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To be the world-class airport constructor and airport project servicer

Research and Practice on Asphalt Overlay in China

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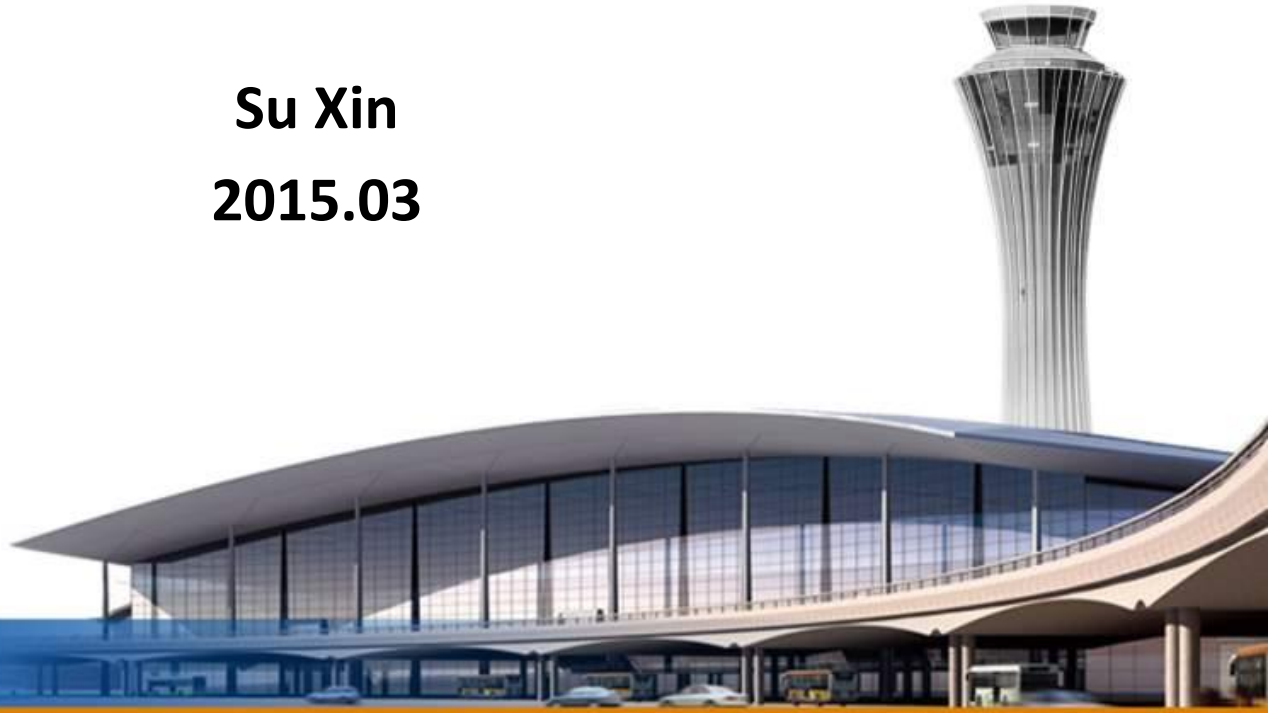


中国民航机场建设集团公司

China Airport Construction Group Corporation

Contents

Projects Review

- 1989 Shanghai Hongqiao Airport
- 1991,1993 Nanjing, Guilin, Xi'ning
- 1994 Xiamen
- 1996 Beijing Capital Airport- Eastern Runway
- 1998 Zhanjiang, Hongqiao
- 2000 Beijing Capital Airport- West Runway, Xi'ning
- 2001 Harbin, Dunhuang
- 2002 Tianjin
- 2003 Dalian
- 2004 Kunming, Karamay
- 2005 Luzhou, Tacheng
- 2006 Hongqiao, Qingdao, Yan'an
- 2007- Changsha, Xiamen, Lijiang, Xining, Tongliao, Mangshi, Shenyang, Urumqi, Xi'an, Lhasa, Mudanjiang, Hongqiao, Kunming, Lvliang, Chongqing, Beijing……
- To be built： Chengdu, Beijing, Tianjin, Baoshan, Zhaotong……

Calculation Methods

Empirical Method:

- $t_j = 2.5 \times (F \cdot h - C_b \cdot h_e)$

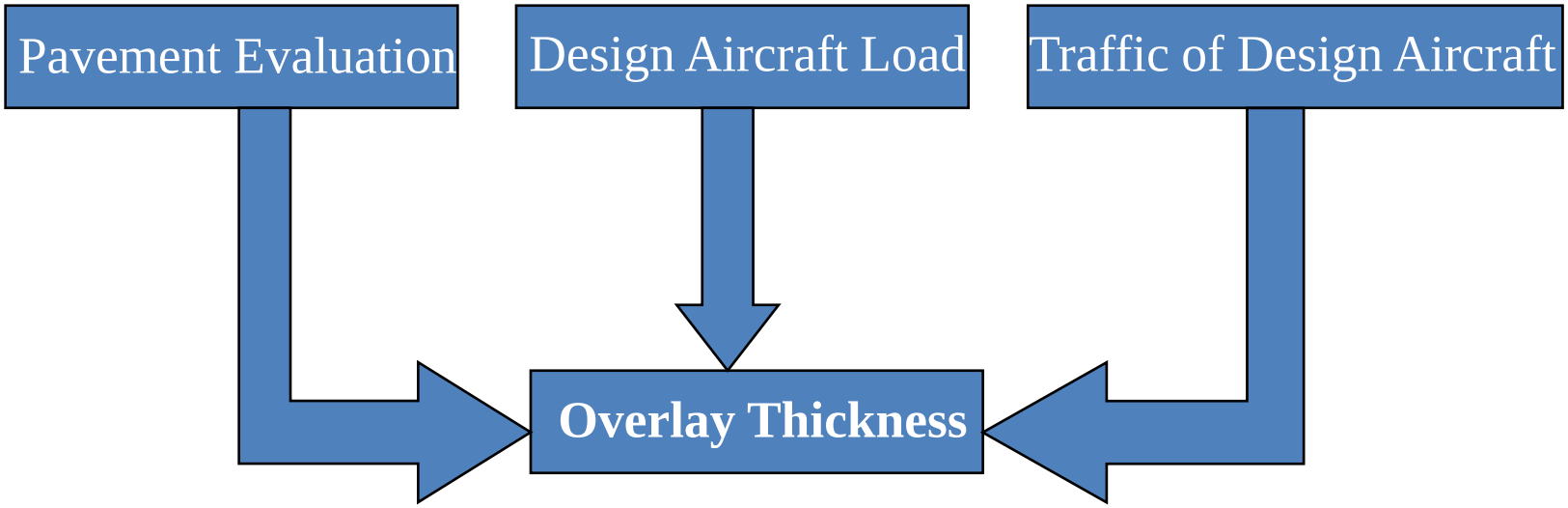
t_j: Thickness of bituminous overlay

F: Factor which controls the degree of cracking

h: Single thickness of rigid pavement required for design

C_b: Condition factor for base pavement ranging from 1.0 to 0.75

h_e: Thickness of existing rigid pavement



Calculation Methods

Mechanistic-Empirical Method:

- **Sums of Cumulative Damage Factor (CDF) of Each Aircraft is not More Than （1.0±0.1）**

$$\sum_{i=1}^{n} CDF_i = \sum_{i=1}^{n} \frac{P_i}{\left(P/C\right)_i \times N_i} \leq 1.0 \pm 0.1$$

Where CDF_i is the cumulative damage factor for specified aircraft type,

P_i is the predicted number of passes in design life,

$(P/C)_i$ is the pass to coverage ratio,

N_i is the tolerant number of load applications for specified structure under one aircraft

- **Predict-equation of Pavement Performance:** $N_i = 10^{\left(10.048-15.117\left(\sigma_p/f_r\right)\right)}$
- **Finite Element Program, NIKE3D_FAA, recommended by FAA**
- **27 Kinds of Aircraft Type in Operation**
- **Flexural-tensile stress on the bottom of old PCC/ Flexural-tensile strength**
- **Strip Division for CDF:** Each 200.0cm strips While each 25.4cm strips for FAA

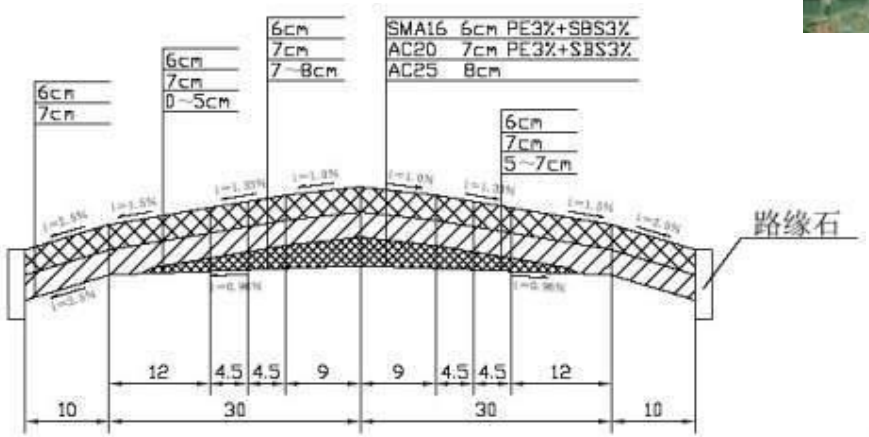
Typical Cases

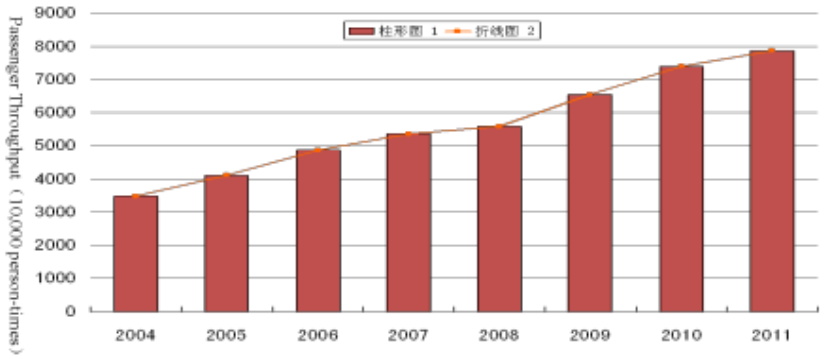
1. Beijing Capital Airport
2. Chongqing Airport
3. Lhasa Airport
4. Other Cases

Beijing Airport Eastern Runway

Background

- ✓ Built in 1954
- ✓ 3800m×60m
- ✓ Asphalt overlaid in 1996
- ✓ Performs well under heavy load





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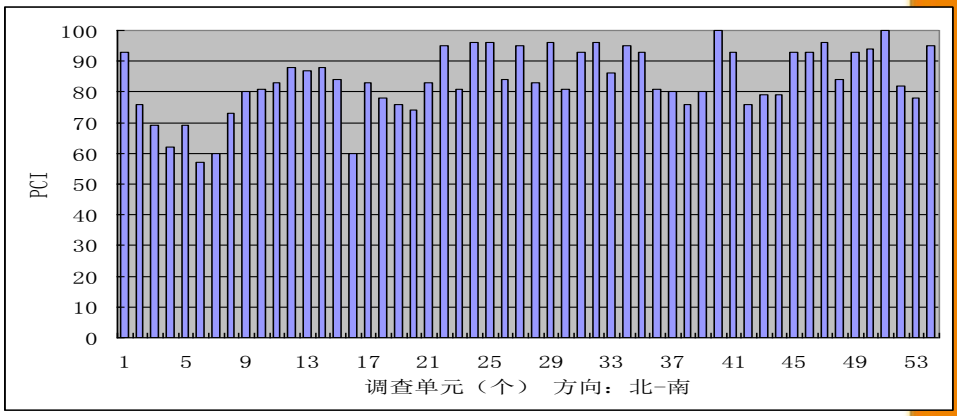
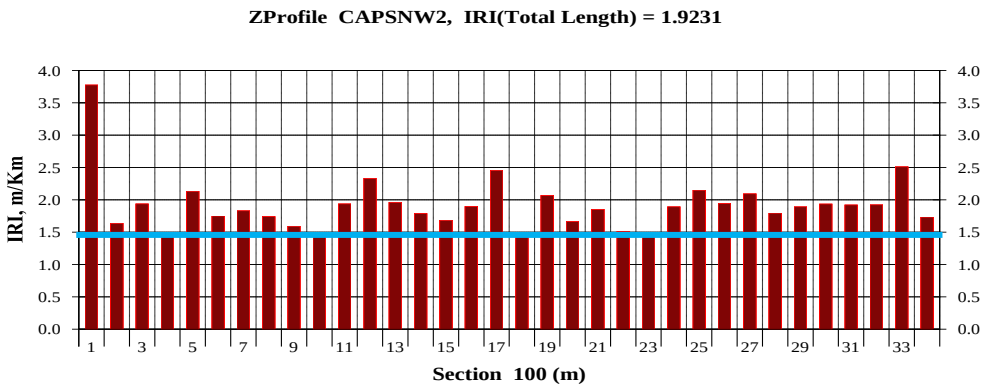
Beijing Airport Eastern Runway

Evaluation Results of 2007

- PCI: Excellent except the north end
- IRI: 1.84 mm
- ISM: Except the north end
- Performance of Mix：Perfect
- Structural life：9years





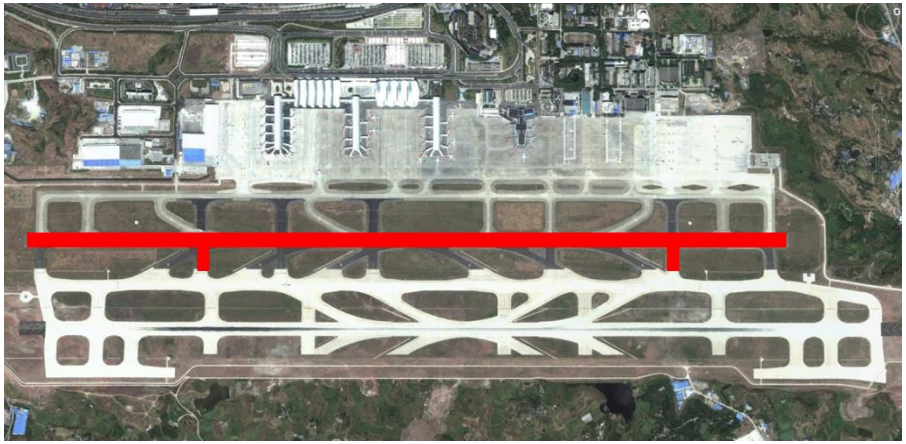
Cantabro Abrasion Test

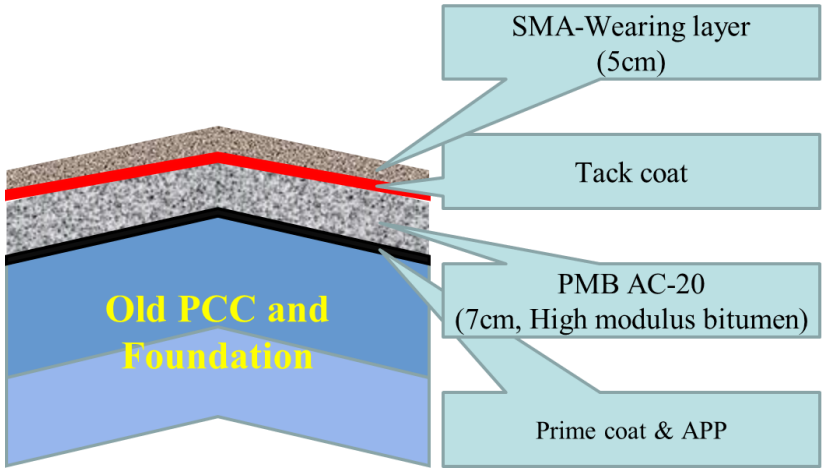
Position	No.	Before test (g)	After test (g)	Damage (%)	Average
North end	5#	1233.4	1116.5	9.5	34.8
	6#	1125.6	874.6	22.3	
	7#-1	1201.0	328.8	72.6	
	5#	1215.2	1062.3	12.6	20.7
	6#	1214.9	454.5	62.6	
	9#	1226.0	1179.3	3.8	
	10#	1233.2	1188.1	3.7	
Middle and South end	14#	1112.6	1049.2	5.7	4.1
	22#	1260.7	1230.8	2.4	
	24#	1263.7	1211.0	4.2	
	20#	1245.9	1201.6	3.6	3.3
	21#	1262.6	1222.5	3.2	
	22#	1263.4	1223.2	3.2	

Chongqing Airport

Background

- ✓ Built in 1985
- ✓ 3200m×60m
- ✓ Asphalt overlaid in 2013
- ✓ Performs well under high temperature climate

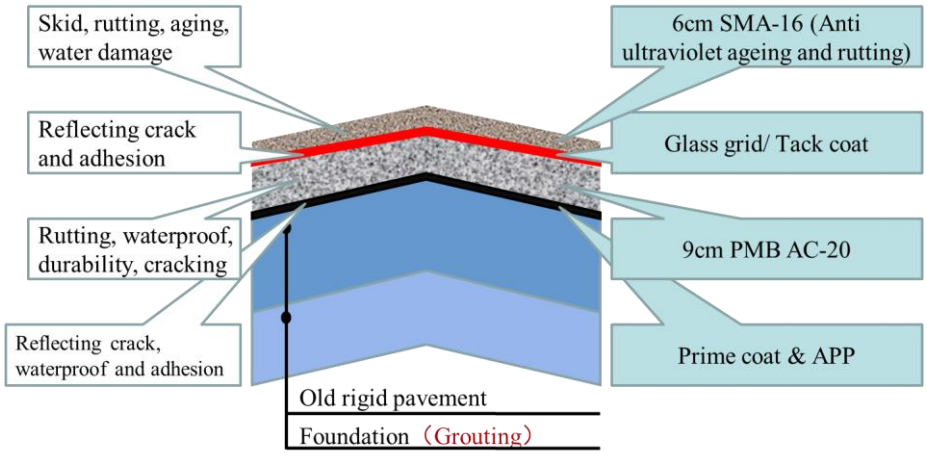




Lhasa Airport

Background

- ✓ Opened in 1990
- ✓ 4000m×45m
- ✓ Asphalt overlaid in 2010
- ✓ High plateau airport with strong ultraviolet radiation



Other cases

Shanghai Hongqiao Airport

Xi'an Xianyang Airport

Changsha Huanghua Airport

Urumqi Airport

Qingdao Liuting Airport

Dalian Zhoushuizi Airport

Shenyang Taoxian Airport

Tianjin Binhai Airport

Some Suggestions

- Based on the latest pavement evaluation results
- Selecting materials and enhanced measures suiting local conditions
- Rational design of overlay thickness
- ……

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Thank You!