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凯密林克科技集团
CHEMILINK
TECHNOLOGIES GROUP

GREEN APPROACH TO RURAL ROADS CONSTRUCTION

– STABILIZATION OF IN-SITU SOILS AND CONSTRUCTION WASTES

Chemilink Technologies Group

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1. Introduction

Why Rural Road???

The Needs:

- Roads for Development
- Roads to Villages, and Resources
- Road to Economic

The Constraint:

- Lack of Resources
- Lack of Machineries
- Lacking of Transportation Network

1. Introduction

What is In-situ Chemical Soil Stabilization???

- Addition of PROPER stabilizing agent with in-situ materials
- Alter/improve the properties of in-situ materials
- Meet various engineering properties & requirements
- Function as structural component of the pavement

1. Introduction

Typical Construction Procedure

Spreading

By Mechanical

By Manual

Mixing

By Stabilizer

By Rotovator

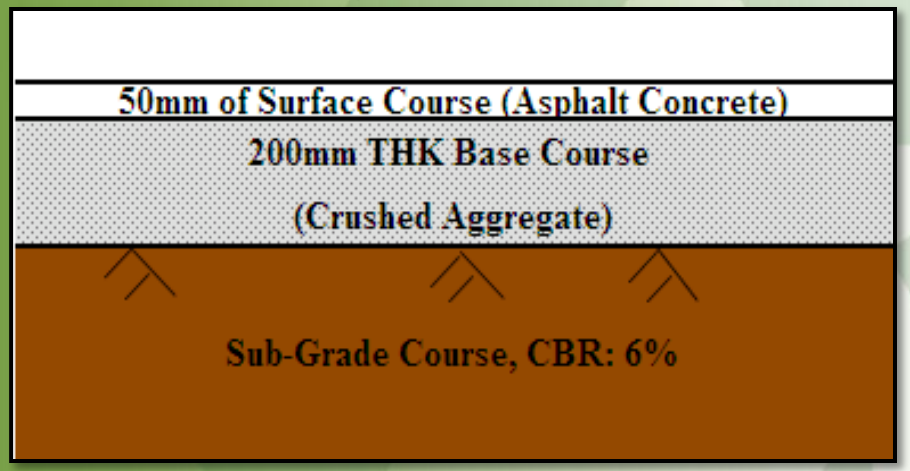
Compaction

By Compactor

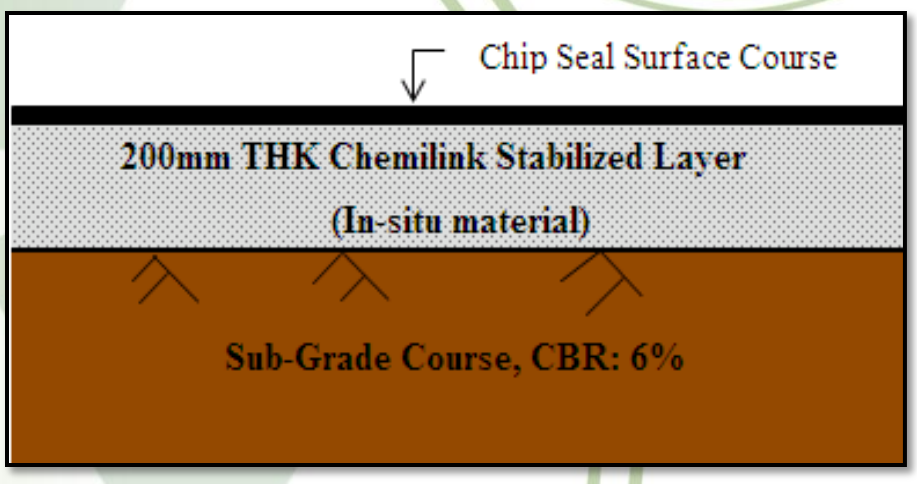
By Compactor

2. Green House Gas Emission And Carbon Footprint

- Pavement Structural Design



Conventional Design



Chemilink Design

2. Green House Gas Emission And Carbon Footprint

Outline of Estimation on CO_2 Emission

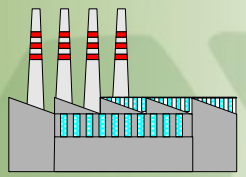
1. Materials Production Stage
2. Materials and Machineries Transportation Stage
3. Rural Road Construction Stage
4. Waste Disposal Stage

Range for Determine the Environmental Loads of Rural Road Construction

Chemilink Method

Conventional Method

Quarry Material



Asphalt Mixing plant

20km

Chemilink Soil Stabilization Agent

Crushed Aggregate

Asphalt Concrete

Machinery Transportation

Chemilink SS-108

100km

80km

20km

500km

Rural Road Paving Works (Kuala Terengganu, Malaysia)

Waste Materials Transportation

100km

Waste Materials Disposal Site

Material Production Stage

Materials and Machineries Transportation Stage

Rural Road Construction Stage

Waste Disposal Stage

2. Green House Gas Emission And Carbon Footprint

Case Study –
Estimation and Comparison on CO_2 Emission

- Two rural roads in Terengganu, Malaysia
- Constructed in December 2009
- Location: Kuala Besut
- Project Dimension: 1km length x 4m width ($4000m^2$)

2. Green House Gas Emission And Carbon Footprint

Emission stage		Quantity of materials	
		Conventional Method	Chemilink Method
I. Material Production			
Surface layer	Bitumen	29.7 t	2.5 t
	Imported virgin aggregate	510.8 t	46.0 t
Base layer	Imported virgin aggregate	2208.0 t	NIL
	Soil stabilization agent	NIL	49 t
Total Quantity of materials		2721.7 t	97.5 t
II. Materials and Machineries Transportation			
Diesel consumption (L) (Materials)		22584.0	2013.1
Diesel consumption (L) (Machineries)		92.0	52.6
III. Rural road construction			
Paving Work	Diesel consumption (L)	1063.2	587.3
IV. Waste Disposal			
Diesel consumption (L)		18142.0	0.0

Estimation on Amount of Materials Consumption

2. Green House Gas Emission And Carbon Footprint

Emission Stage	Conventional Method	Chemilink Method
I. Material production	16.30	0.71
II. Material and Machineries Transportation	60.95	5.56
III. Rural road construction	2.90	1.58
IV. Waste Disposal	48.80	NIL
Total stage emissions (ton-CO_2)	128.95 ton	7.85 ton

Estimation on CO_2 Emission

3. Other Advantages Of Chemical Soil Stabilization

Better Technical Performance

- Higher & Wide Range of Strength
  CBR (7-D) from 30% to 300%
  UCS (7-D) from 0.7MPa to 5.0MPa
- Better volume stability under different temperature/ moisture condition
- Lower Permeability from 10^{-7} to 10^{-12}m/s
- Forms Semi-Rigid Platform for effective load distribution

3. Other Advantages Of Chemical Soil Stabilization

Reduce Demands on Raw Backfilling Materials (Reduced Exploitation on Natural Resources)

Negligible amount of Foreign Materials

Minimize Creation of Construction Wastes

Faster Construction and Less Disturbance to Environment and Public

Overall Cost Effectiveness

Sustainable Recyclability

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Rural Roads Construction (2009), Terengganu Malaysia

During Construction

After Chemilink Stabilization

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Rural Roads Construction (2009), Terengganu Malaysia

Before Chemilink Stabilization

After Chemilink Stabilization

Chip Seal Surface

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Plantation Access Road Construction, Felda Sahabat 7 (2009), Malaysia

Before Chemilink Stabilization

After Chemilink Stabilization

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Rural Road Construction (2007), Tibet, China

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Oil Field Road Construction for Caltex (2003), Sumatra Indonesia

Subgrade Condition

Road in use after 3 months

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Changi International Airport Runway Widening (2004-2005), Singapore

Spreading

Mixing

Compaction

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Sultan Ismail International Airport Runway/Taxiway Widening (2007-2008), Malaysia

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Jalan Tutong Widening Phase II & III (1997-1999), Brunei

Road after 2-year completion

Opened Road Cross Section

4. Chemical Soil Stabilization

Highlight of Projects Adopted Chemical Stabilizing Agents

Batamas Shipyard Construction (1997), Batam Indonesia

Spreading and Mixing

Compaction

5. Conclusion

- Importance and constraint of roads construction in rural area development
- By using in-situ chemical soil stabilization, carbon footprint can be reduced by 5-15 times
- In-situ chemical soil stabilization, an alternative approach of environment friendly, technical effective, cost efficient method to rural roads development

THANK YOU