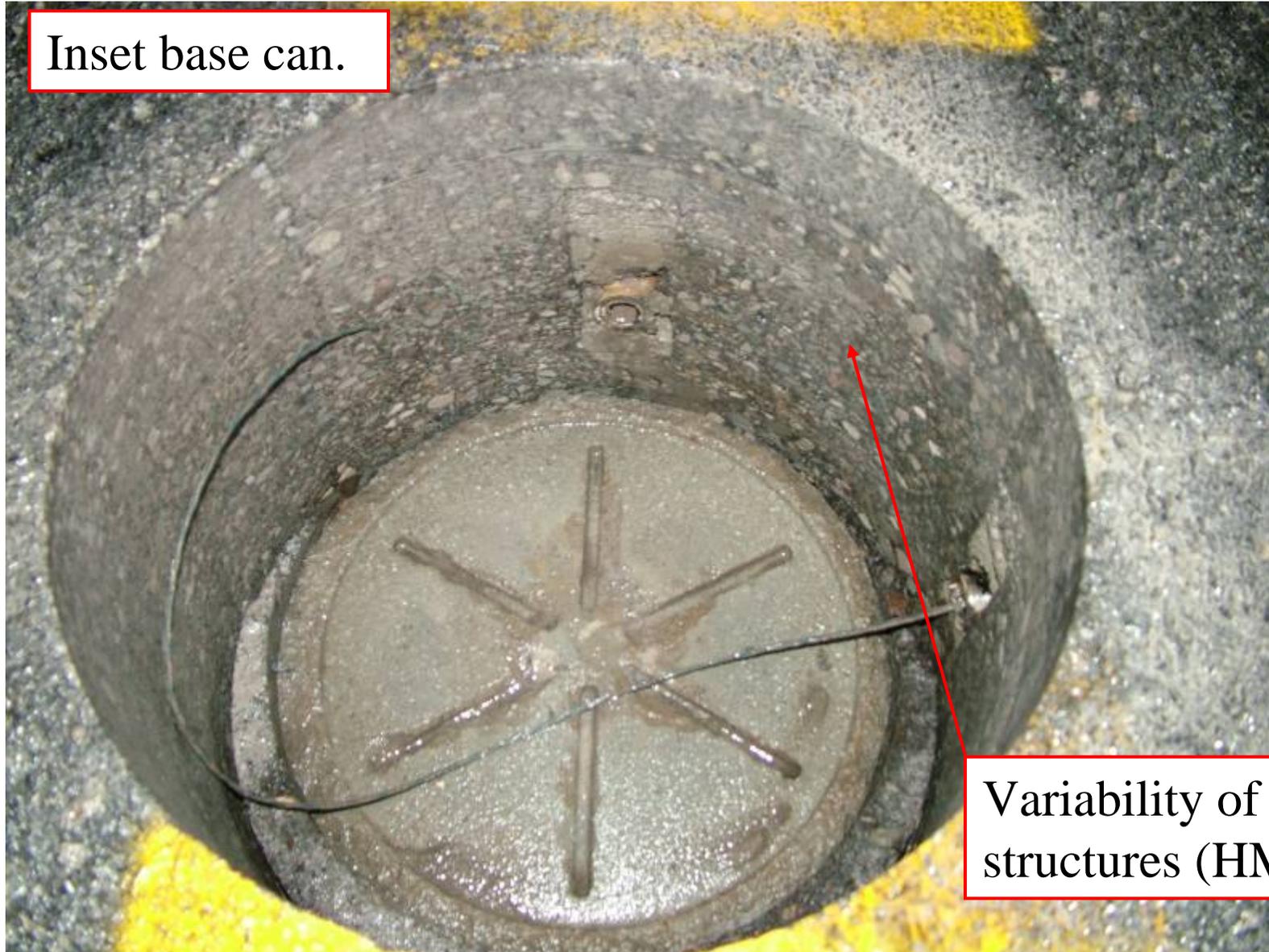
## Impact of Inset Lighting Installation on Airfield Pavement

Sinking inset can due to insufficient cure time and surrounding support.



## Impact of Inset Lighting Installation on Airfield Pavement

Inset base can.



Variability of structures (HMAC).

## Impact of Inset Lighting Installation on Airfield Pavement

Typical  
base can.

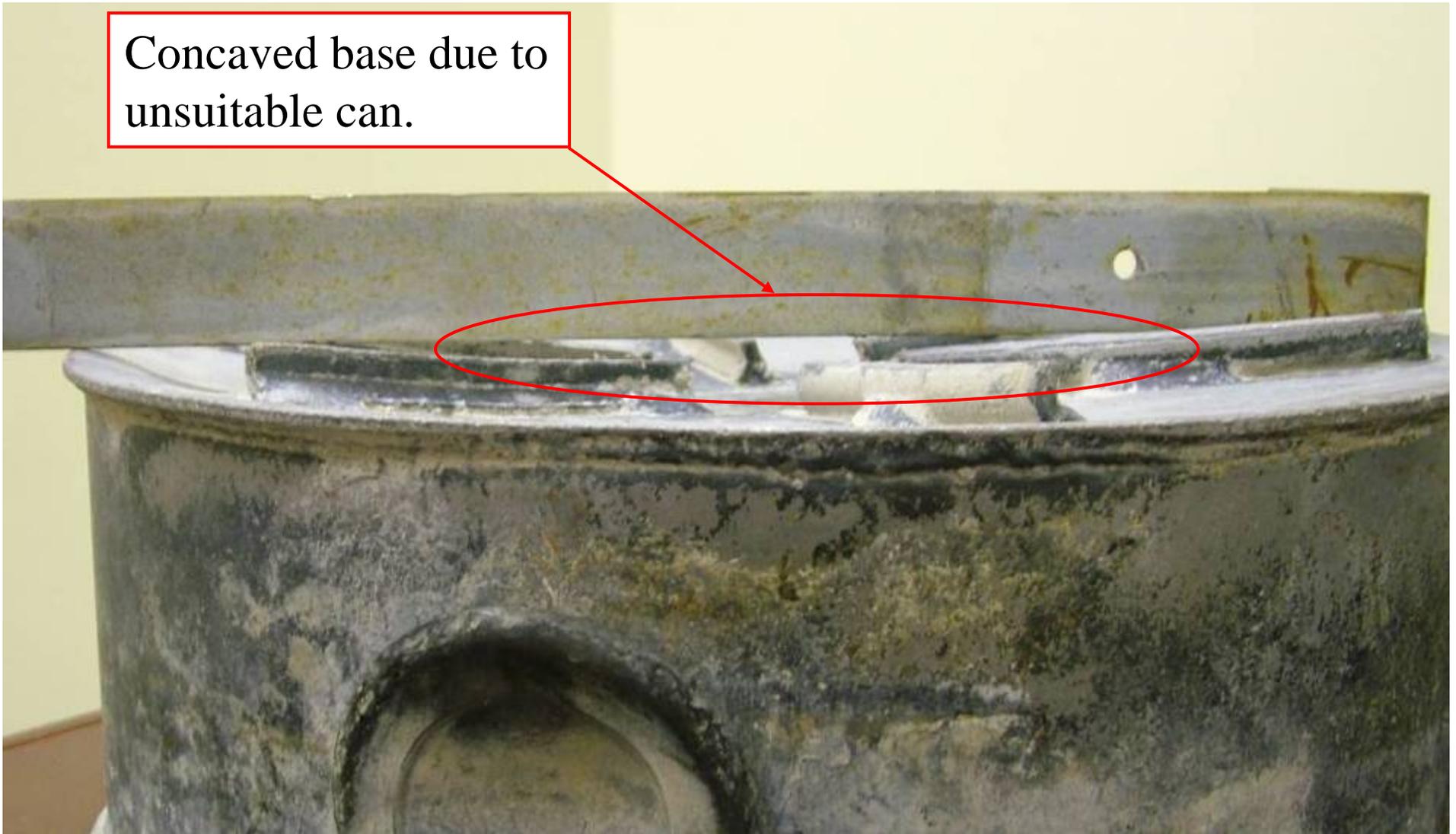


Weak base;  
support depends  
on epoxy fill.

## Impact of Inset Lighting Installation on Airfield Pavement



Concaved base due to unsuitable can.





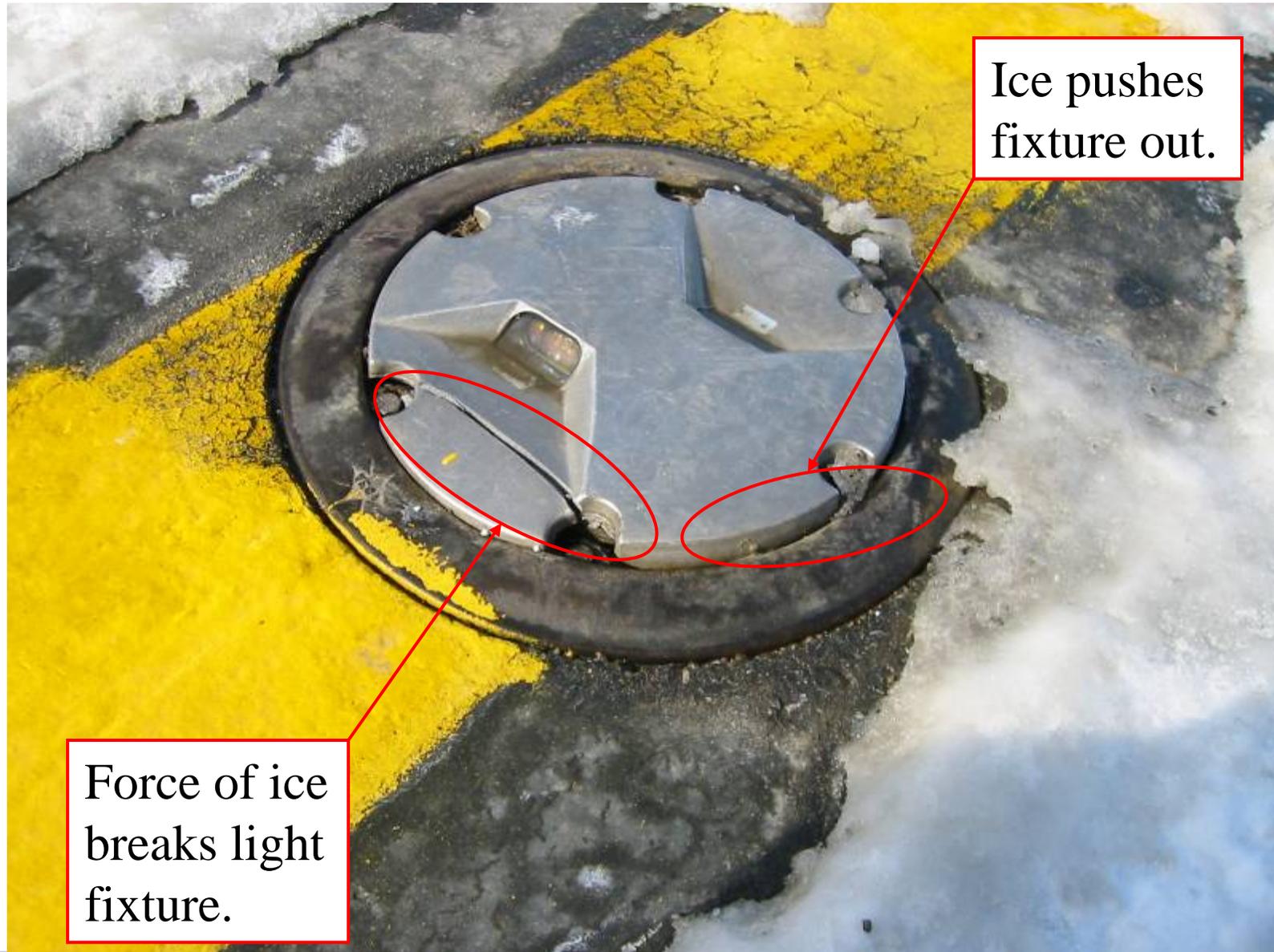
## ▶ Airfield Pavement - Problems

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### ■ Inset Can Installations

- No drainage for inset cans
- Can fills with water → freezing water (ice) expands and pushes light fixtures upward

## Impact of Inset Lighting Installation on Airfield Pavement



Ice pushes  
fixture out.

Force of ice  
breaks light  
fixture.

## Impact of Inset Lighting Installation on Airfield Pavement





## ▶ Airfield Pavement - Problems

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### ■ Inset Can Installations

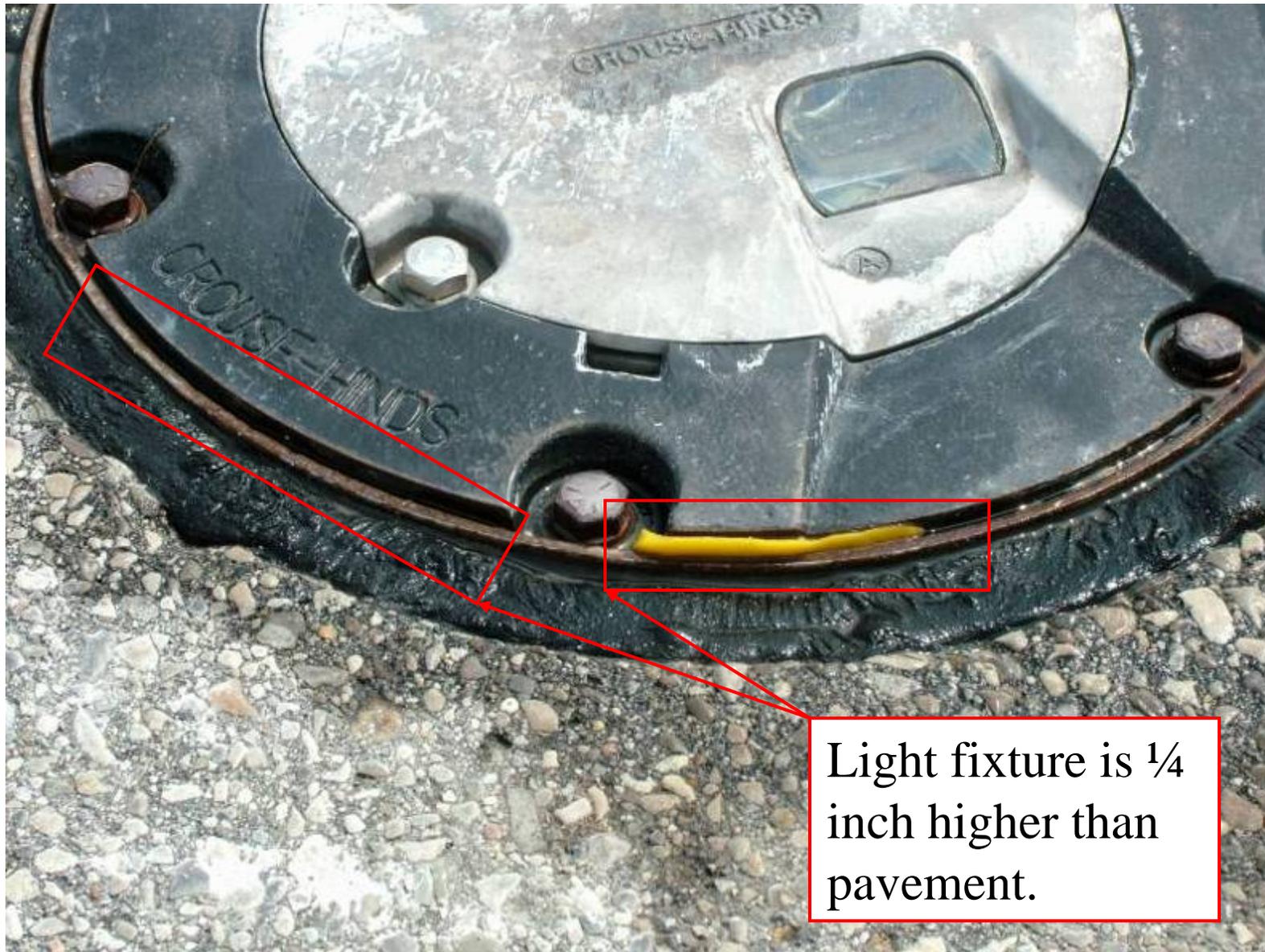
- Pavement settlement
- Pavement around can deteriorates sooner than life cycle of Runway/Taxiway/Apron pavement

## Impact of Inset Lighting Installation on Airfield Pavement



No support and can't  
fill with joint sealant

## Impact of Inset Lighting Installation on Airfield Pavement





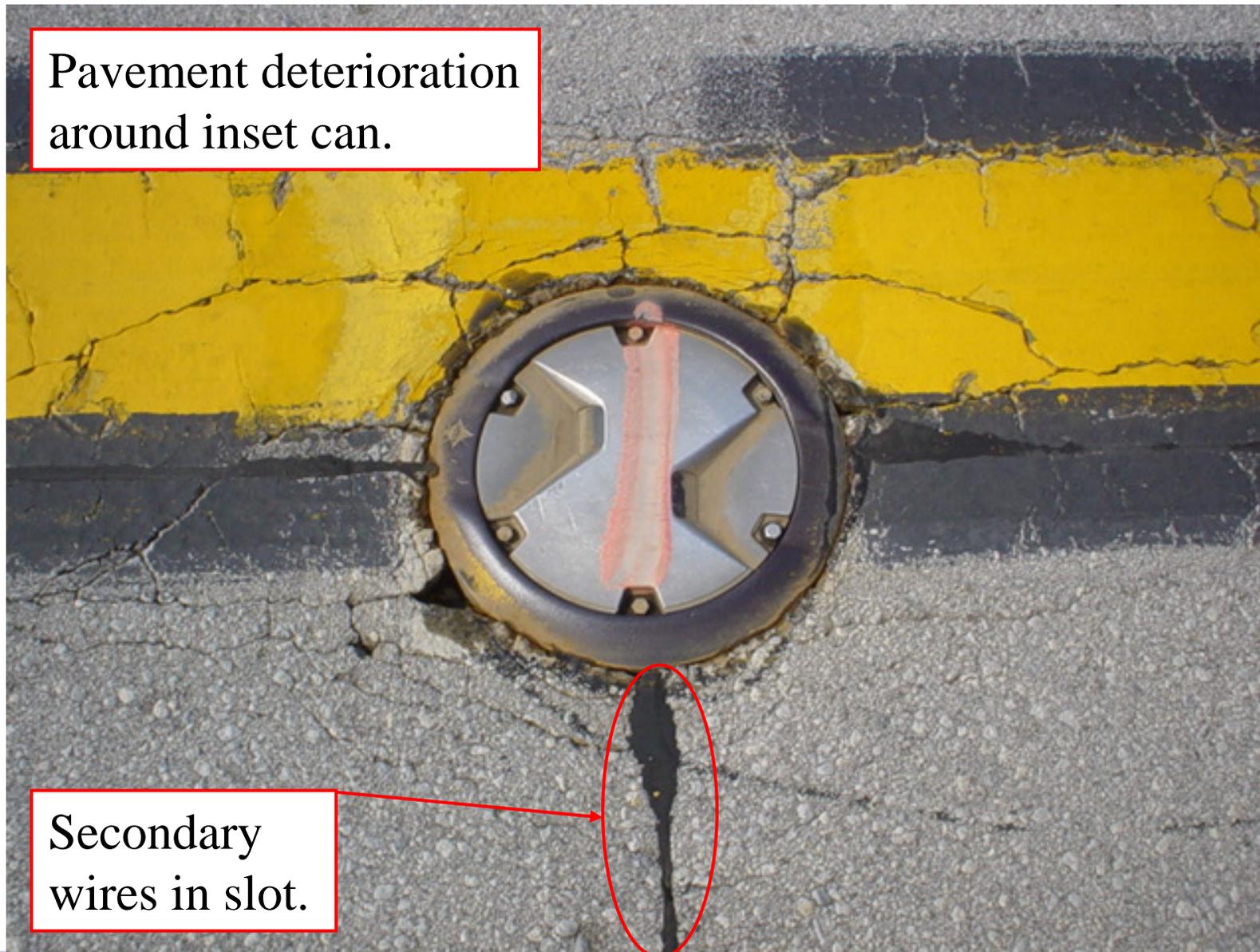
## ▶ Airfield Pavement - Problems

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- Conduit Chases and Trenches
  - Pavement failure along trenches
  - Impacts on pavement
    - Reduced life cycle

## Impact of Inset Lighting Installation on Airfield Pavement

Pavement deterioration  
around inset can.



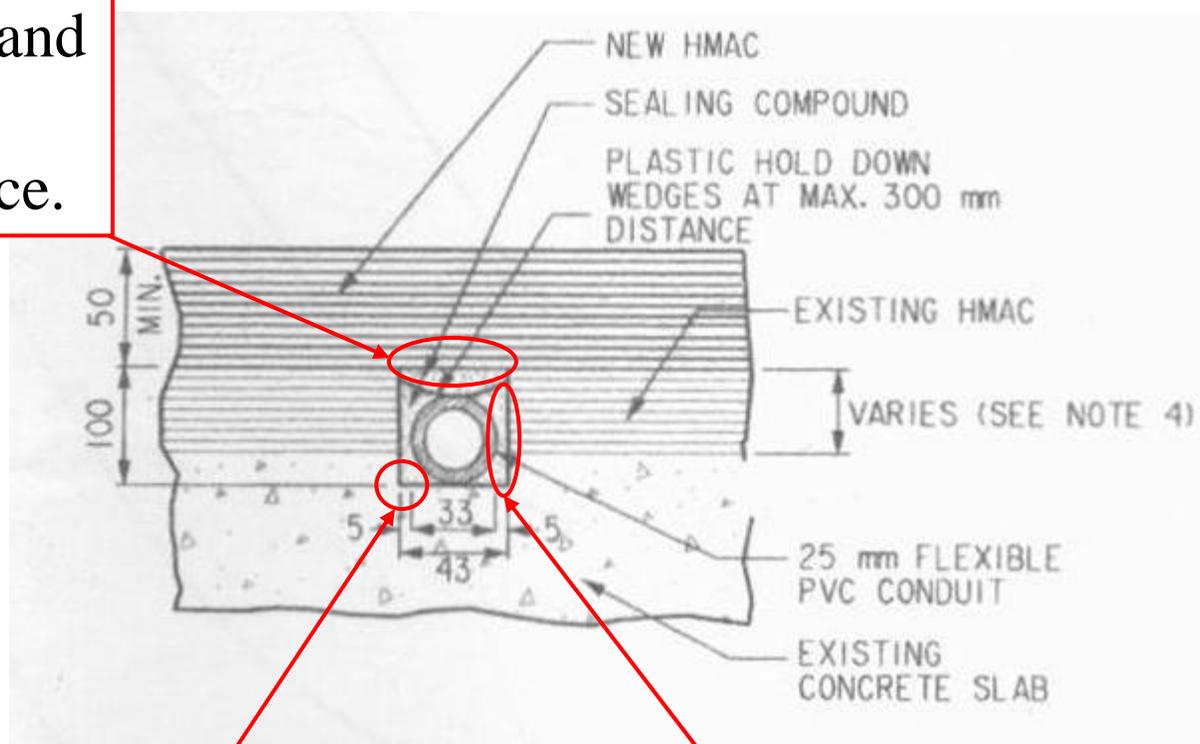
## Impact of Inset Lighting Installation on Airfield Pavement



Pavement failure along trenches as a result of inadequate backfill material (Rapid set mortar, which solidifies in one week to provide full strength).

## Impact of Inset Lighting Installation on Airfield Pavement

Water freeze and thaw will damage surface.

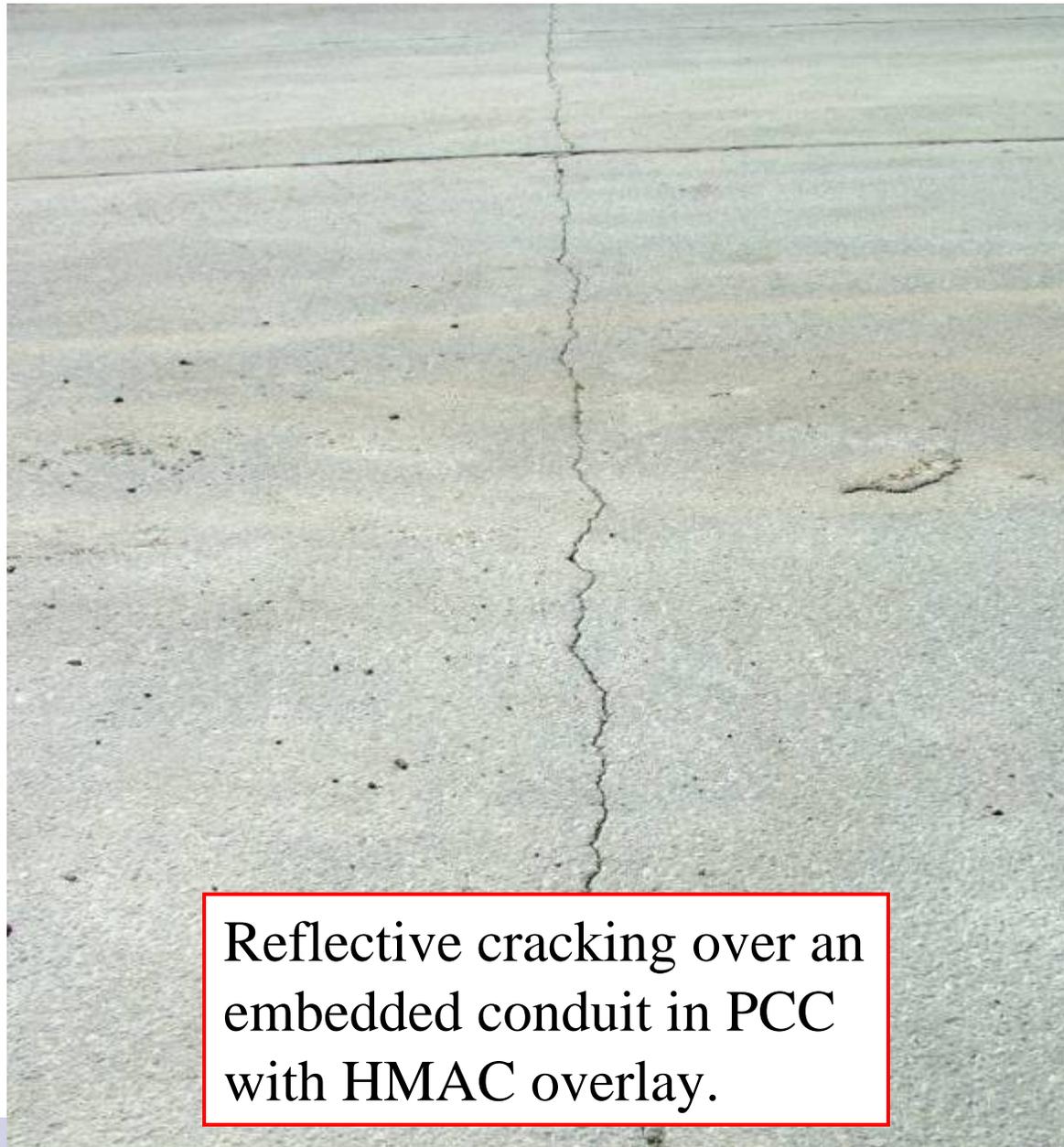


Sharp corner will be the weakest point that causes cracking.

PVC conduit will crush due to stress concentration and lack of surrounding support.

**Typical Industry Detail**

## Impact of Inset Lighting Installation on Airfield Pavement



Reflective cracking over an embedded conduit in PCC with HMAC overlay.

## ▶ Airfield Pavement – Causes / Results

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- Poor base can and conduit support
  - Settlement
  - Mismatch material → Pavement deterioration
- Water ingress into inset can and underlying material
  - Further pavement deterioration
  - FAA recommends to pump out water twice a year → High maintenance cost
- Inappropriate / Insufficient drawing details
  - Concentrated stresses; Failure.



## ▶ Airfield Pavement - Solutions

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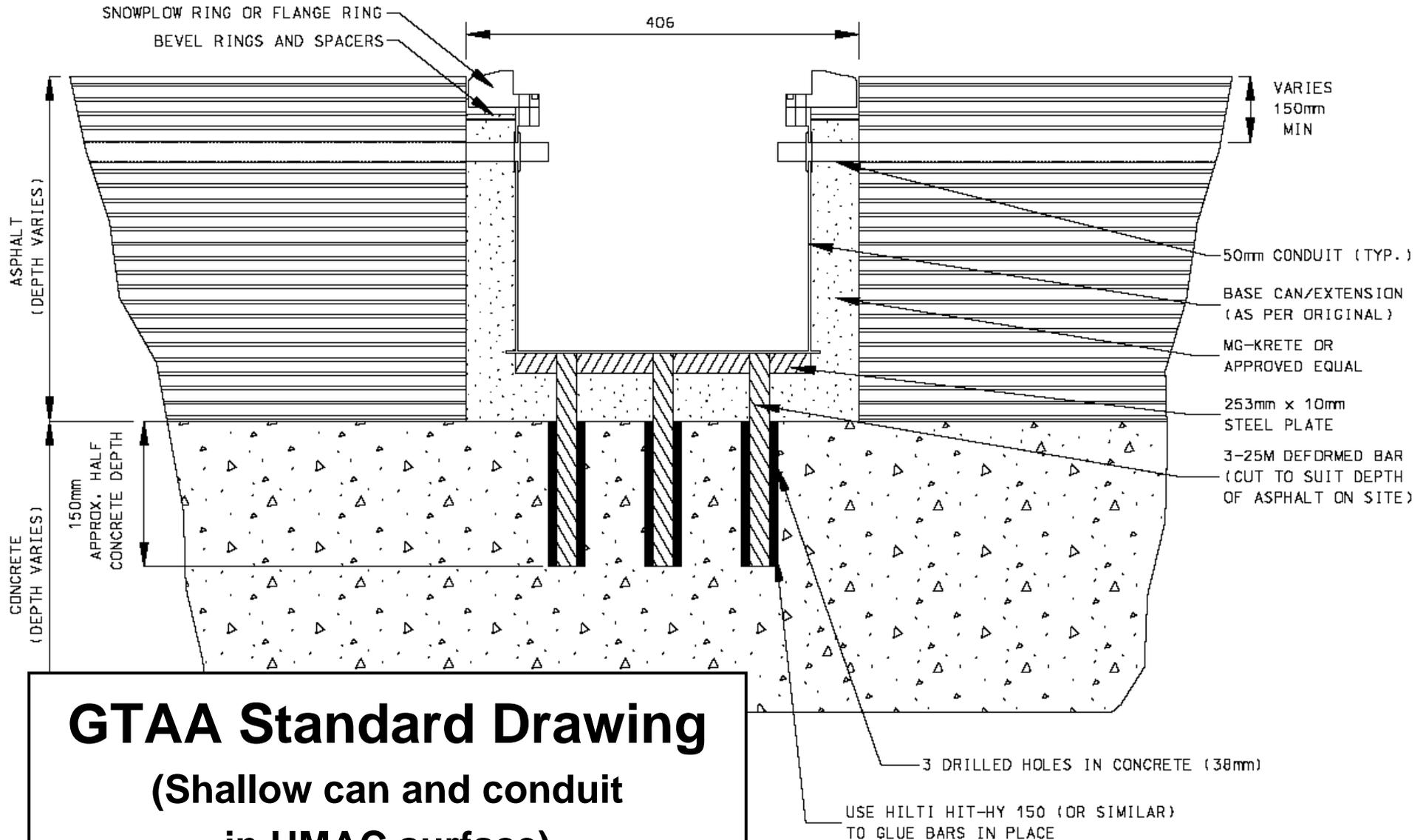
- Reduce Concentrated Stresses
  - Adequate inset can base and lateral support
    - 6" of concrete to support light can

## Impact of Inset Lighting Installation on Airfield Pavement



Base support with  
can attached.

# Impact of Inset Lighting Installation on Airfield Pavement



**GTAA Standard Drawing**  
**(Shallow can and conduit**  
**in HMAC surface)**

## Impact of Inset Lighting Installation on Airfield Pavement



A better epoxy.

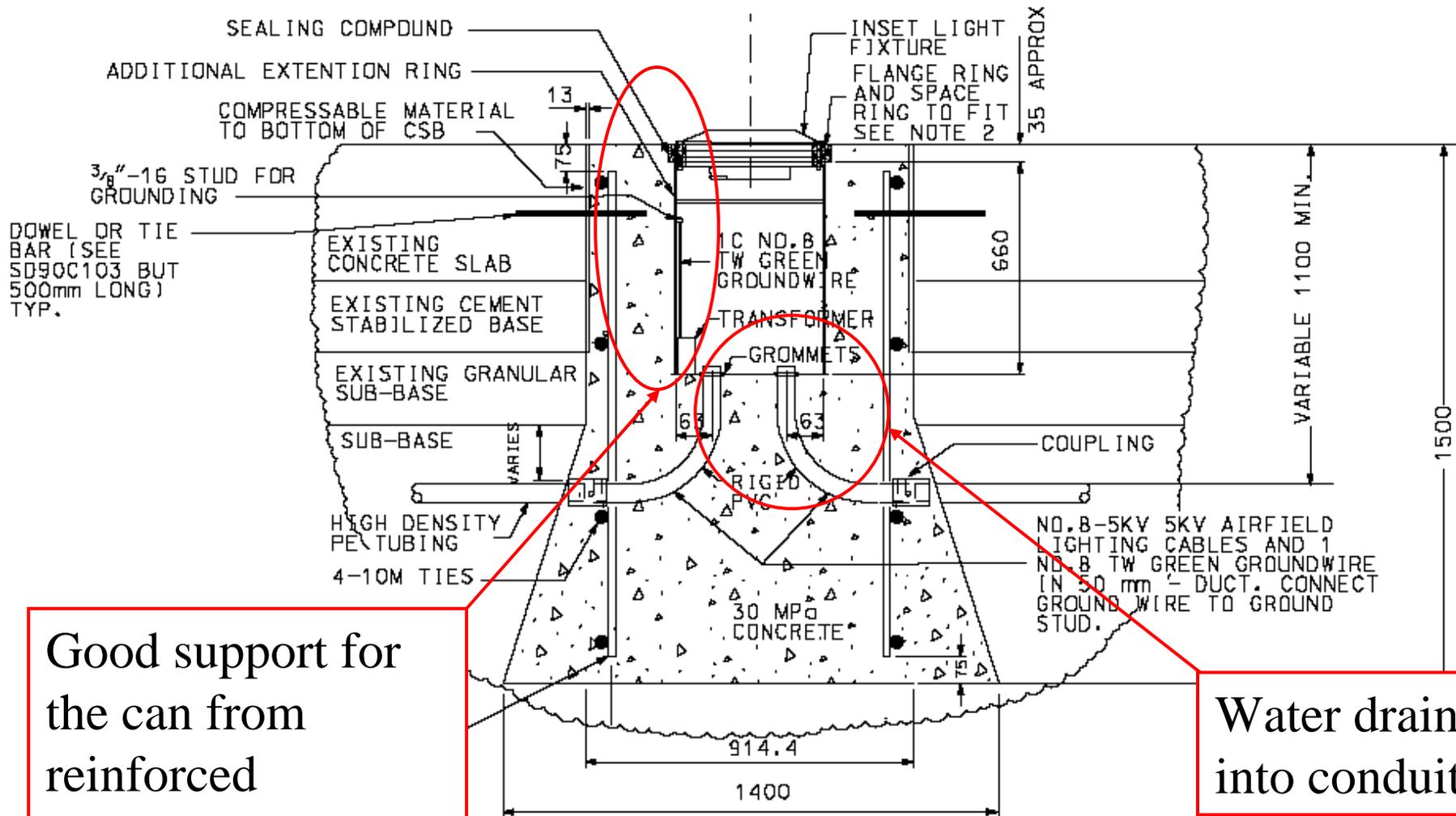


## ▶ Airfield Pavement - Solutions

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- Detailed Installation Drawing
  - Drainage! Drainage! Drainage!
  - Adequate installation for drainage (needs specific design)
  - Better can support → rebar into concrete
  - All Details to scale
    - Designer can then visualize the feasibility of design
    - Cost and time savings (contractor does not have to re-draw)

# Impact of Inset Lighting Installation on Airfield Pavement



Good support for the can from reinforced concrete.

Water drains, into conduits.

**GTAA Standard Drawing**  
(for directional boring)

## ▶ Airfield Pavement - Solutions

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### ■ Installation Duration

- Sufficient cure time to allow supporting material (concrete) to achieve full strength
- Avoid air traffic during cure time



## ▶ Airfield Pavement - Solutions

- Rounded corners in trenching, and;
- Sufficient room around conduit for concrete support/protection
- Rough and clean surface for better bonding
- **CLEAN**, surface **MUST** be clean.

## Impact of Inset Lighting Installation on Airfield Pavement



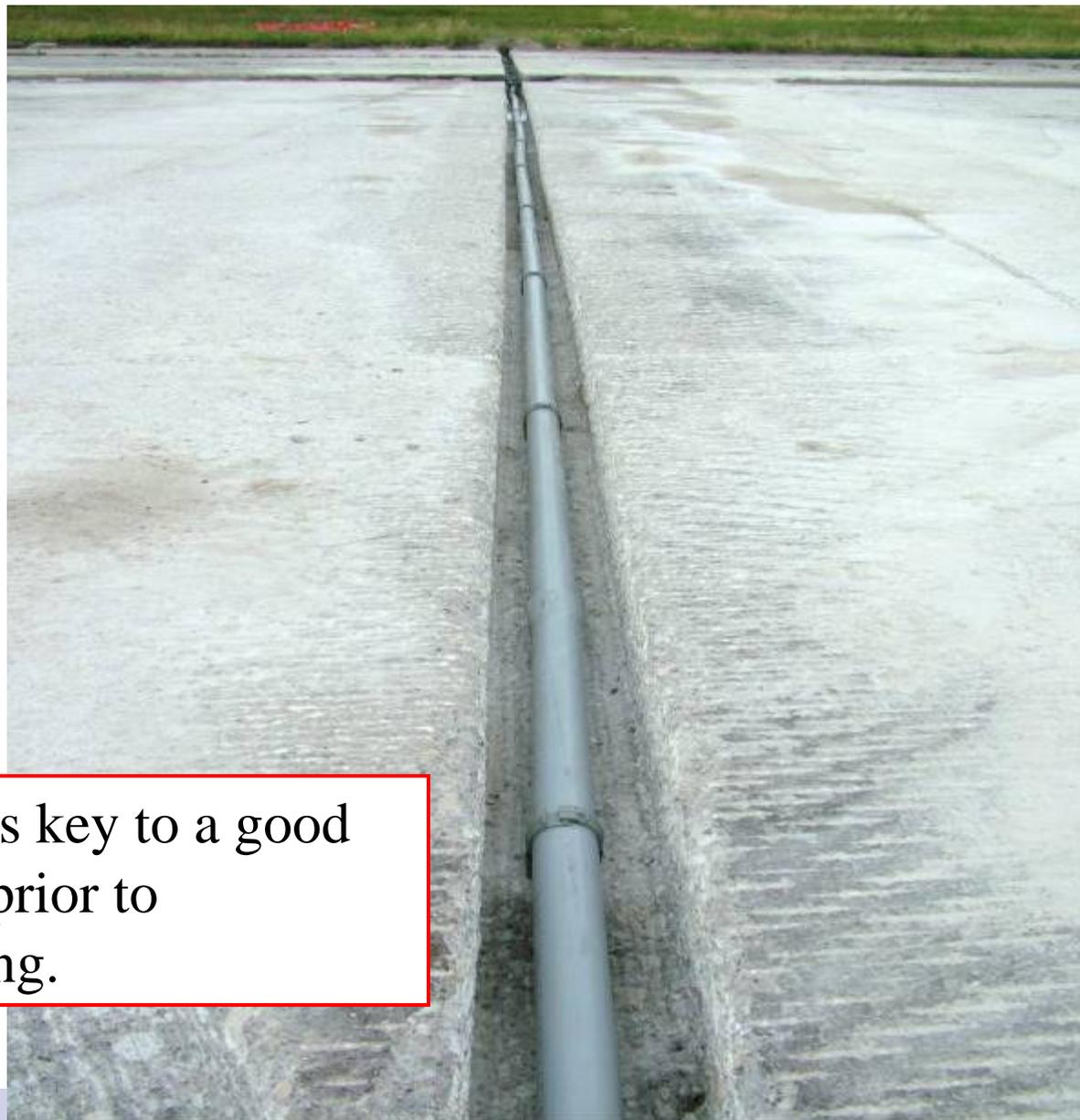
HMAC on  
PCC, Trenching

## Impact of Inset Lighting Installation on Airfield Pavement



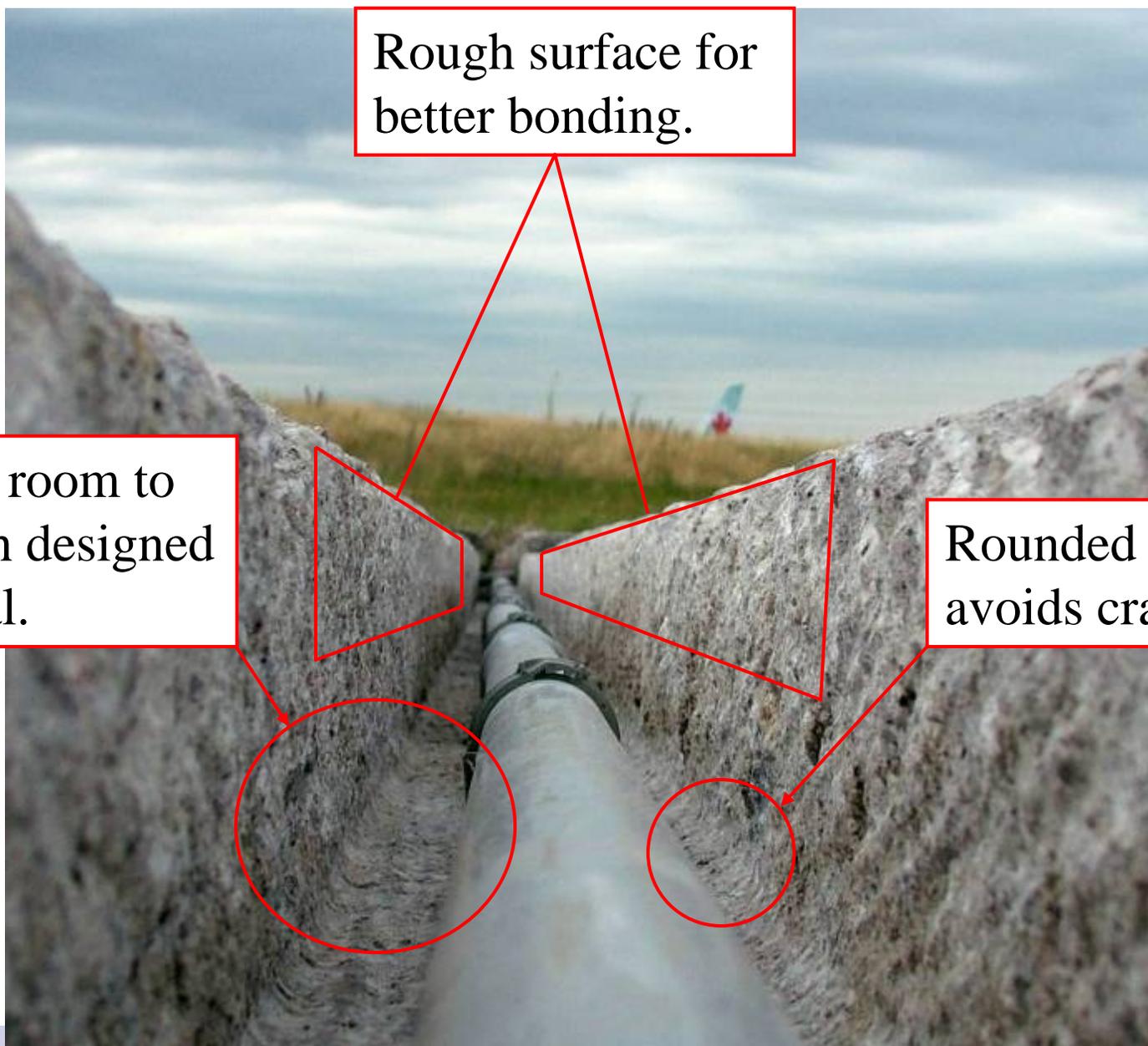
Trenching  
in concrete.

## Impact of Inset Lighting Installation on Airfield Pavement



‘Clean’ is key to a good product prior to backfilling.

## Impact of Inset Lighting Installation on Airfield Pavement



Rough surface for better bonding.

Lots of room to fill with designed material.

Rounded corner avoids cracking.

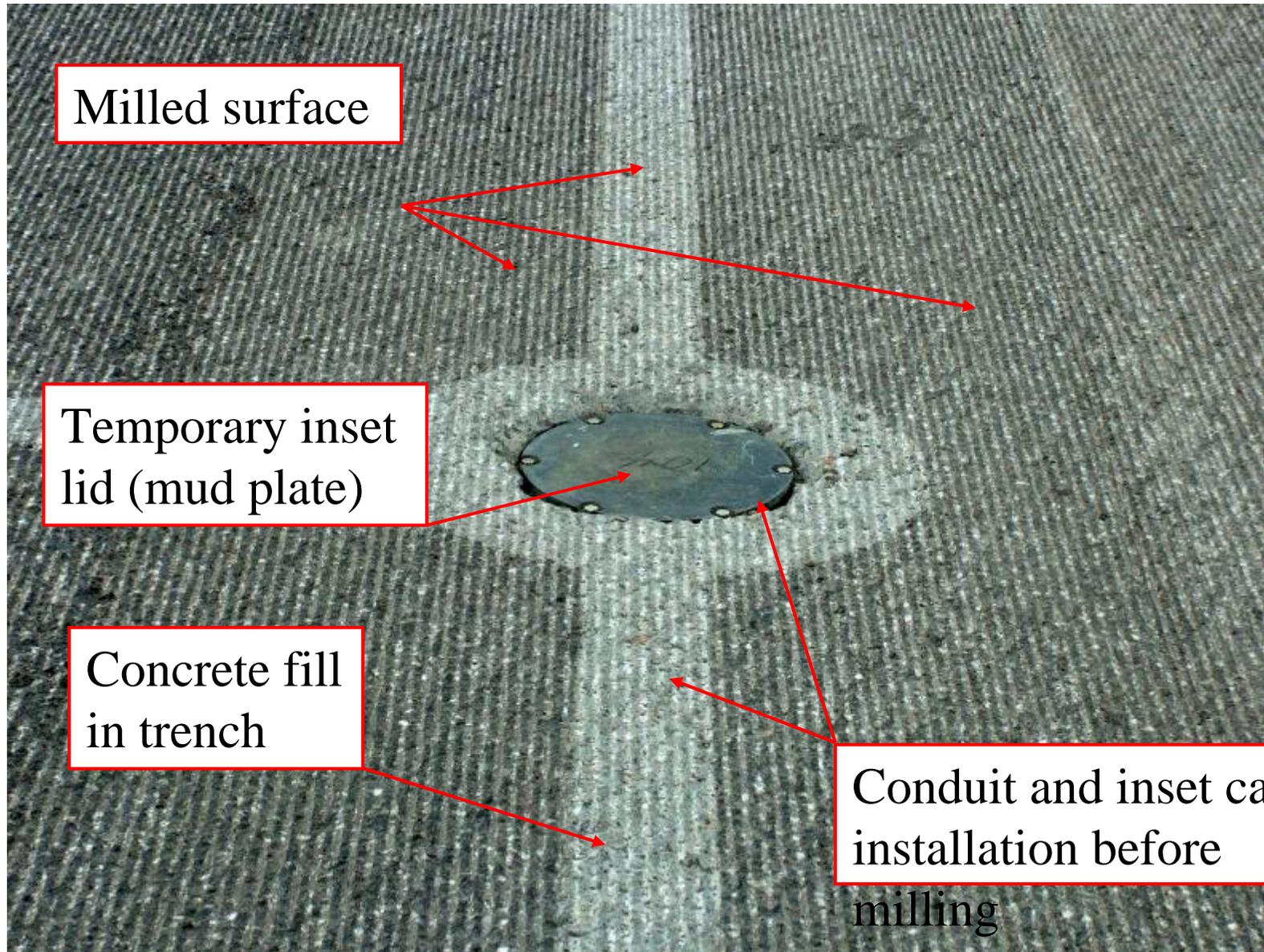
## Impact of Inset Lighting Installation on Airfield Pavement



## Impact of Inset Lighting Installation on Airfield Pavement



# Impact of Inset Lighting Installation on Airfield Pavement



Milled surface

Temporary inset lid (mud plate)

Concrete fill in trench

Conduit and inset can installation before milling

milling

## ▶ Airfield Pavement - Solutions

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- **Directional Boring Technology**
  - Under existing PCC pavement conduit installations
  - Less impact on pavement structure
- **Applications**
  - There must be suitable sub-grade (cohesive soil)
- **Overview of construction (PCC)**

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## Impact of Inset Lighting Installation on Airfield Pavement



## ▶ Inset Light Protection

- Development of specialized equipment needed
- Installation of Flange Rings and Snowplow Rings
  - Protection against snow plow blades
  - Snowplow ring deflects the impact of blades

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## Impact of Inset Lighting Installation on Airfield Pavement



## Impact of Inset Lighting Installation on Airfield Pavement



Protected light fixture.

# Impact of Inset Lighting Installation on Airfield Pavement



## Impact of Inset Lighting Installation on Airfield Pavement

# It's not electrical:



# Impact of Inset Lighting Installation on Airfield Pavement Ditch Witch Would be Surprised:



# ▶ Comments and Questions

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