Signs/Markings
One Airport's Experiences

Salt Lake City
International Airport

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FAA Northwest Mountain Region Airports Conference

Changes in AC 150/5340-1K

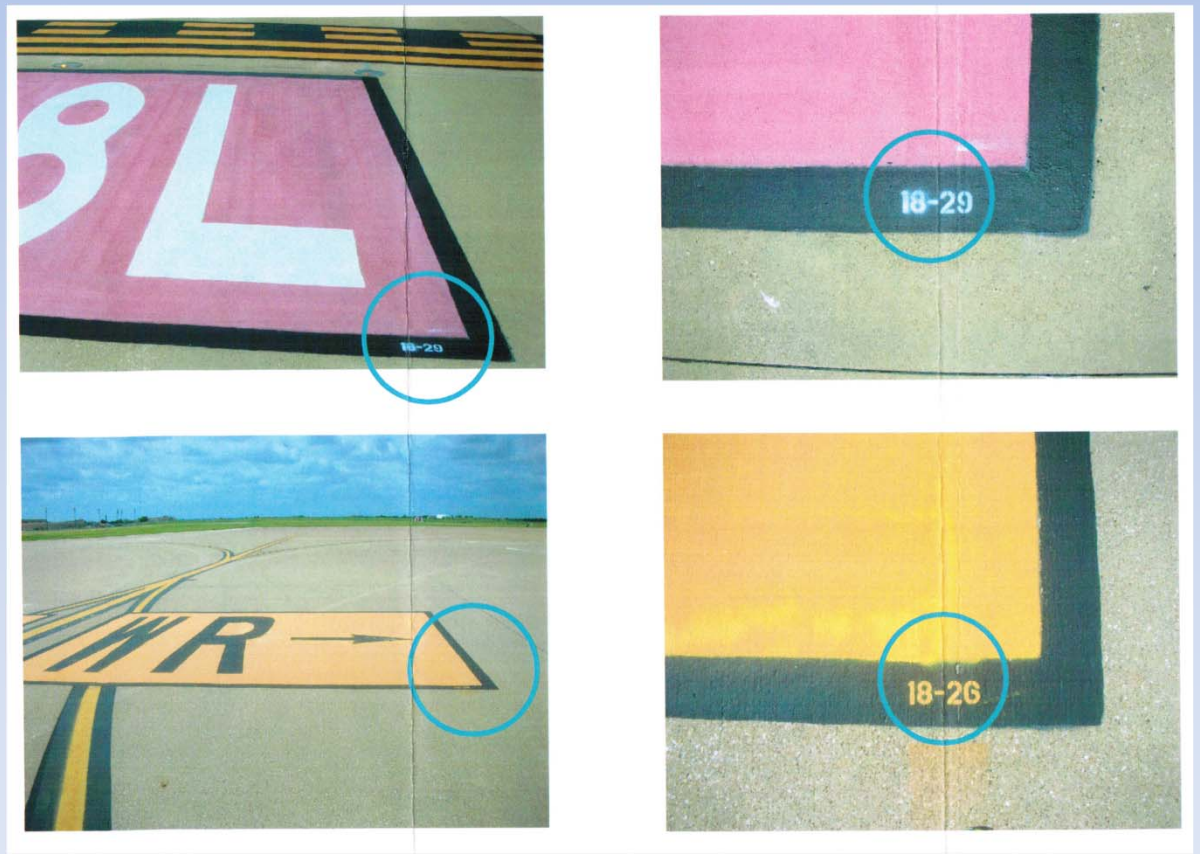
Standards for Airport Markings

- Extensive Text and Format Changes
- Incorporates all applicable surface marking supplements from SAMS
- New and Revised Figures
- Color-Coded Text Boxes
  - Green (Painting) – Explains painting precautions and solutions, such as when proportioning is permissible for runway surface markings
  - Red (Safety) – Emphasizes safety initiatives
  - Gray (General) – Contains general remarks

Changes in AC 150/5340-1K

Airport Markings

- Painted Numbering System for Record Keeping of Surface Painted Markings



May be used to facilitate the daily inspection, scheduled maintenance, necessary repairs , etc.

Changes in AC 150/5340-1K

Airport Markings

- Table 1-1

Painting a Black Border			
Pavement Surface Type	**Age of Pavement Surface [1]**		
	New	**Up to 2 years old**	**Over 2 years old**
Portland Cement Concrete Surfaces	**Yes**	**Yes**	**Yes**
Asphalt Concrete Surfaces	**No**	**No**	**Yes**
Asphalt Treated Surfaces	**No**	**No**	**Yes**

Provides general guidelines for determining when to add black borders to light covered pavements.

Changes in AC 150/5340-1K

Airport Markings

- Gray Box on Use of Glass Beads on Permanent Pavement Markings

Glass Bead Requirement
Paragraph 620-3.5, *Application, per AC 150/5370-10 (General)*

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads ***immediately after application of the paint.*** A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate(s) shown in Table 1 of AC 150/5370-10. Glass beads shall not be applied to black paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made.

Changes in AC 150/5340-1K

Airport Markings

- Includes a New Chapter 3 on Holding Position Markings
  - Consolidates the six different applications of holding position markings
  - New pattern designations
    - Pattern A, B, and C surface markings for holding positions

Changes in AC 150/5340-1K

Airport Markings

- Includes a New Chapter 3 on Holding Position Markings
  - Consolidates the six different applications of holding position markings
  - New pattern designations
    - Pattern A, B, and C surface markings for holding positions
- Adds New and Revised Text for Painting the Enhanced Taxiway Centerline Marking (Paragraph 4.3)

Changes in AC 150/5340-18F

Standards for Airport Sign Systems

- General Updates in an Effort to Bring Harmony and Consistency with Sign, Marking and Airport Design Standards, e.g., 5300-13, 5340-1K, 5345-44J, 5340-30E, ICAO, and referenced to appropriate AC's
- Incorporated Most of the SAMS
- Figures are Redrawn for Better Clarity and Detail

Changes in AC 150/5340-18F

Airport Sign Systems

- Paragraph 6, Location Signs
  - Reworded for clarity
    - "The yellow border must be set in from the inner edge of the sign to yield a continuous black margin."

Changes in AC 150/5340-18F

Airport Sign Systems

- Paragraph 8, Direction Signs
  - Updated to prohibit collocating taxiway direction signs with boundary signs

Changes in AC 150/5340-18F

Airport Sign Systems

- Paragraph 11, Vehicle Roadway Signs
  - Updated to include a runway holding position roadway sign used on vehicle roadways that enter or intersect a runway

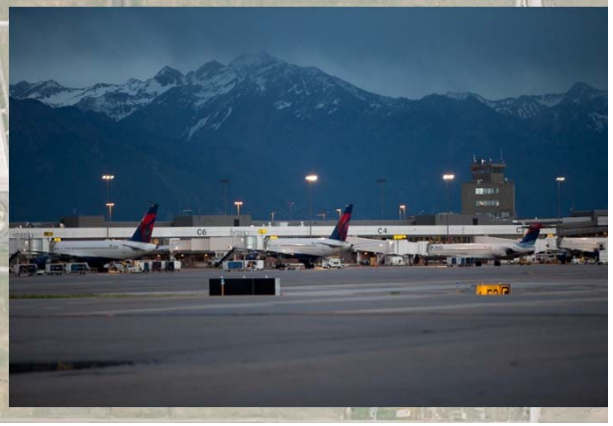
Salt Lake City International Airport

Spans 7,700 Acres with 4 Runways

16R/34L: 12000’
16L/34R: 12004’
17/35: 9596’
14/32: 4892’

Approximately 367,000 Operations/Year

Airport has almost 400 airfield signs and applies a lot of airfield paint



What is Wrong With This Marking?

Airport relocated the runway holding position marking. The old marking was painted over with grey paint which most closely matches the color of concrete.

What is Wrong With This Marking?

Taxiway centerline leading into a dead end construction zone.

What is Wrong With This Marking?

Holding position marking at night gives the appearance of a taxiway edge line due to lack of reflectivity.

What is Wrong With This Marking?

Holding position marking installed 250' from centerline. The marking should be painted at the location of the sign.

SLC Markings

- **Advantages**: Assets and resources that can help us meet the requirements of FAR 139
  - Equipment
  - Personnel

SLC Markings

Advantages

- Equipment
  - 2 Paint Trucks Owned, Operated, and Maintained by the Airport
  - Well Maintained Paint Striping Machines
  - Stencils and Other Application Materials
- Personnel
  - Dedicated Maintenance Team for Paint Application

SLC Markings

- **Challenges**: Areas of opportunity to improve processes and procedures to comply with FAR 139
  - Weather
  - Construction Contracted Painting
  - Training
  - Maintenance
  - Operations

SLC Markings

Weather Challenges

- Temperature
  - Painting normally takes place at SLC April to October when high temperatures are above 60° F
  - Painting during “winter” months may not adhere due to low temperatures
    - Why paint during winter?
      - Construction delays
      - Behind on the paint schedule

SLC Markings

Weather Challenges

- Temperature
  - Markings below painted November 13, 2010 at around 1830 local – High 43°F and Low 34°F

Behind schedule due to construction in area.

100’ of edge marking painted after barricades pulled on new taxiway. Visible markings painted two weeks prior.

SLC Markings

Weather Challenges

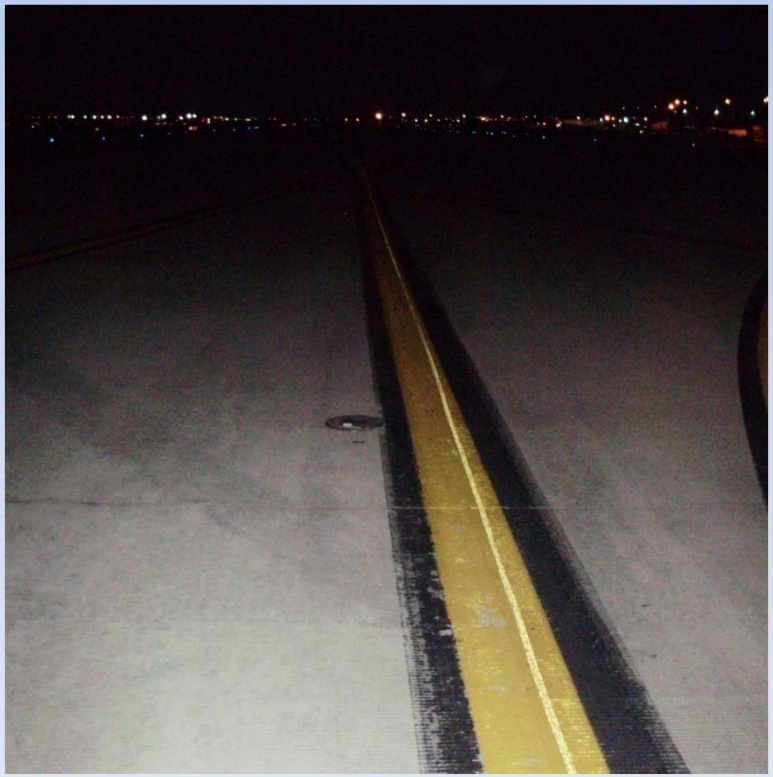
- Temperature
  - Marking again painted in early November on newly completed taxiway

Missing Taxiway Centerline

SLC Markings

Weather Challenges

- Snow Removal Brooms and Plows
  - Glass beads diminished from plowing and brooming.

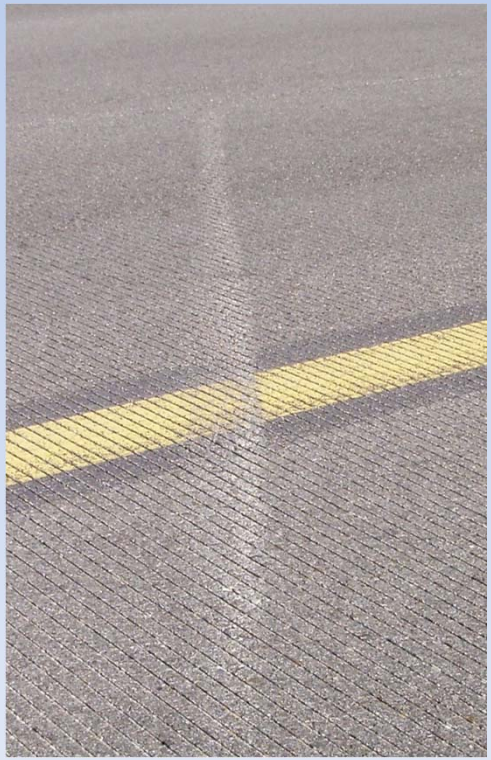


Glass beads are visible in the joint seem but snow brooms have taken off the rest of the beads on the marking.

SLC Markings

Weather Challenges

- Snow Removal Brooms and Plows
  - Some paint markings worn from snow removal equipment



Broom mark on the taxiway across the centerline.

SLC Markings

Weather Challenges

Lessons Learned/Solutions

- Never paint when ground temperatures are below 55°
  - If painting must be done, inspect the markings often and expect to re-paint the markings as needed
- Inspect markings closely after snow operations
  - Expect reflectivity to diminish from winter operations
  - Refresh and replenish all markings every year

SLC Markings

Contractor Challenges

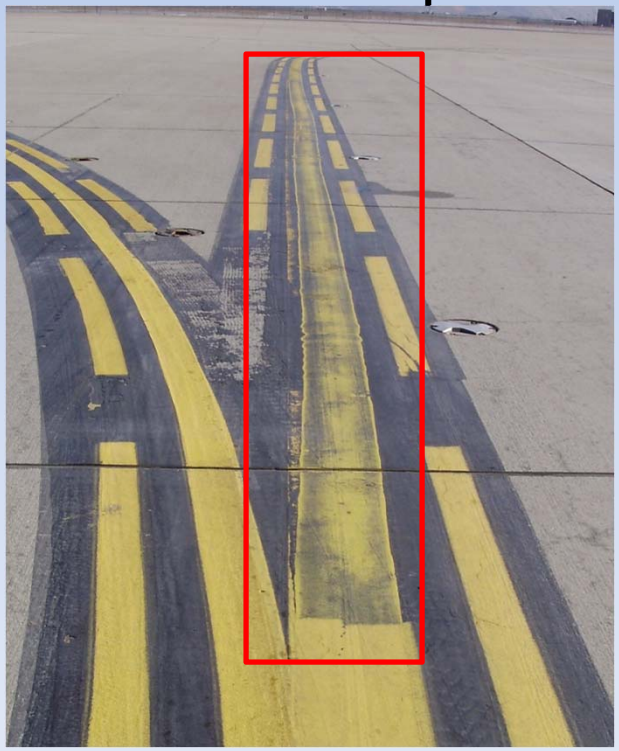
- Preparation Work
  - Adequately preparing new surfaces for painting
    - Removing dirt and dust before application.
    - Pre-marking the pavement for proper placement

Area was not properly cleaned after construction and paint did not completely adhere.

SLC Markings

Contractor Challenges

- Airport Marking Experience
  - Few FAR 139 airports in the area
  - Contractors specialize in road striping



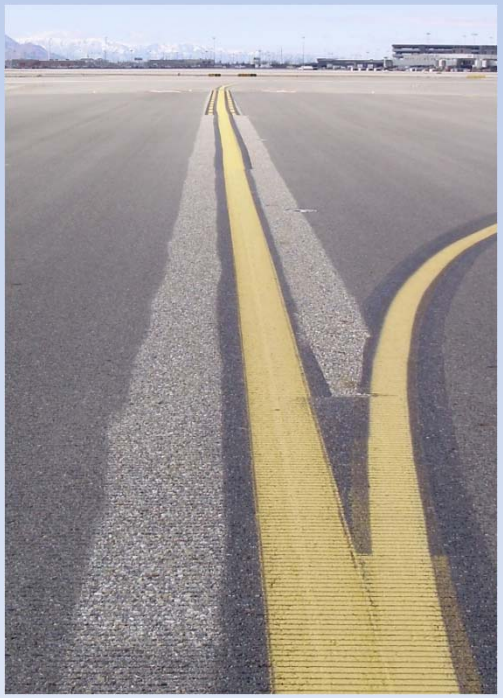
Area highlighted shows contractor applied paint after a construction project where paint application rate was lower and glass beads were not applied.

SLC Markings

Contractor Challenges

- Standards
  - Contractors not completely familiar with AC 150/5340-1K, Standards for Airport Markings

Contractor did not sand blast these two small sections of taxiway edge markings but instead blacked them out. Now they are showing through.



Contractor misread construction plans and painted enhanced centerline too long on newly overlaid taxiway. Paint markings had to be sand blasted.

SLC Markings

Contractor Challenges

Lessons Learned/Solutions

- Ensure Contractors meet standards and expectations of FAR 139
  - Train and provide contractors with the applicable AC's
  - Require contractors to rectify sub-standard work
- Write contracts for "in-house" painting on airfield construction projects

SLC Markings

Training Challenges

- Standards
  - Understanding and following the guidance of AC 150/5340-1K, Standards of Airport Markings

Two markings that conflict with each other.

SLC Markings

Training Challenges

- Standards
  - Understanding and following the guidance of AC 150/5340-1K, Standards of Airport Markings

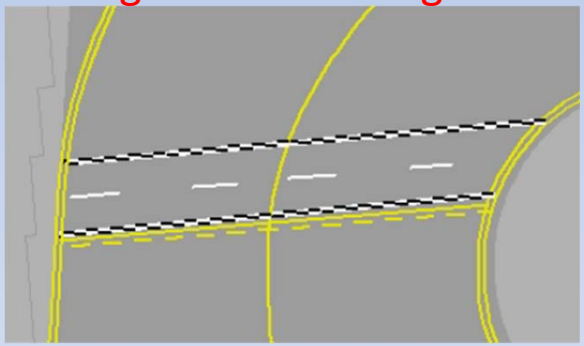
Stencil marks should not be present in paint markings.

SLC Markings

Training Challenges

- Consistency
  - Follow the marking plan

Image from Marking Plan

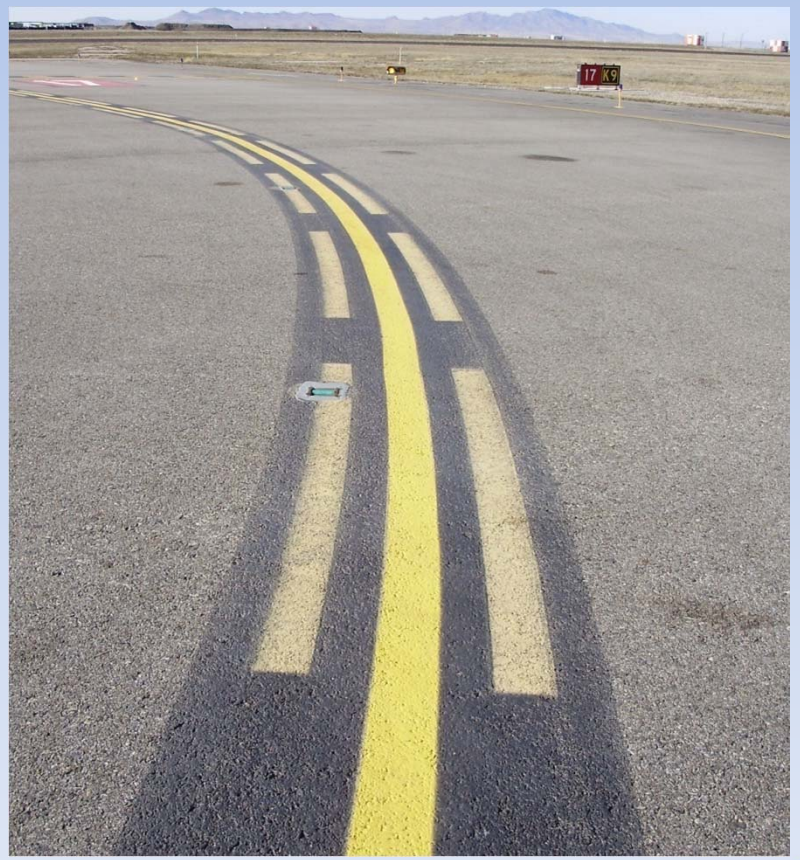


Zippered road marking not painted on both sides of the road as shown in the marking plan.

SLC Markings

Training Challenges

- Consistency
  - Avoid deficiencies



Centerline and enhancements are different shades of yellow. Enhancements painted in the previous year.

SLC Markings

Training Challenges

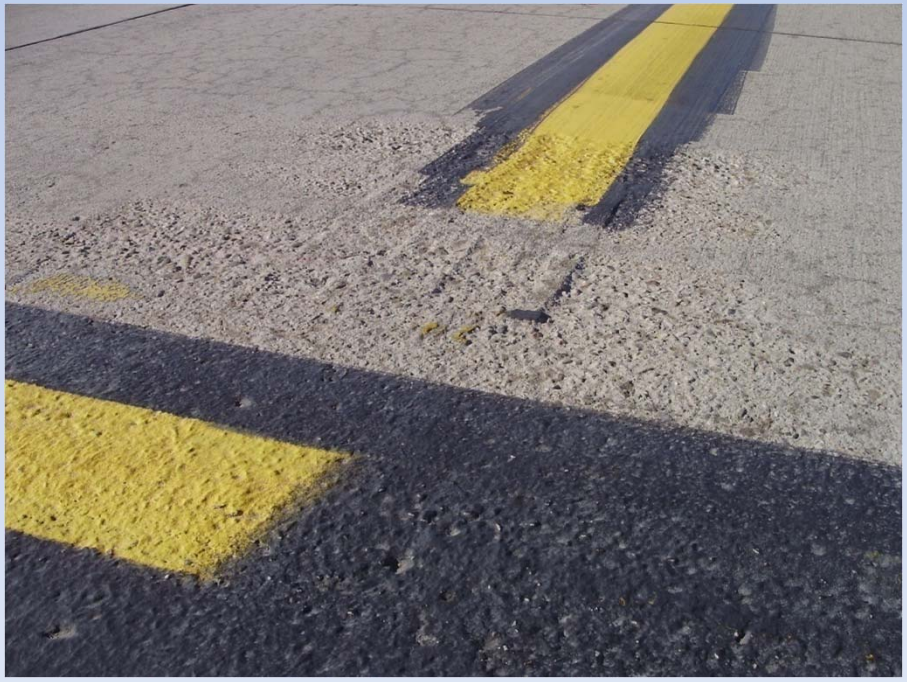
Lessons Learned/Solutions

- Put emphasis on marking specific training
- Develop paint marking “experts” out of maintenance and operations personnel

SLC Markings

Marking Maintenance Challenges

- Marking Removal
  - Procedures and techniques in removing paint markings



Visible pavement scars caused by grinding of paint markings.

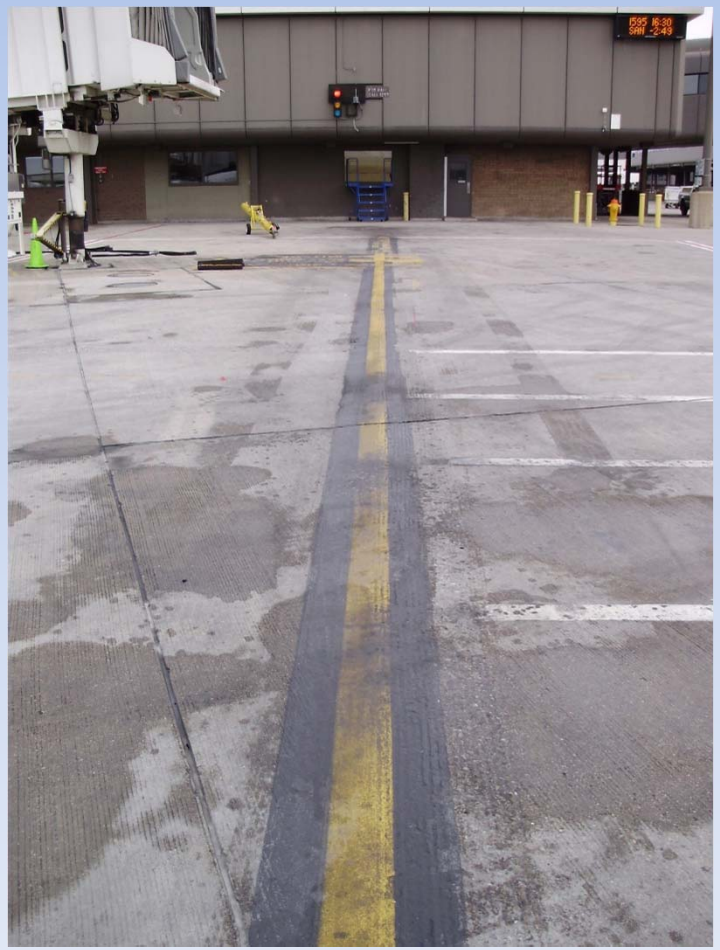
What is the established best practice for removing paint markings?

What techniques have you used in removing paint markings?

SLC Markings

Operation Challenges

- Paint Discoloration

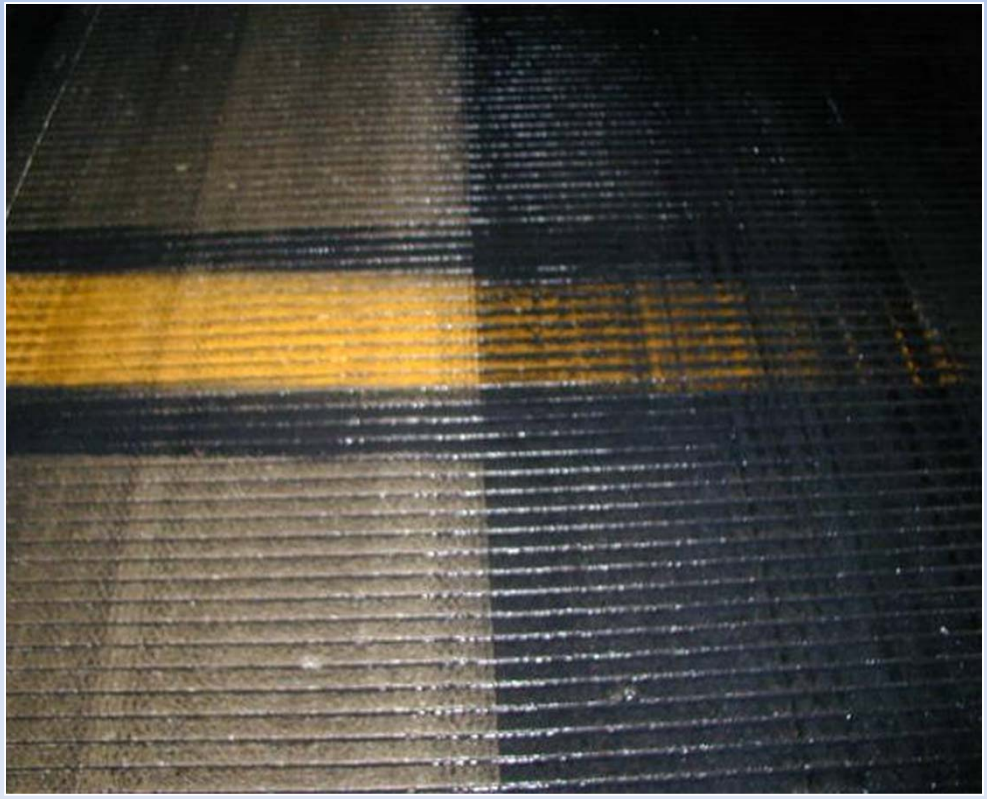


Oil, fuel, and other products cause fading to paint markings over time.

SLC Markings

Operation Challenges

- Tire Rubber



Build-up obscures runway paint markings.

SLC Markings

Marking Maintenance/Operations Challenges

Lessons Learned/Solutions

- Employ better techniques that are less scarring to the pavement
  - High pressure water blasting or sand blasting
- Monitor tenant operations to ensure spills are cleaned
- Inspect non-movement areas for paint discrepancies
- Establish a schedule for runway rubber removal

What marking challenges are you facing at your airport?

What is Wrong With This Sign?

Easy fix, just need to turn the location sign panel over.

What is Wrong With This Sign?

This ILS boundary sign is incorrectly installed at the boundary of a regular runway holding position, rather than an ILS critical area boundary.

What is Wrong With This Sign?

Airport maintenance personnel replaced a broken sign panel with a non-standard panel from an old destination sign. A new panel had not been ordered.

What is Wrong With These Signs?

Direction signs and their respective arrows are to be arranged left to right in a clockwise manner.

The A and B direction signs should be switched.

The E direction sign should be are the far right in the sign array.

What is Wrong With These Signs?

Direction sign arrow on a holding position sign

Taxiway direction sign?

What is Wrong With This Sign?

Caption

What is Wrong With These Sign Bases?

Caption

SLC Signs

- Assets and resources that can help us meet the requirements of FAR 139
  - Personnel
  - Non-complex Airport Configuration

SLC Signs

Personnel Advantage

- Signs are maintained to standard
  - Components from lighting to fixtures in place and operable
  - Damaged signs are quickly repaired or replaced

SLC Signs

Airport Configuration Advantage

- Runway and Taxiway Layout
  - Simple sign layout plan
  - Majority of the configuration is either north to south or east to west
  - Four runways with limited land and hold short operations
    - Only one area on the airfield where runways converge

SLC Signs

- **Challenges**: Areas of opportunity to improve processes and procedures to comply with FAR 139
  - Training/Complacency to Standards
  - Construction Contracted Sign Installation
  - Pilot Confusion
  - Weather

SLC Signs

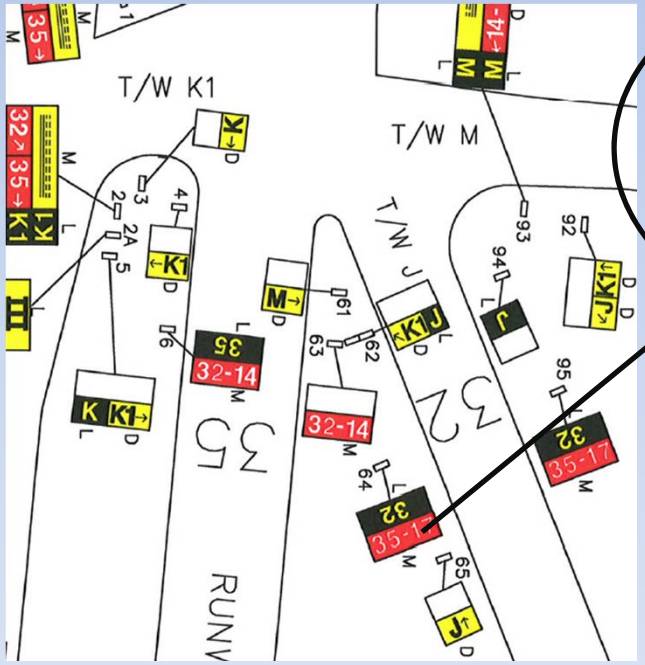
Training/Complacency Challenges

- Signs Often Overlooked
  - "Been this way for years so they must be fine" mentality
- Personnel not utilizing the Sign AC's in conjunction with the Sign Plan

SLC Signs

Training/Complacency Challenges

- Example……



N

This mandatory hold short sign gives the impression that the 17 numbers would be located toward the right. The sign should state 17 – 35 to show the correct orientation of the runway.

SLC Signs

Training/Complacency Challenges

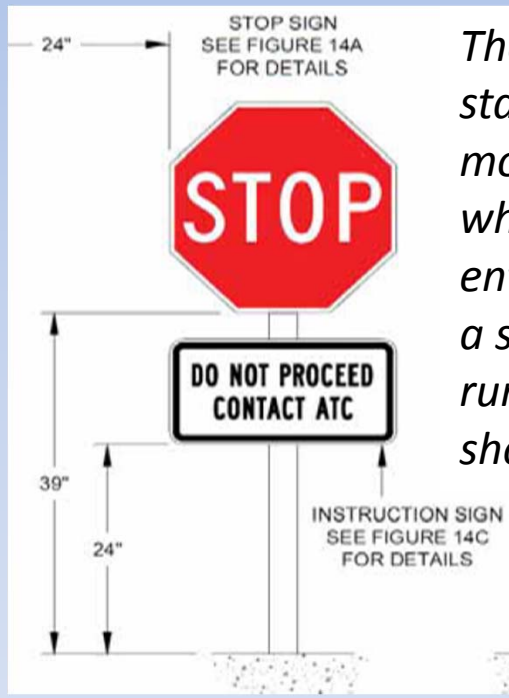
- Example……

AC 150/5340-18 states "A dash is used only with mandatory instruction signs" and "a dot…is used on signs where one arrow is common to two destinations". This sign should have a dot instead of a dash.

SLC Signs

Training/Complacency Challenges

- Example……



The 2010 revision of the AC states "For an airport with more than one runway, where vehicle service roads enter or intersect a runway a standard retroreflective runway hold position sign should be installed…"

AC 150/5340-18 states " Install standard highway stop signs on vehicle roadways at the intersection of each roadway with a runway or taxiway".

What training techniques or programs have been effective in training personnel?

SLC Signs

Training/Complacency Challenges

Lessons Learned/Solutions

- Periodically review every sign in the plan in accordance with the AC
- Changes in AC revisions must be noted and signs inspected for compliance

SLC Signs

Contractor/Construction Challenges

- Review Construction Plans
  - Numerous signs on new taxiway project at SLC were not designed to the standards of the AC
    - Common Mistakes
      - Multiple direction signs collocated on a sign were not arranged in a clockwise manner.
      - Angle of arrows not correct in relation to degrees of the turn.

SLC Signs

Contractor/Construction Challenges

- Inspect Sign Panels Installed by Contractors
  - Ensure the signs meet the standards found in the AC's

Construction plans for this sign show a black panel being placed on the right half of the sign. Sign was manufactured and installed with large yellow background extending far beyond the legend. Also, destination signs are "not normally collocated with other signs". Previous versions of the AC restricted destination signs being collocated with other signs.

SLC Signs

Contractor/Construction Challenges

Lessons Learned/Solutions

- Send proposed modified or new construction sign plan to the FAA for review before installation or construction
  - Prevents expensive alterations of signs after installation
- Ensure installed signs meet the sign plan as written

SLC Signs

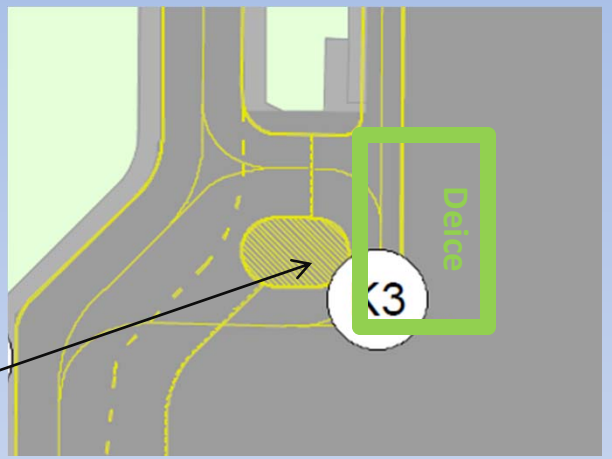
Pilot Confusion Challenges

– Examine signs to see if they may cause confusion for users

Unconventional arrow on mandatory sign for runway 17/35, with intent to prevent pilots from mistakenly lining up on runway 32 for a runway 35 departure.

SLC Signs

Pilot Confusion Challenges



Sign shows deice next turn left with the main portion of the deice pad located just to the right of the sign. Pilot may confuse taxi lane between the pad and taxiway as the deice area.

SLC Signs

Pilot Confusion Challenges

Lessons Learned/Solutions

- Solicit feedback from pilots, airlines, and ATC on where confusion is encountered
- Jump seat with pilots or have pilots ride along on inspections
- Put personnel in pilots shoes while inspecting signs
  - Ask the question “Is the information provided clear and concise?”

SLC Signs

Weather Challenges

- Snow
  - Equipment on occasion damages sign faces
  - Snow obscures signs

SLC Signs

Weather Challenges

Lessons Learned/Solutions

- Inspect all signs after winter events
- Record sign damage with weather data to determine trends
  - Don’t rule out equipment operation training
- Continually clean signs during winter events
  - Use a squeegee to prevent sign face damage and never use ice scrappers

SLC Signs and Markings

Areas of Improvement

- Training
  - In depth training of AC's in correlation with the marking and sign plan
- Periodic Inspection and Review
  - Periodically inspect all signs and markings to avoid complacency
- Contractor Relationships
  - Work closely with contractors during installation of markings and signs to ensure expectations and standards are met
- Best Practices
  - Research and experiment to apply techniques that help us maintain and improve our compliance of markings and signs

What challenges do have with airfield signs at your airport?

Questions?