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Chemilink In-Situ Rehabilitations for Various Pavements in Malaysia

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1. Introduction

- Rapid development
- Increase in traffic volume and loading
- tropical region with rich rainfall, marine clay, peat and swampy soils, other soil improvement methods limited effectiveness
- Maintenance and upgrading work is tough
- Super-fast and Super strong technology introduced by Chemilink
- Significant improvement of CBR within short period without surface cracking like cement stabilization

1. Introduction

- Singapore Changi Airport project featured on Discovery Channel since 2008
- 1st Soil Stabilization Product approved by Federal JKR together with Malaysia Highway Authority

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Federal JKR Approval Letter

LAMPIRAN A

KEPUTUSAN MESYUARAT JAWATANKUASA BERSAMA (JKR-LLM) KELULUSAN PRODUK BAGI KERJA-KERJA JALAN BIL.2/2016

SYARIKAT	: Advanced Stabilization Technologies Resources PLT
PRODUK	: Chemilink Soil Stabilization
MODEL	: SS-108
BAHAN	: Soil Stabilizing Agent
PENGILANG	: Chemilink Technologies Group PTE LTD (Singapura)
KEPUTUSAN	: **LULUS**

ULASAN:

i. Produk telah mematuhi *Standard Specification For Road Works Section 4: Flexible Pavement* (JKR/SPJ/2008-S4 / JKR 20403 0003 07) dan *LLM/GP/T5 08 : Guideline for Malaysia Toll Expressway System - Design Standard.*

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2. In-Situ Rehabilitation and "Floating" Semi-Rigid Platform Effects

Advantages:

- Reuse existing unsuitable soil or damaged crusher run
- Promote Green Technology
- Early strength
- Faster construction
- Less traffic disturbance, immediate open traffic
- Semi-rigid floating platform, water impermeable
- minimize differential settlement
- Short and long term cost saving

2. In-Situ Rehabilitation and "Floating" Semi-Rigid Platform Effects

Project Examples

a) Public road over swampy area (1996, Brunei)

b) Road with higher water table (2002, Brunei)

2. In-Situ Rehabilitation and "Floating" Semi-Rigid Platform Effects

Project Examples

c) Oil Field Road over Swampy Region (2003, Indonesia)

d) New Well Road Functioning as Stock Yard (2003, Indonesia)

2. In-Situ Rehabilitation and "Floating" Semi-Rigid Platform Effects

Project Examples

e) Public road over paddy field (2012--, Malaysia)

f) Road with higher water table (2012--, Malaysia)

3. Design Criteria and Construction

- CBR≥120% within 24-hour
- Chemical Binder Dosage: 1.50-3.00%
- Achievable Stiffness Modulus (28-day):2,000-8,000MPa
- UCS: 3.0-6.0 MPa

3. Design Criteria and Construction

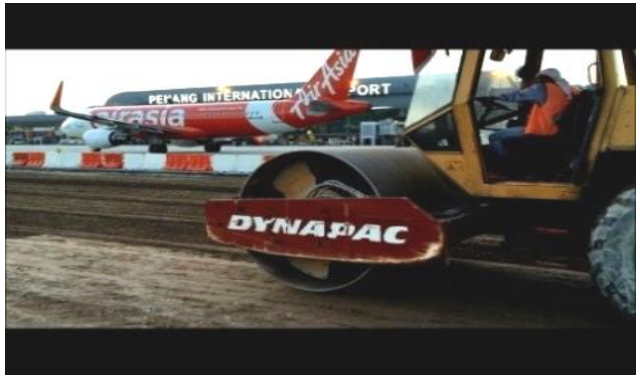
Manual Spreading

Mechanical Spreading

Dry Mixing

Wet Mixing

3. Design Criteria and Construction



Compaction

Finished Layer of Stabilized Base.

In-Situ CBR Test

Laying of Asphalt Concrete

Immediate Opening

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Construction Procedure

video

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Project Case Studies

- Base strengthening of City Road
- Various Public Roads
- Heavy Duty City Road Junction
- Various Testing Result
- Senai Airport Runway and Taxiway Widening
- Penang Airport Taxiways Rehabilitation
- Strengthening of Port Klang Container Yards

Project Case Studies

Base Strengthening of City Road (Brunei, 2000)

- Rehabilitated thickness: 300mm
- Working time: 10:00pm – 6:00am
- Rehabilitation sequence: lane by lane and night by night
- A purpose: to make road more even and prevent differential settlements

a) Rehabilitation in process

b) Immediate opening to traffic

c) Cored samples at site

Project Case Studies

Various Public Roads (2012-- , Malaysia)

•Road before and after ISR (300mm, Base)

Project Case Studies

Various Public Roads (2012--, Malaysia)

- Road before and after rehabilitation (300mm, base)
- Rehabilitation in process

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Project Case Studies

Various Public Roads (2012-- , Malaysia)

•Road before and after ISR (300mm, Base)

Project Case Studies

Heavy-Duty City Road Junction (2017, Malaysia)

- 300mm ISR for base course
- 50-75mm Semi-Rigid Pavement (SRP) as surface wearing course

a) ISR for base course

b) SRP as AC wearing course

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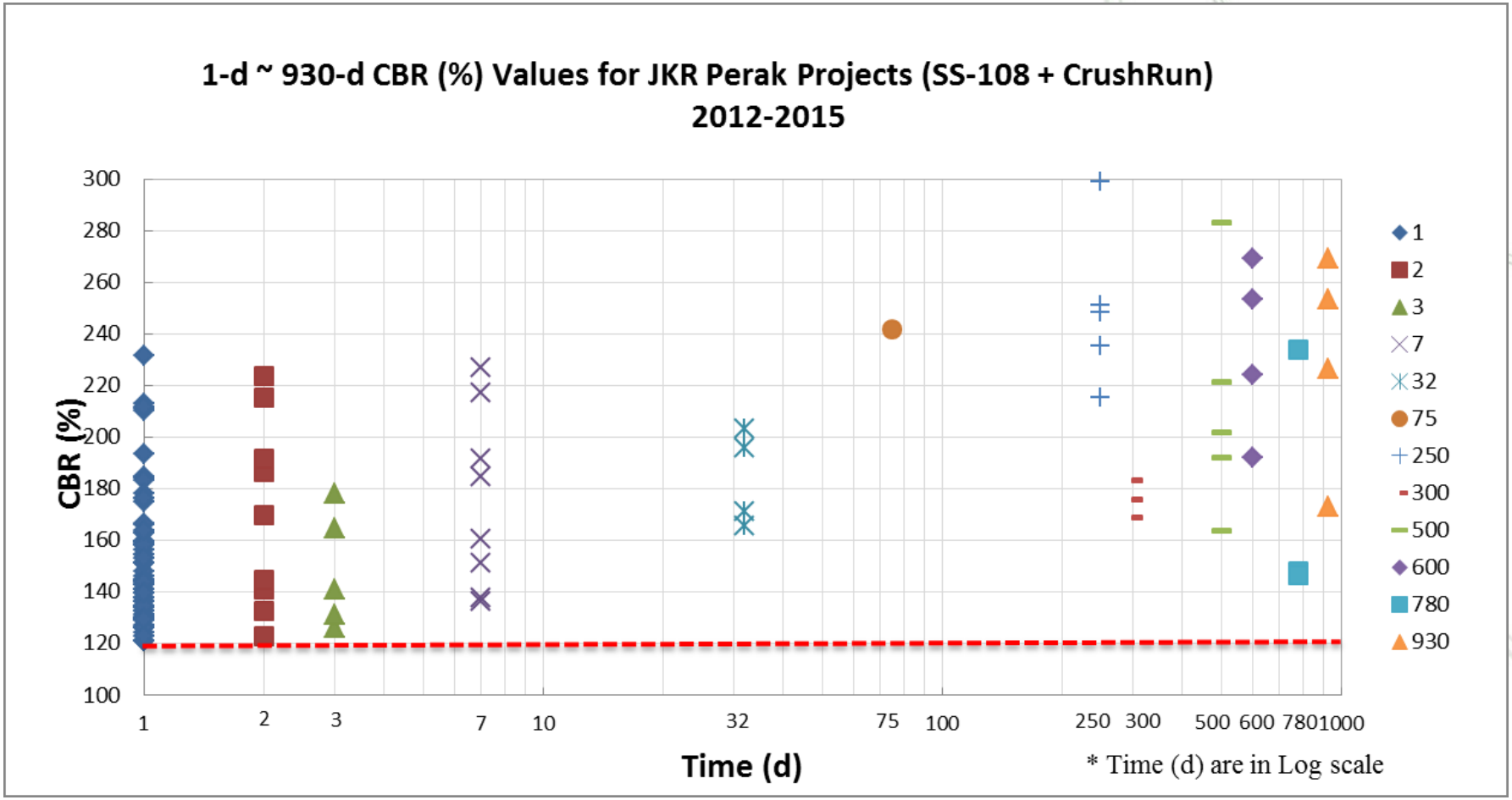
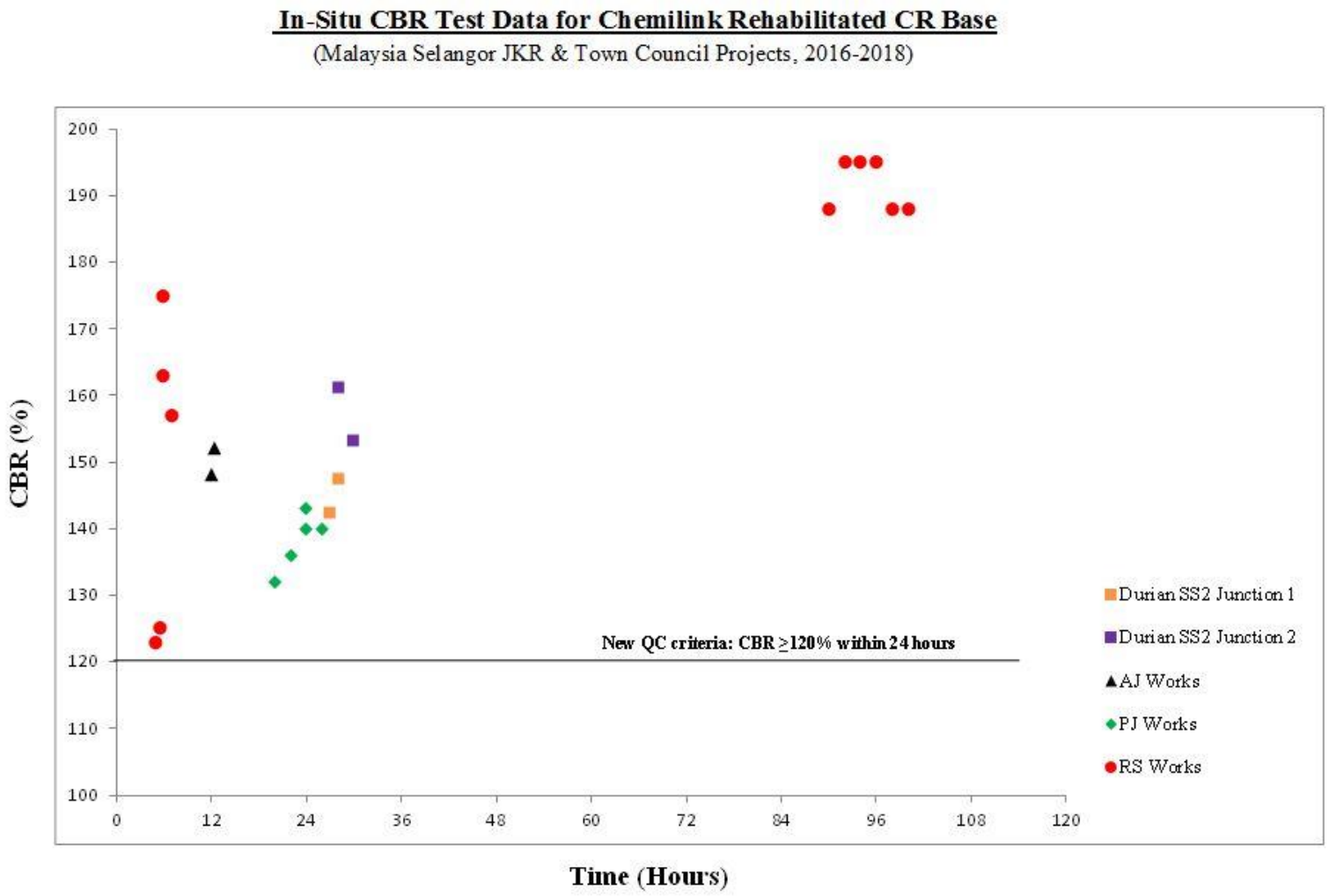
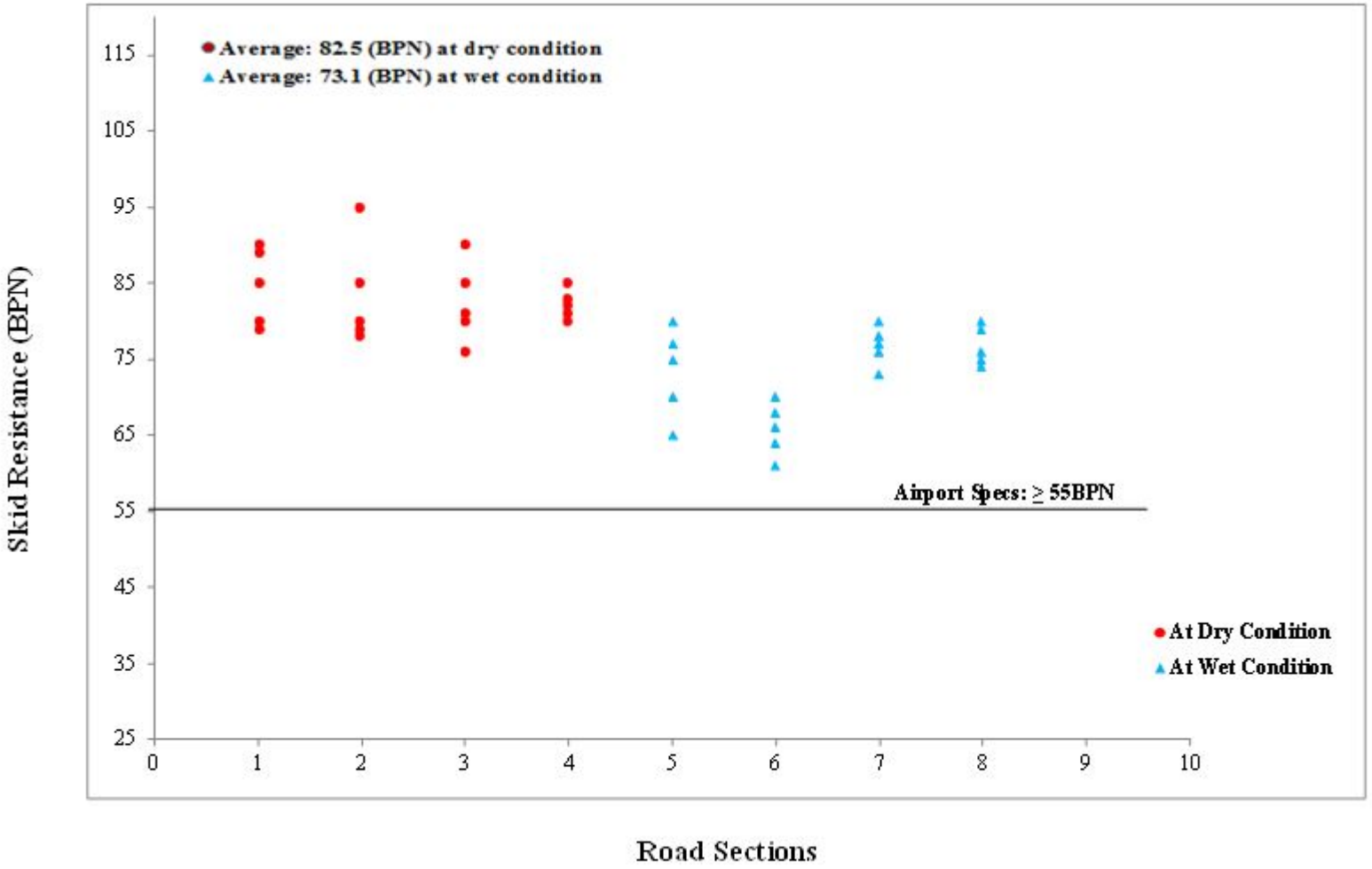
Perak JKR Test Data



Selangor Test Data



Skid Resistance



Chemical-Clay Stabilization for Runway/Taxiway Widening at Sultan Ismail International Airport, Malaysia

Senai International Airport Runway & Taxiways Widening (2007-2008)

Technical Challenges

- Higher clay/silt content (> 80%)
- Higher LL (up to 88%) & PI (up to 46%)
- Higher in-situ moisture content (up to 2 x OMC)

SENAI AIRPORT RUNWAY SHOULDER WIDENING
Soil Investigation Summary

NO	LOCATION	DEPTH (mm)	INSITU MC (%)	OMC (%)	MDD (Mg/m3)	LL (%)	PI (%)	CLAY&SILT (%)	SAND (%)	GRAVEL (%)
		150~450 mm	depth at 350mm							
6	P6	350	23.59	15.00	1.74	73	36	54.80	32.40	12.80
7	P7	350	30.08	22.00	1.49	88	37	78.80	19.20	2.00
8	P8	350	41.63	18.00	1.54	76	31	70.40	2.60	27.00
11	P11	350	27.38	19.00	1.68	62	33	66.80	33.20	0.00
12	P12	350	38.74	19.00	1.55	79	46	82.70	17.20	0.10
13	P13	350	21.37	17.00	1.71	56	23	62.20	30.60	7.20

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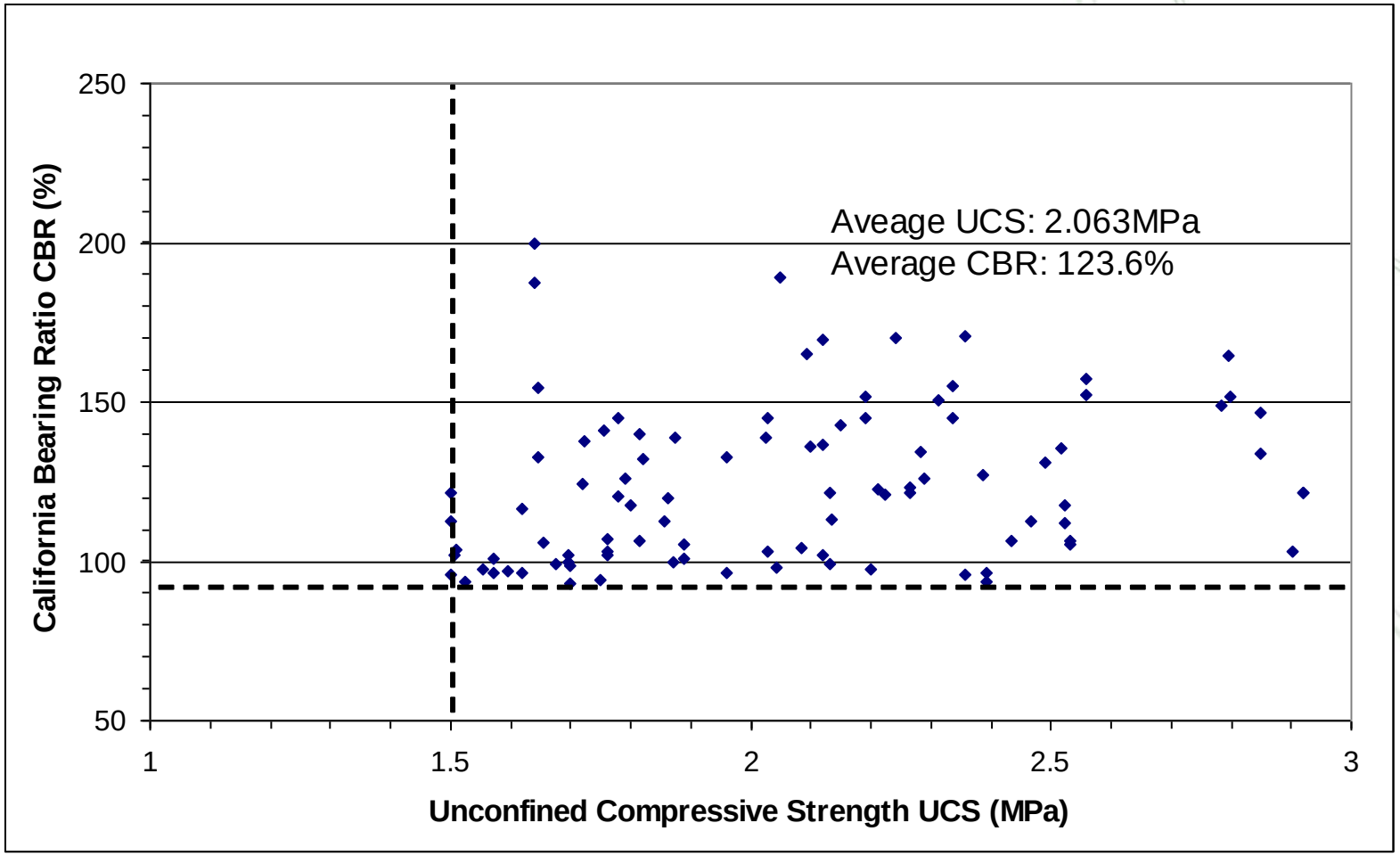
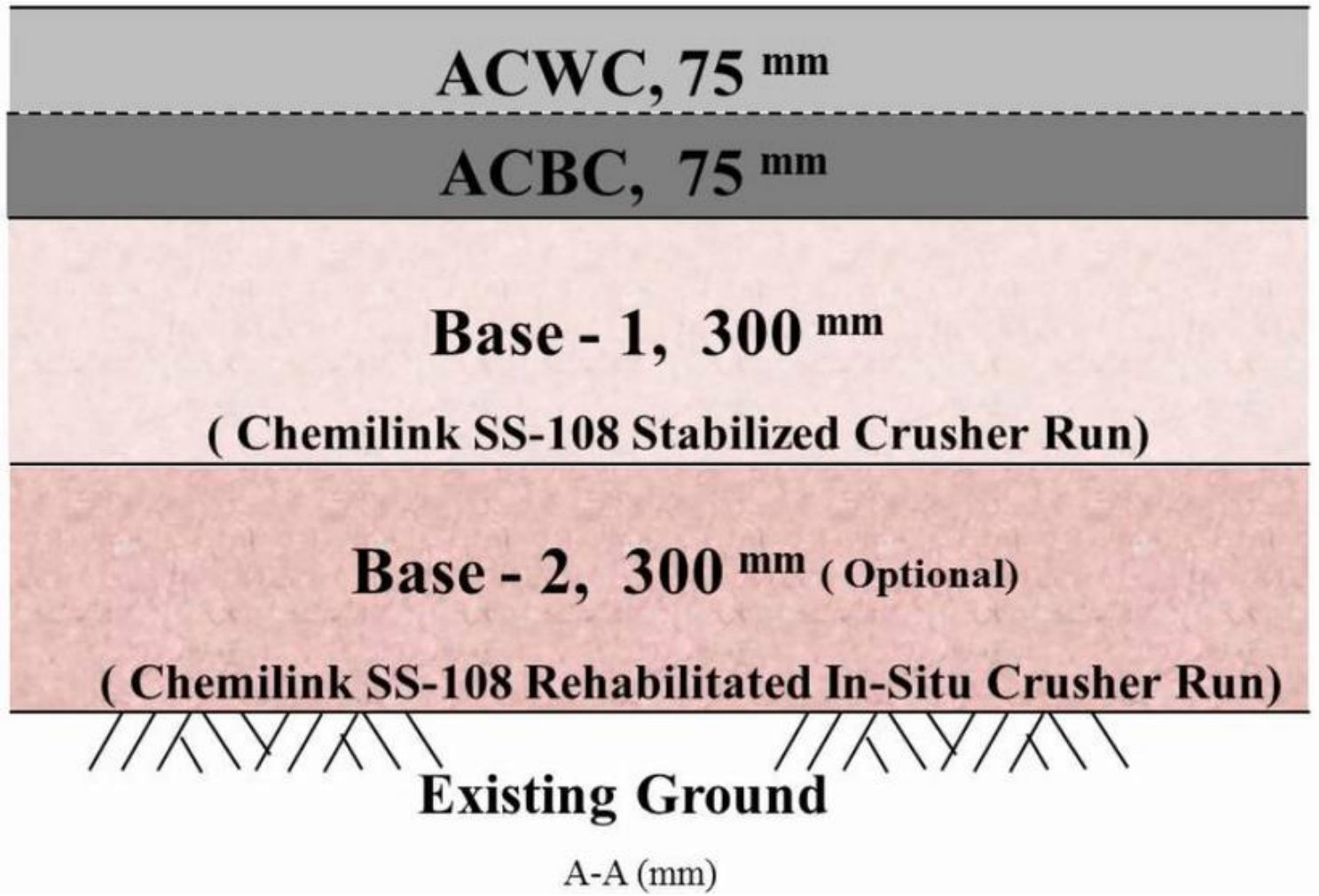
Chemical-Clay Stabilization for Runway/Taxiway Widening at Sultan Ismail International Airport, Malaysia



Penang Airport Taxiways Rehabilitation



Penang Airport Taxiways Rehabilitation

•Visual investigations were conducted immediately before the strengthening project started.

•The observations tally with the full investigation report and thus the strengthening designs were quickly adjusted and **ISR Solution** were engaged.

a) Section 1

b) Section 2

c) Section 3

Selected Damaged Sections of Taxiways

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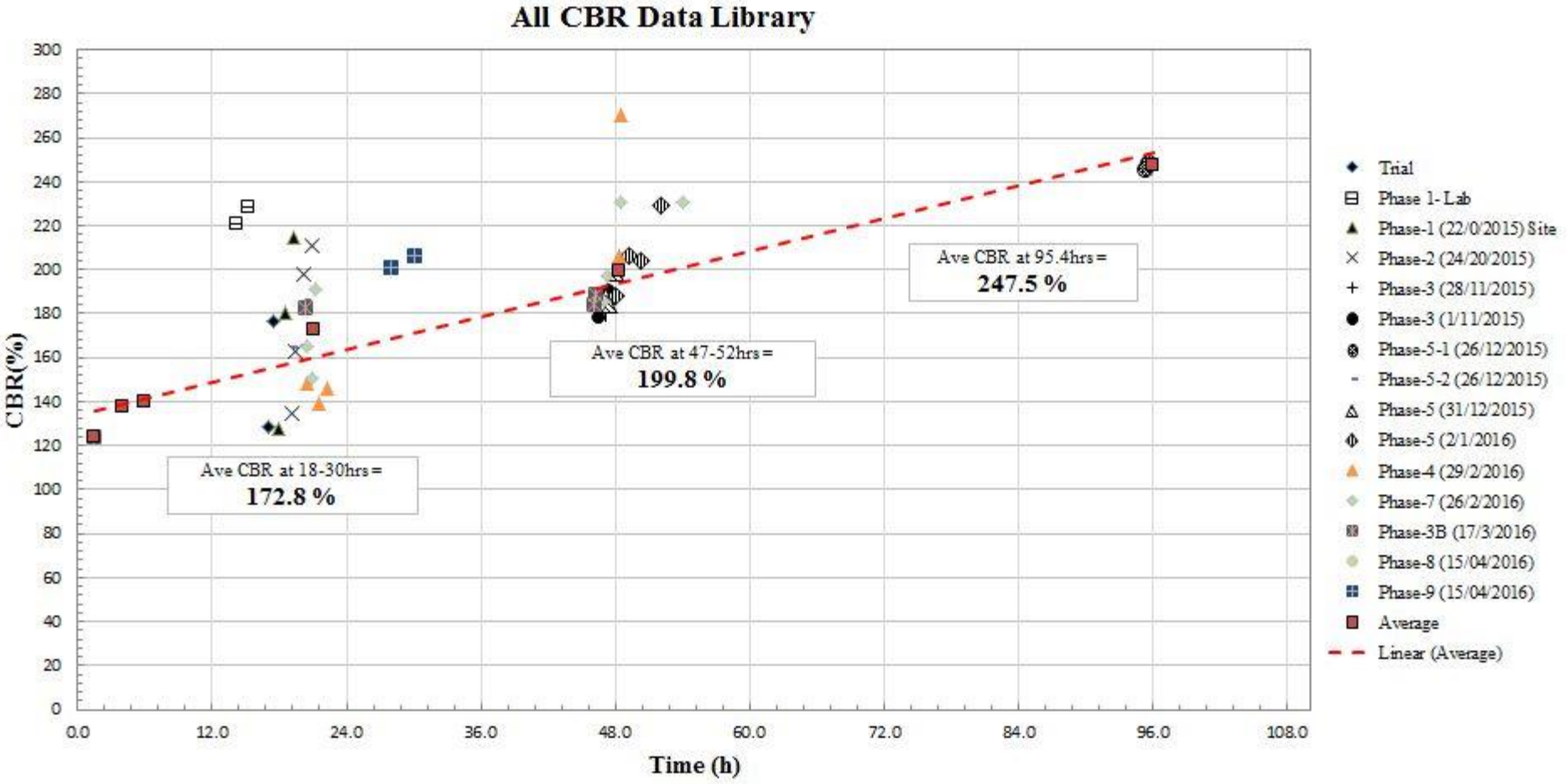
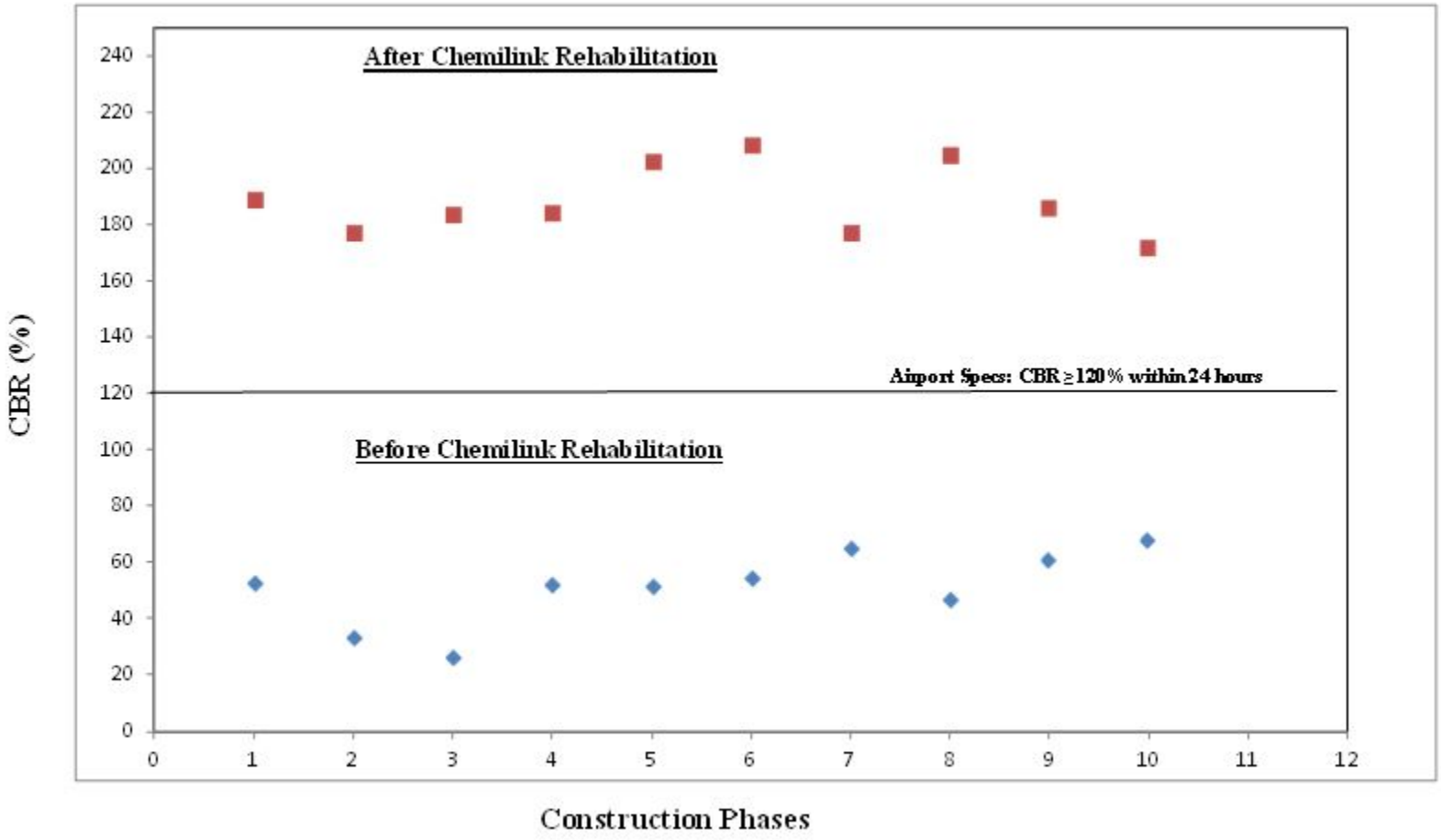
Penang Airport Taxiways Rehabilitation



Penang Airport Taxiways Rehabilitation



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Project Case Studies

Port Klang's Container Yard (2010-2013, Malaysia)

•Before and after ISR, phase by phase

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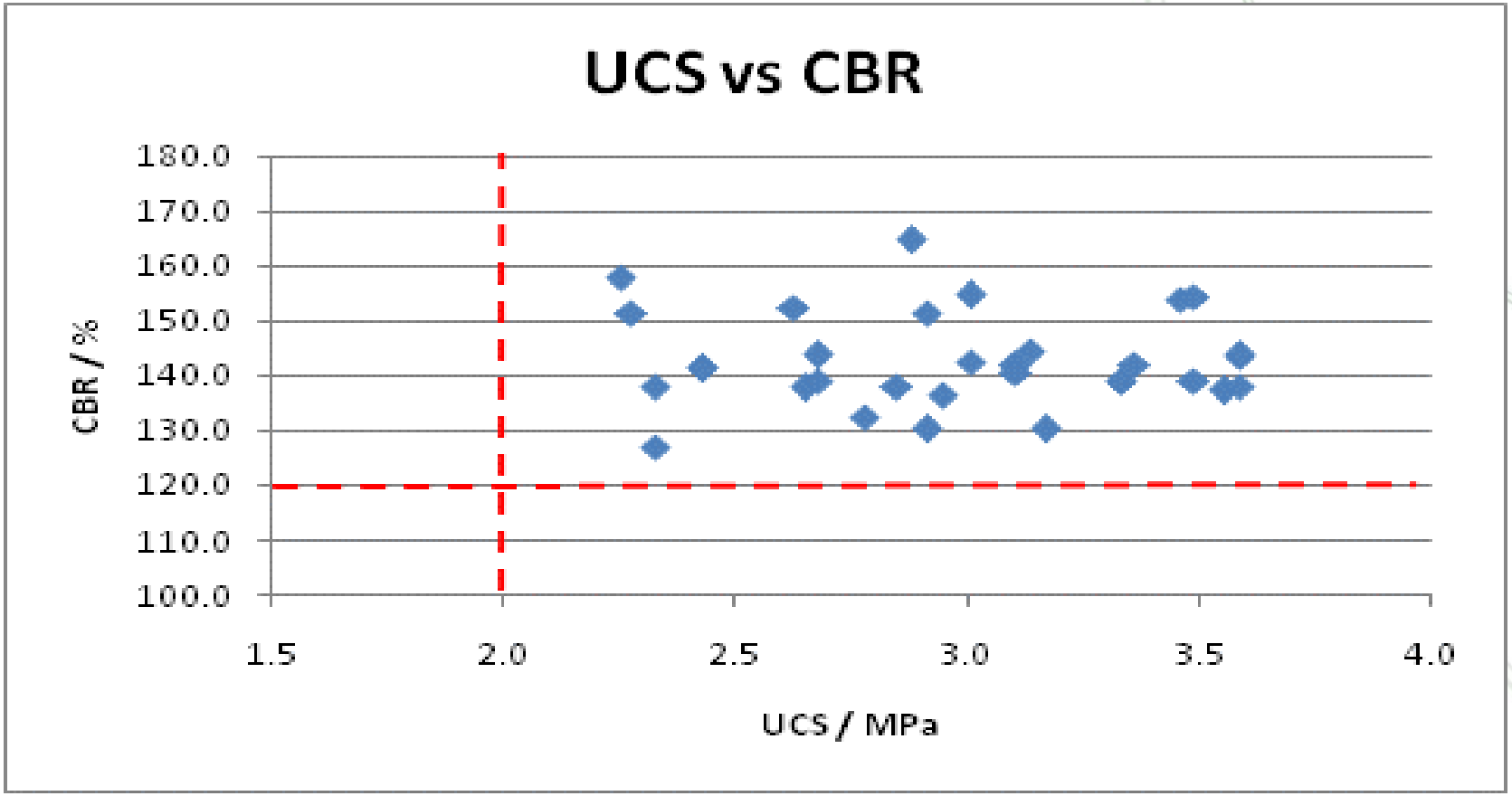
Strengthening of Port Klang Container Yards



Conclusion

•Proven technology, especially over swampy and soft ground areas, in South East Asia for the past 20 over years.

•Significantly promoted the re-use and recycle of the in-situ materials

•First approved rehabilitation/stabilization solution in Malaysia under JMAL.

•The rehabilitated base/sub-base courses are satisfactory, and no defects or failures have been found during the long-term operations.

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Thank You for Your Attention!

Q&A