DGAC - SYMPOSIUM
Runway Surface Conditions Assessment and Reporting

Paris, 31 March – 1 April, 2016

How to address the issue of fixing Maintenance/Minimum Friction Levels of a runway?

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1967 – ICAO Annex 15
COMPACTED SNOW AND ICE

0.40 and above	5	GOOD
0.39 to 0.36	4	MEDIUM/GOOD
0.35 to 0.30	3	MEDIUM
0.29 to 0.26	2	MEDIUM/POOR
0.25 and below	1	POOR

1973 – USAF AFWL – HYDROPLANING

Greather than 0,50	5	GOOD
	4	
0,42 to 0,50	3	FAIR
0,25 to 0,41	2	MARGINAL
Less than 0,25	1	UNACCEPTABLE

HYDROPLANING POTENTIAL

MU-METER AIRCRAFT PAVEMENT RATING

MU	EXPECTED AIRCRAFT BRAKING RESPONSE	RESPONSE
GREATER THAN 0.50	GOOD	NO HYDROPLANING PROBLEMS ARE EXPECTED
0.42 - 0.50	FAIR	TRANSITIONAL
0.25 - 0.41	MARGINAL	POTENTIAL FOR HYDROPLANING FOR SOME A/C EXISTS UNDER CERTAIN WET CONDITIONS
LESS THAN 0.25	UNACCEPTABLE	VERY HIGH PROBABILITY FOR MOST AIRCRAFT TO HYROPLANE

Mu-Meter Aircraft Pavement Rating

Joint FAA/USAF/NASA Runway Research Program

1980 FAA NRFM

1990 FAA Tire study

1973	1975	1986	1991	1997
USAF	FAA-12	FAA-12A	FAA-12B	FAA-12C

1973 (USAF)
- **0.50**
- **0.42**
- 0.25

1975 (FAA-12)
- 0.50

1986 (FAA-12A)
- 0.50

1991 (FAA-12B)
- **0.72**
- **0.52**
- **0.42**

1997 (FAA-12C)
- 0.72 – 0.66
- 0.52 – 0.38
- 0.42 – 0.26

40 MPH – 60 MPH

1975 – FAA

MINIMAL AVERAGE FRICTION REQUIREMENT FOR RUNWAY PAVEMENTS

0.50 | 5 | MINIMUM

4

3

2

1

After the runway has been cleared of contaminants, the AVERAGE WET MU VALUE should not be no less than 0.50

1991 – FAA
FRICTION LEVEL CLASSIFICATION

0.72 – 0.66		NEW DESIGN/CONSTRUCTION
0.52 – 0.38	5	MAINTENANCE PLANNING
	4	
0.42 – 0.26	3	MINIMUM
	2	
	1	

This table was developed from qualification and correlation tests conducted at NASA Wallops Flight Facility in 1989.

FAA TABLE 3-3

(ICAO TABLE A-1)

2013 – ICAO Annex 15
COMPACTED SNOW AND ICE

0.40 and above	5	GOOD
0.39 to 0.36	4	MEDIUM/GOOD
0.35 to 0.30	3	MEDIUM
0.29 to 0.26	2	MEDIUM/POOR
0.25 and below	1	POOR

New SNOWTAM based upon TALPA ARC includes «wet runway»

RUNWAY SURFACE DESCRIPTION		PILOT – DOWNGRADING CRITERIA
DRY	6	
WET	5	GOOD
	4	GOOD TO MEDIUM
«SLIPPERY WET» runway	3	MEDIUM (RWYCC 3)
STANDING WATER	2	MEDIUM TO POOR
	1	POOR
	0	LESS THAN POOR

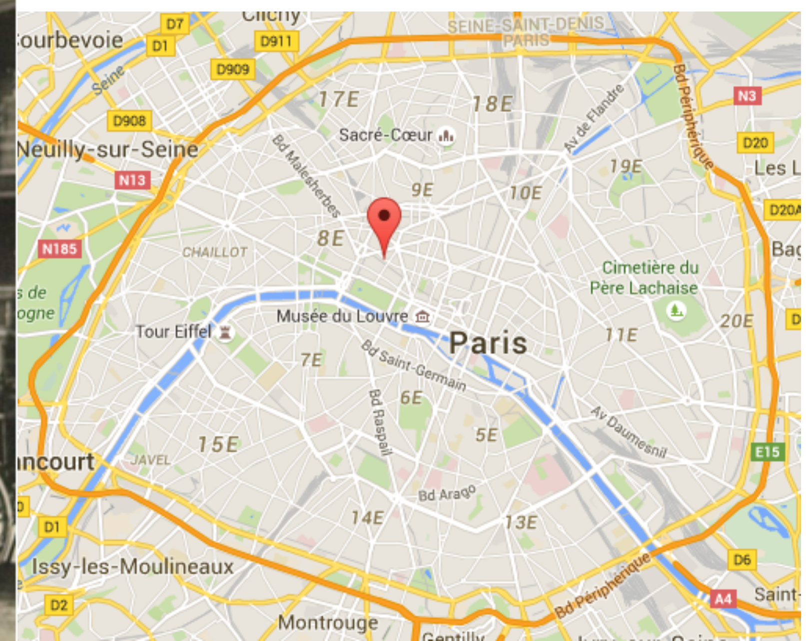
NB! Snow, Slush, Ice not listed in this presentation

PARIS 1860ish

Slippery (wet) - Horses that fell in Rue de Sèze and Rue Neuve des Capucines

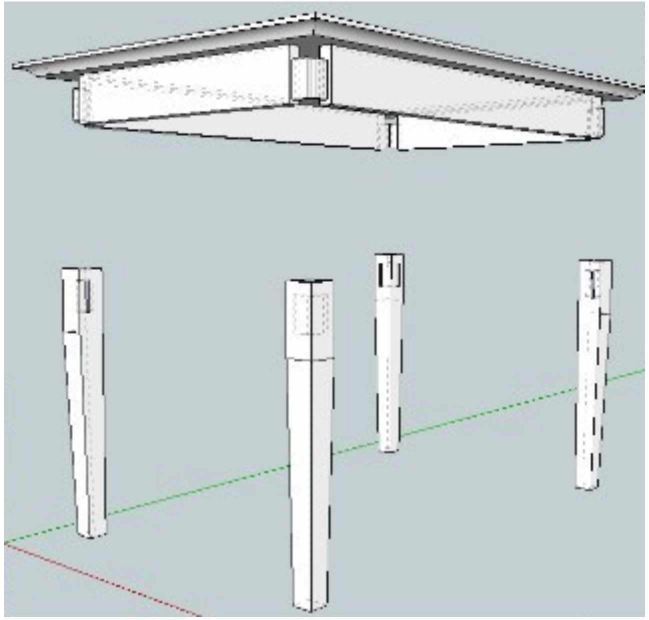
6 months period

1308 – Sandstone – (R de Sèze)
1409 – Asphalt – (R Neuves des Capucines)



- 1873 – London
- 1885 – Berlin
- 1885 – United States – 10 cities

MINIMUM FRICTION LEVEL [MATRIX]
Analogy – four leg table – stable
WET RUNWAY



Analogy of a four leg table

1. Leg - Geometry (Drainage - ponding)
2. Leg – Macrotexture
3. Leg – Skid resistance
4. Leg – Runway End Safety Area (RESA)

If one leg is missing – then we do not have a stable and safe condition. However – regarding surface friction characteristics we need to have focus on the RUNWAY. Three of the legs belongs to the RUNWAY SURFACE FRICTION CHARACTERISTICS .

MINIMUM FRICTION LEVEL [MATRIX]

GEOMETRY	MACROTEXTURE	SKID RESISTANCE
MFL [Geometry, Macrotexture, Skid resistance]		

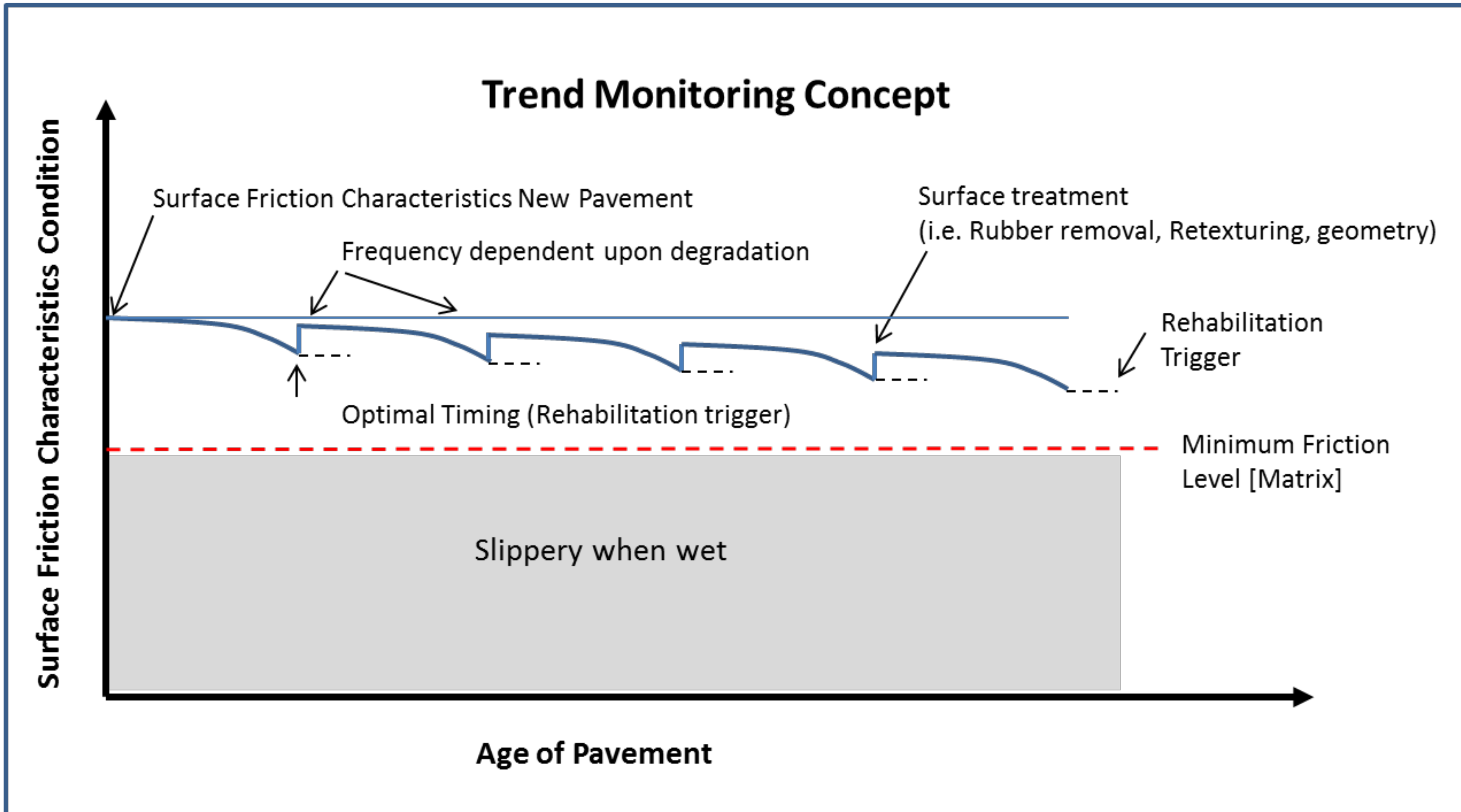
Known technology and measurement standards. No specific challenge.	MTD (Volume)
	• NASA grease patch
	• EN-13036-1
	• ~~ASTM E 965-96~~ Withdrawn 2015
	
	Relationship between NASA method and EN-13036-1 not universally accepted.
	
	Spot measurements
		Mu-Meter 0.50/0.42/0.25 (1973)
		
		No established reference for calibration of friction measuring devices
		• Manage uncertainty
		  • Reference device
		  • Calibration
		  • Competency
		Management
		• ISO/IEC 17025
		• ISO/IEC 17043
		• ISO 9001

Aggregates • EN 932-1, 2 and 3 • EN 933-1, 2, 3, 4, 5, 7, 9 and 11 • EN 1097-1, 2, 3, 5, 6, 7 and 8 Shape, size, resistance to wear and polishing. Built in qualities	MPD (profile) • ISO 13473-1, 2, 3, 4 and 5 Relationship MPD vs. MTD are device type dependent. Continuous measurements	Friction measuring devices are considered needed to measure the polishing of aggregates embedded in a pavement surface. However desired level of precision cannot be achieved. Proper management needed.

MINIMUM FRICTION LEVEL [MATRIX]

GEOMETRY	MACROTEXTURE	SKID RESISTANCE
MFL [Geometry, Macrotexture, Skid resistance]		
Known technology No challenge	Historic, MTD Emerging, MPD (Norway)	Mu-Meter 0.42 (FAA)
Laboratory EN (CEN) standards Built in quality in pavement.	EN standard for MTD ISO standard for MPD	France has developed proper management on State level
• Contract • AIP information? • Basis for trend monitoring	• Decisions needed for proper management on regional level (EASA)	• Decisions needed for proper management on regional level (EASA)

TREND MONITORING



MINIMUM FRICTION LEVEL [MATRIX]

GEOMETRY	MACROTEXTURE	SKID RESISTANCE
TREND MONITORING		
• Change to geometry over time.	• Rubber build up • Wear/damage from heavy equipment	• Polishing from traffic (aircraft and maintenance equipment)
Trigger: • Ponding • No drainage due to prevailing weather (wind)	Trigger: • Loss of macrotexture • **Minimum level (not to go below) set by the State**	Trigger: • **Level set by the State** • **Not to go below Mu-Meter 0.42**