2020. August

Humus-B Soil Stabilized Method (HSSM) for Sub Base / Base of Pavement

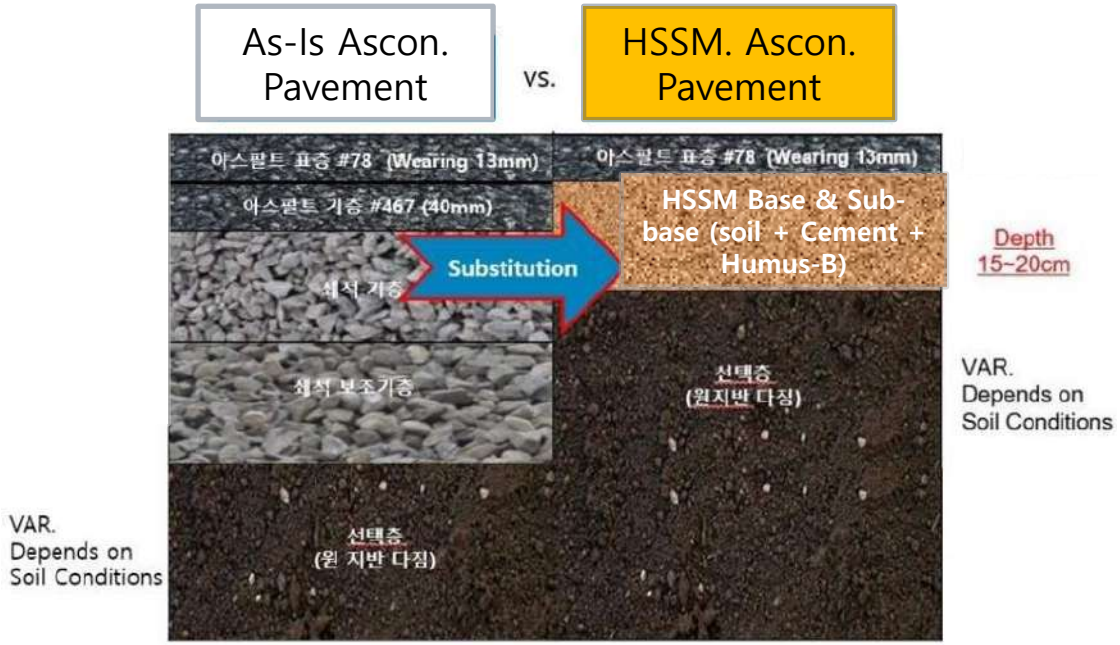
InnoCSR Co., Ltd
KOREA

B&F E&C LIMITED
BANGLADESH

CONTENTS

What is the HSSM?

- Humus-B Soil Stabilized Method (HSSM) is cost effective construction method for Pavement Sub(base) using highly compacted mixture of soil/aggregate with cement, and extra small amount of Humus-B (Chemical admixture, i.e. Soil Stabilizer)
- **Normal Mixing Ratio: Appr. Soil (91.8~95.8%) + 0.2% (Humus-B) + 4~8% (Cement)**
- **Subbase and Base Thickness (15cm ~ 20cm) reduction with high strength and durability ⇒ Green Solution for Low Cost, Fast Construction, and Better Quality**



Outstanding Features of HSSM

A. Low Cost

- Reduced Excavation/Reclamation
- Granular Material of Subbase/Base
- Cut in Construction Time **(Min. 50%)**
- A bituminous surface thickness

Reduction (Min. 20%)

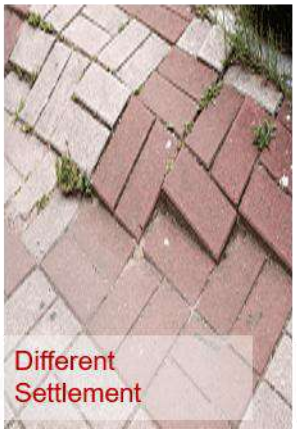
Source: GeoCrete Homepage www.geocretespecialist.com

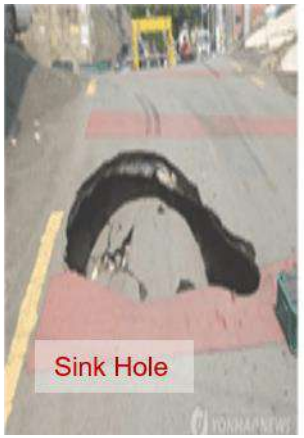
At least 25% Cost Saving

B. Quality Improvement

- Differential Settlement with Stiffness
- Crack from Differential Settlement
- Sink Hole, Potholes, Puddles, etc

Prevention





Analysis of Cost Saving by HSSM

➢ Case Study: Dongtan 5-1 Area, South Korea/ Traditional Method

Quantity Estimation (560 m2, in Dongtan 5-1 Area, South Korea)

1. Road Design.

Length	140 m
width	4 m
Surface Layer	0.26 m
Base Layer Depth	0.4 m

Road Desingn Spec. (560 m2)	Layer	Specification	Depth	Remarks
	1. Wearing (surface)	Ascon(#78, WC-2)	6 cm	
	2. Ascon Middle layer	Ascon(#67, WC-4)	5 cm	
	3. Ascon Base Layer	Ascon(#467, BB-2)	10 cm	
	4. Aggregates Sub-Base	40mm	40 cm	

As-Is Method

2. Quotation Detail (Unit : US $)

Classification	Process & Standard	unit	quantity	Material		Labor			Equipment cost			SUM.		Remarks
				unit price	sum	unit price	Work day	sum	unit price	Work day	sum	unit price	sum	
Material	Aggregates	m3	224 m3	20	**4,480**							20	4,480	Ex Spot Price
	Ascon (#467)	ton	134.4 ton	55	**7,392**							55	7,392	
	Ascon (#67)	ton	67.2 ton	58	**3,898**							58	**3,898**	
	Ascon (#78)	ton	80.64 ton	60	**4,838**							60	4,838	Ascon Gravity =2.4
	Sub-Total				20,608								**20,608**	
Equipment for paving	Back Hoe (6W)	ea	1						600	7	4,200		4,200	
	Roller (Tandum)	ea	1						600	8	4,800		4,800	
	Asphalt Finisher	ea	1						800	1	800		800	
	Dump Truck	ea	1						500	8	4,000		4,000	
	Sub-Total												**13,800**	
Labour for pavement	Labour Local	person	3			300	24	21,600					21,600	
	Korean Expert	person	1			600	8	4,800					4,800	
	Sub-Total							26,400					**26,400**	
Grand Total					20,608			26,400			13,800		**60,808**	

Daily Transportation : Daily 40MT 500-1000 Trucks

Total Days: 8 Days

Total Period: 8 Days

Total Cost: Appr. 60K USD

Analysis of Cost Saving by HSSM

➢ Case Study: Dongtan 5-1 Area, South Korea/ New Method

Quantity Estimation (560 m2, in Dongtan 5-1 Area, South Korea: Soil Stabilizer)

1. Road Design.

Length	140 m
width	4 m
Surface Layer	0.09 m
Base Layer Depth	0.2 m

2. Component Consumtion

HUMMUS	3 kg/m3
CEMENT	130 kg/m3
Soil	1800 kg/m3
Volume	112 m3

Road	Layer	Specification	Depth
Desingn	1. Wearing	Ascon(#78, WC-2)	9 cm
Spec.	2. Ascon Base	Ascon (#467)	0
(560 m2)	3. Base layer	Humus-B	20 cm

3. Quotation Detail (Unit : US $)

Classification	Process & Standard	unit	quantity	material Cost		Labour cost			Equipment cost			SUM.		Remarks
				unit price	sum	unit price	Work day	sum	unit price	Work day	sum	unit price	sum	
Material for HUMMUS (Soil Stabilizer) Compaction	HUMUS-B	m3	336 kg	20.0	**6,720**							20	6,720	FOB Korea
	Cement	m3	14560 kg	0.06	**874**							0.06	874	Portland
	Soil	m3	201600 kg	-	-							-	-	free of cost
	Ascon (#78, WC-2)	ton	121 ton	60	**7,258**							60	7,258	Ascon Gravity =2.4
	Sub-Total				14,851								**14,851**	
Equipment for paving	Back Hoe (6W)	ea	1						600	1	600		600	
	Roller (Tandum)	ea	1						600	2	1,200		1,200	
	Asphalt Finisher	ea	1						800	2	1,600		1,600	
	Dump Truck	ea	1						500	2	1,000		1,000	
	Sub-Total												**4,400**	
Labour for pavement	Labour Local	person	3			300	6	5,400					5,400	
	Korean Expert	person	1			600	2	1,200					1,200	
	Sub-Total							6,600					**6,600**	
Grand Total					14,851			6,600			4,400		25,851	

Daily Transportation : Daily 40MT 500-1000 Trucks

Total Days: 2 Days

Total Period: 2 Days

Total Cost: Appr. 25K USD (60% Saving)

2
Chapter

Construction & Equipment

HSSM Construction Sequence

HSSM - Simple and Easy Two STEP Construction Method

- 1st STEP: Mixing (Mixing ratio: Soil 92~94% + 0.2% Humus-B + 5~8% Cement + Water]
  2nd STEP: Normal Compaction for only two Layer (Each Layer: 20 ~ 30cm)

1st STEP : Mixing (4 Option for Field Condition)


Opt #1: Back Hoe


Opt #2: Mobile Mixer


Opt #3: Batch Plant Installation in Field


Opt #4: Mobile Rapid Mix Batch Plant

2nd STEP : Normal Compaction


1. Soil Transportation


2. Dumping to Finisher


3. Base/Subbase Levelling


4: Compaction

Application with General Paving Facility

Field Mixing by Back Hoe

① Humus-B Paving

② Rolling

Field Mixing : Mobile Mixer

③ in case of Permeable Road

④ Bearing Capacity Test

Asphalt Paving after curing

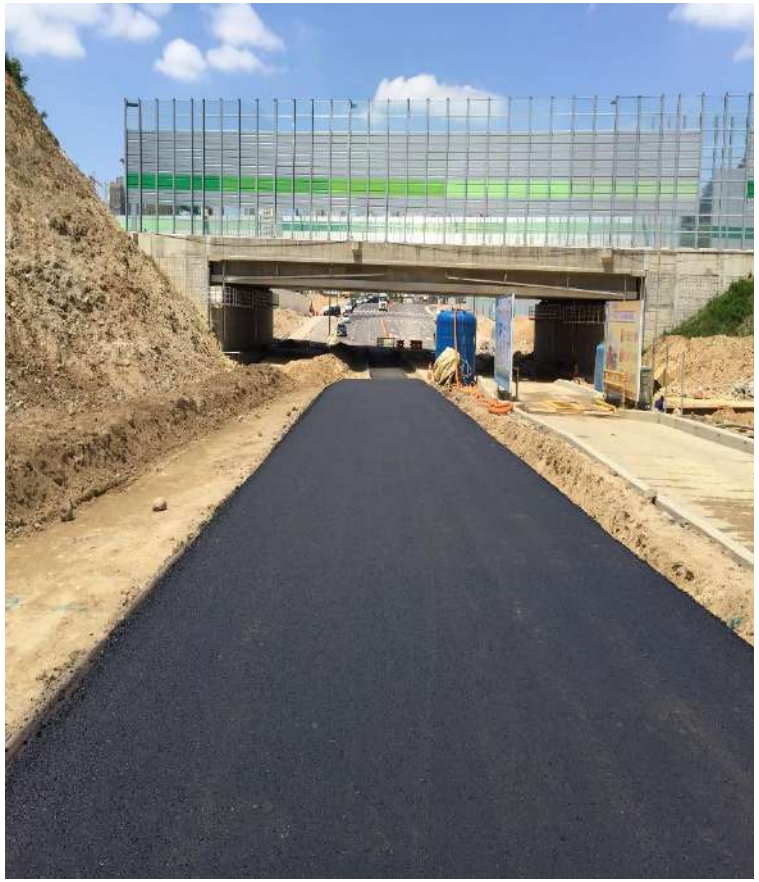
Block Paving on Permeable Road

Chapter 3

References

Construction Site Photo (at LH Dongtan 5–1 in Korea)

Before (2018 May.19 : 8 AM) → After (2018 May.20 : 3 PM)



AADT(annual Average Daily Traffic : 1,000 units 40 ton Dump Trucks

Construction Site Video (at LH Dongtan 5–1 in Korea)

1st. Day :
HSSM Mixing, Paving and Compaction

2nd. Day :
Tack Coating & ASCON Paving

VIDEO -1

VIDEO -2

Construction Site Video (at LH Dongtan 5–1 in Korea)

Before
(2018 May.18 : 3 PM)

After
(2018 May.23 : 11 AM)

VIDEO -1

VIDEO -2

Coring & Compressive Test (at LH Dongtan 5–1 in Korea)

K-TI (주)한국건설품질시험연구원
Korea Construction Quality Test Institute

시 험 성 적 서

시 료 명	: 휴머스 B (H-30cm) 좌측, 우측, (H-40cm) 좌측, 우측	접 수 번 호	: KTI1B-LRS-0706-01
시료채취장소	: 동탄 5-1 급구 진입로 시험시공(도로포장) 구간	발 급 번 호	: KTI1B-TRS-0711-01
시 험 용 도	: 시험시공 후 일축압축강도 평가	접 수 일	: 2018년07월06일
업 체 명	: 지하정보기술㈜	발 급 일	: 2018년07월11일
의 뢰 자	: 김창동	페 이 지	: 1/3
주 소	: 경기도 의왕시 이미로 40 인덕원 IT 밸리 D동 609 호		

귀하가 의뢰한 위 시료에 대해서 아래 시험 방법에 따라 시험한 결과를 다음과 같이 알려드립니다.

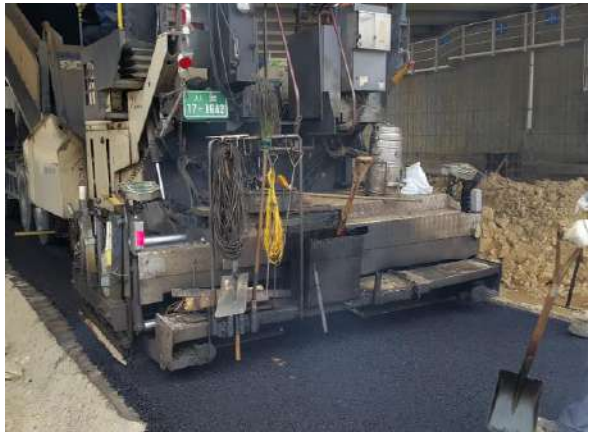
- 결 과 -

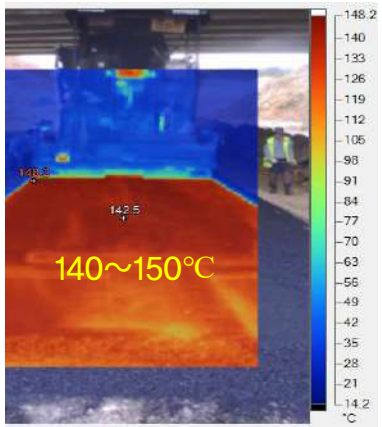
시험항목		시험방법	단위	시험결과	비고
압축강도	#(H-30cm) 좌측	의뢰자 제시	MPa	5.20	
	#(H-30cm) 우측		MPa	5.98	
	#(H-40cm) 좌측		MPa	5.96	
	#(H-40cm) 우측		MPa	5.21	

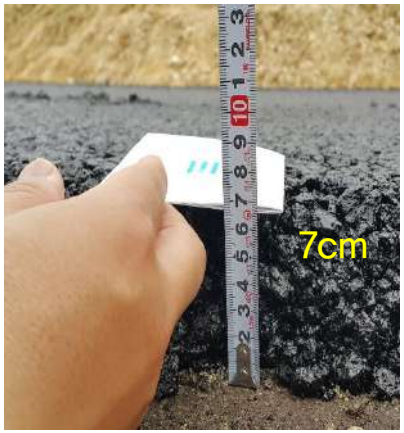
ity Test Institute

Compare HSSM vs. conventional Paving

Asphalt Pavement







After 6 months Road Layer

Appendix

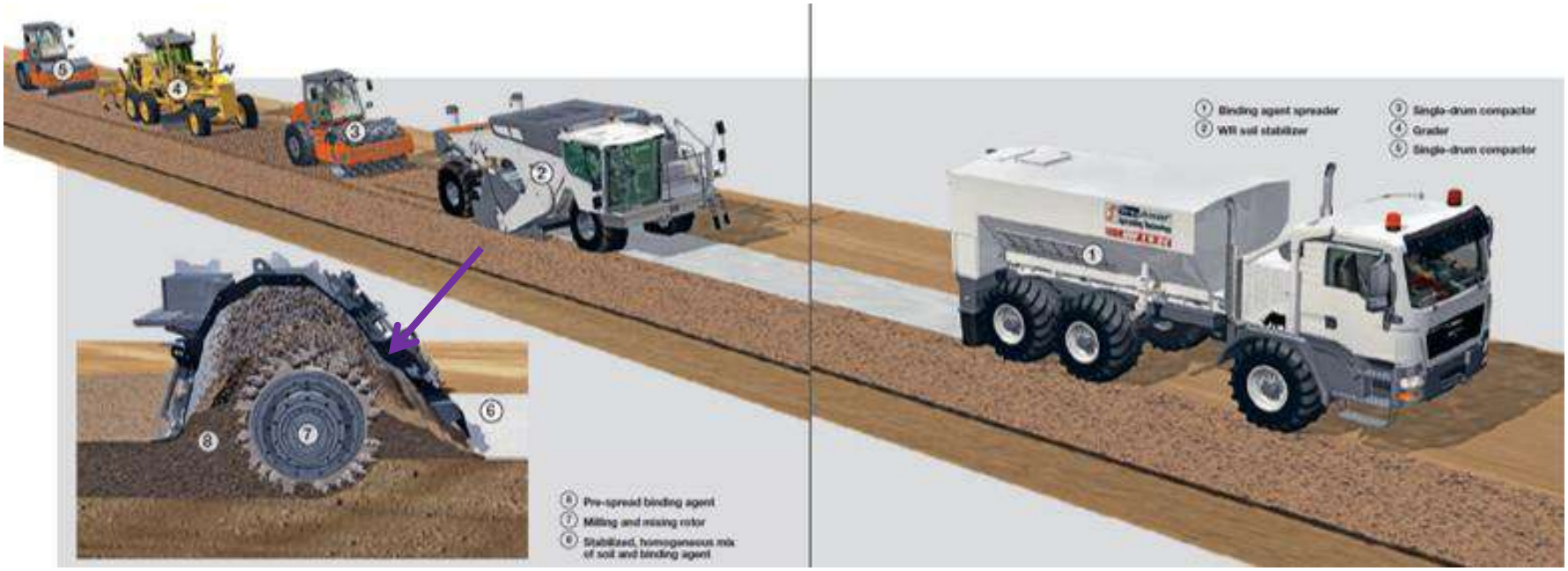
Comparison of HSSM & Soil Cement

Overview of Soil Cement

What is Soil Cement?

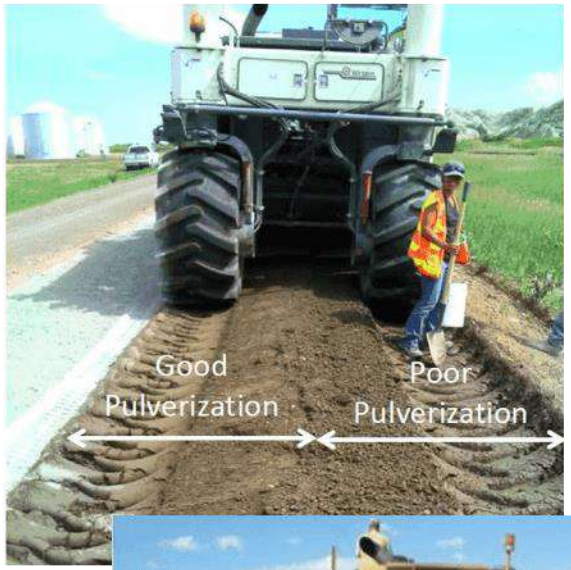
Soil cement is a construction material, a mix of pulverized soil with measured amounts of cement and water, usually processed in mixing and compacted to high density. Hard, semi-rigid durable material is formed by hydration of the cement particles.

Since it was first applied to road construction in the United States in 1935, it has been widely used not only in advanced countries such as the US and Europe but also in Southeast Asia.

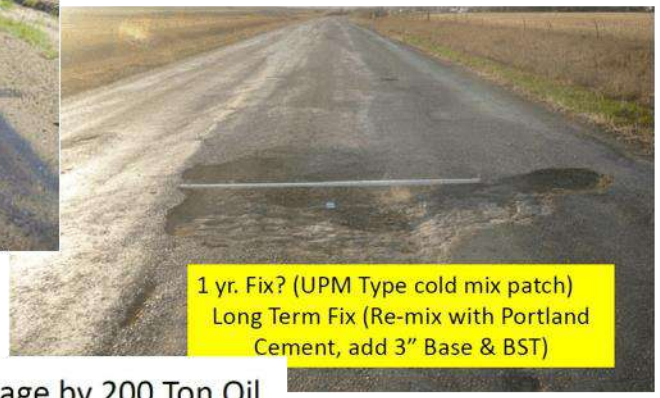


Overview of Soil Cement

Problems Applying Soil Cement in Pulverization Method



Cause



Damage by 200 Ton Oil Rig Movement (2011)

Result

Repair Methods:
No Depression Area: Remove BST & fabric, new BST full width
Depression Area: Re-soil cement, 3" Gravel & BST Full width

Comparison of HSSM & Soil Cement

Description	Soil Cement (Specification)		HSSM
Max. Size of Soil and Aggregate	Soil above 80% pass #4 (4.76mm) sieve.	PCA (Portland Cement Association 2017 USA)	Less than 40 mm
Allowing Mixing Time	Within 2 hours		Within 12 hours
Construction Joint	Need		No need
Construction Method	In situ Pulverizing (Special Equipment)		Ready Mix (Normal Equipment)

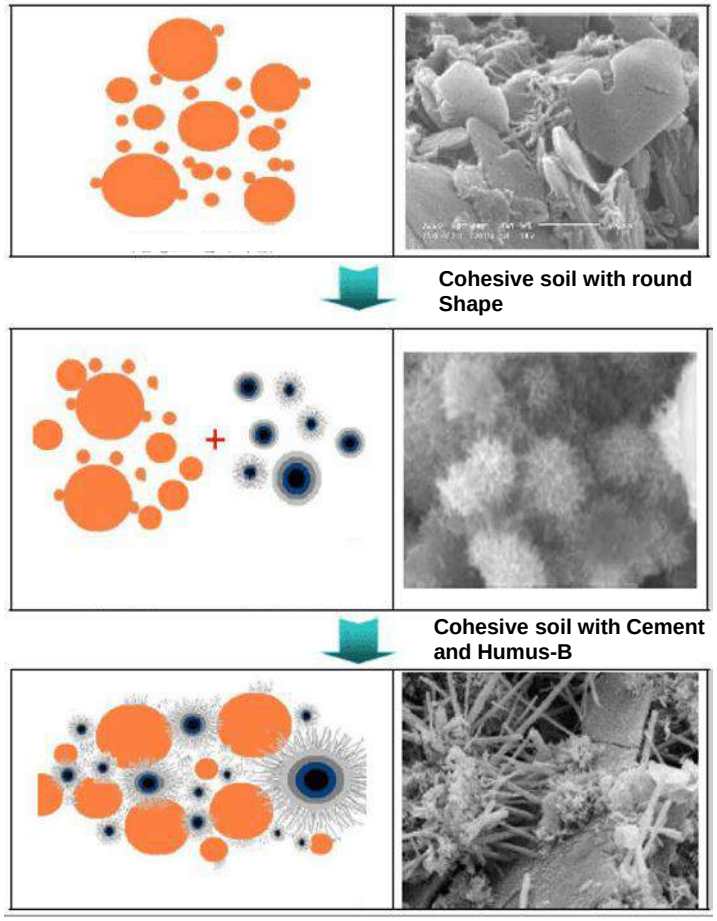
What is the HSSM?

Humus-B?

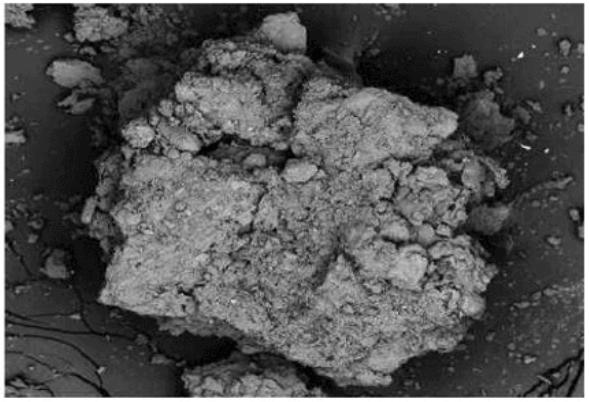
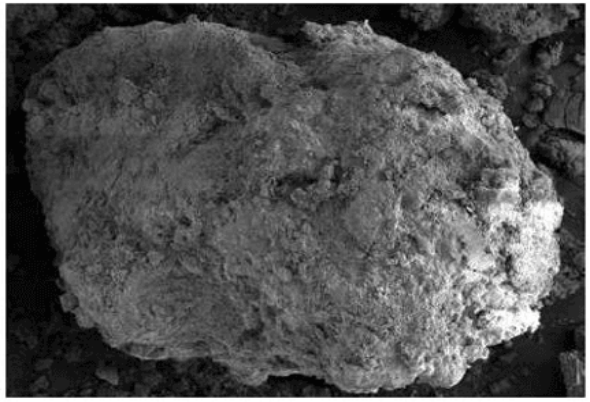
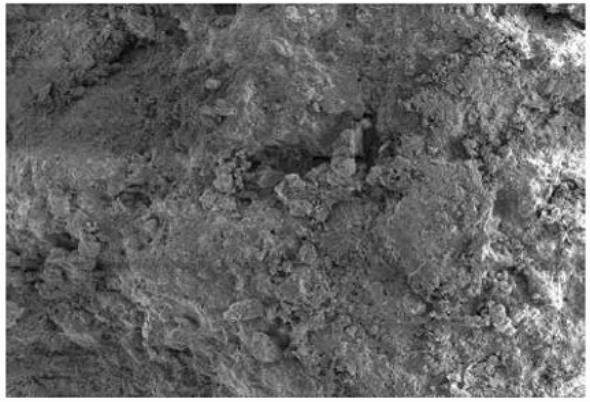
1. **Chemical Admixture** made by a Korean Technology (Patented)
2. **Eco-friendly Powder** composed of inorganic materials
3. **Excellent on-site applicability** due to adaptability to most of soil composition

Green Solution for Low Cost, Fast Construction, and Better Quality

Solidification Process with Humus-B (by electron Microscope)

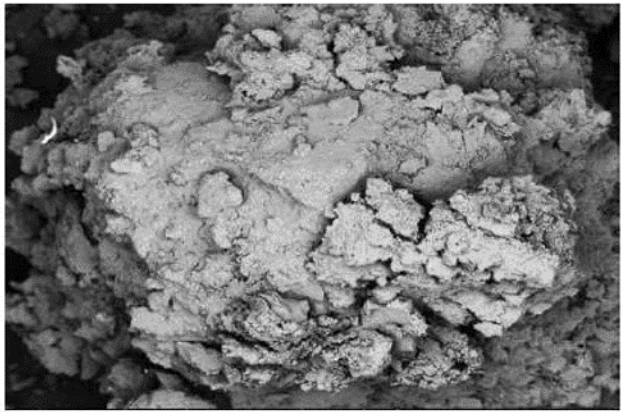
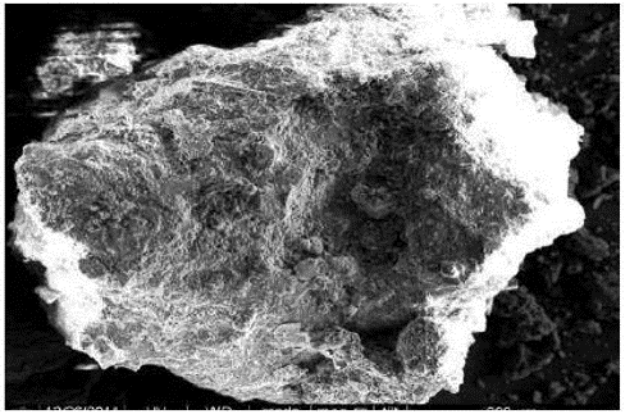
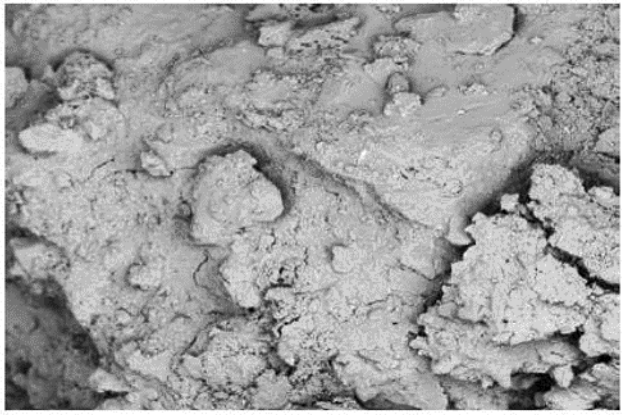
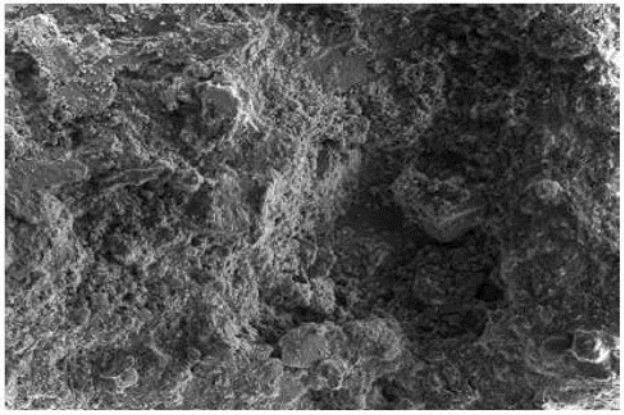


Humus-B Additive Effects – by SEM

×200		
	Cement + Soil + Humus-B (0%)	Cement + Soil + Humus-B (0.2%)
×500		
	Cement + Soil + Humus-B (0%)	Cement + Soil + Humus-B (0.2%)

SEM Picture (After 7 days curing)

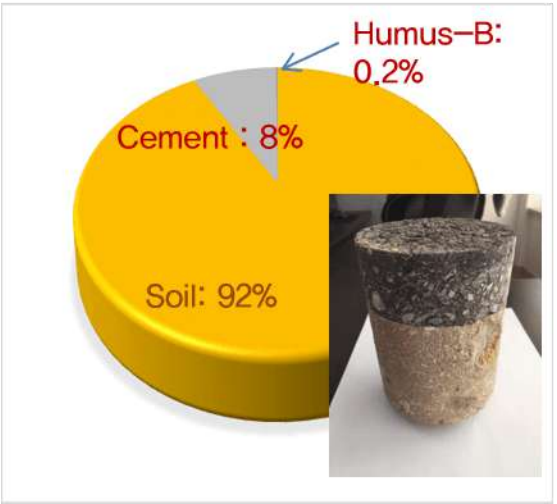
Humus-B Additive Effects – by SEM

×200		
	Cement + Soil + Humus-B (0%)	Cement + Soil + Humus-B (0.2%)
×500		
	Cement + Soil + Humus-B (0%)	Cement + Soil + Humus-B (0.2%)

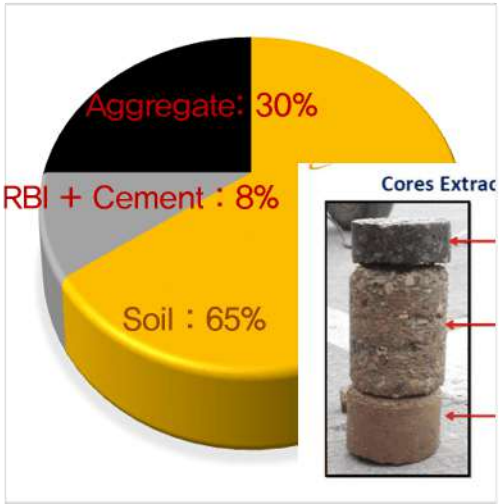
SEM Picture (After 28 days curing)

Comparing Humus–B vs. Other Chemical Admixtures

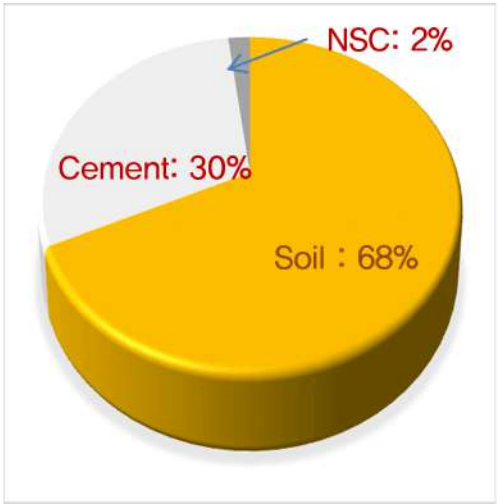
Humus–B (HSSM)



RBI– 81 (Netherland)



NSC (Japan)



– 92% Soil + 0.2% Humus–B + 8% Cement Mix ⇒ Highly strength and Durability

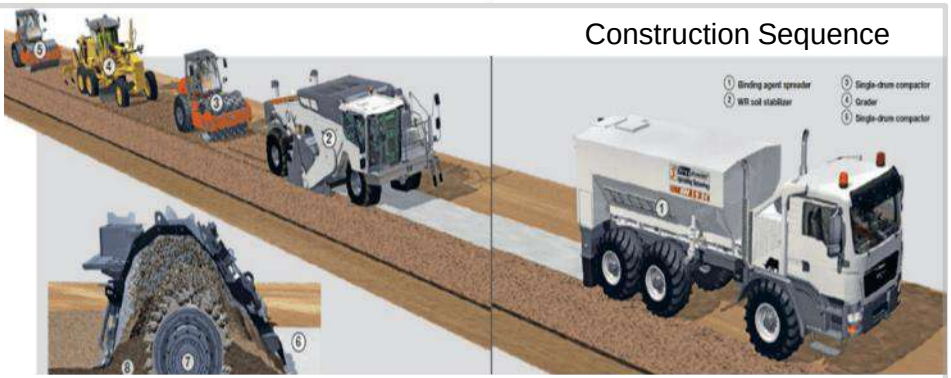
Desc.	Humus-B	RBI–81	NSC	Remarks
Cement(%)	5 ~ 8	8 ~ 10	30% or more	Cement Min. vs. NSC
Aggregate (%)	-	30	-	Only RBI necessary
Strength (7days)	4 ~ 8 MPa	0.1 ~ 3 MPa	2 ~ 6 MPa	Highly Strength

Outstanding Features of HSSM

C. Constructability

- Exc./Rec. sequence reduction
- Simple Series of Construction
- Curing time reduction
- Construction Equipment Min.

Constructability Increase



Small and Large Scale Construction Applicable

D. Maintenance

- Design stage: Structural safety secure
- Const. stage: Simple Mix and Compaction
- Public use : Surface Smoothness, bearing Cap.
- Maintenance : Low Cost, Low deflection, Low Fatigue life, Lower asphalt strains, No Breaker

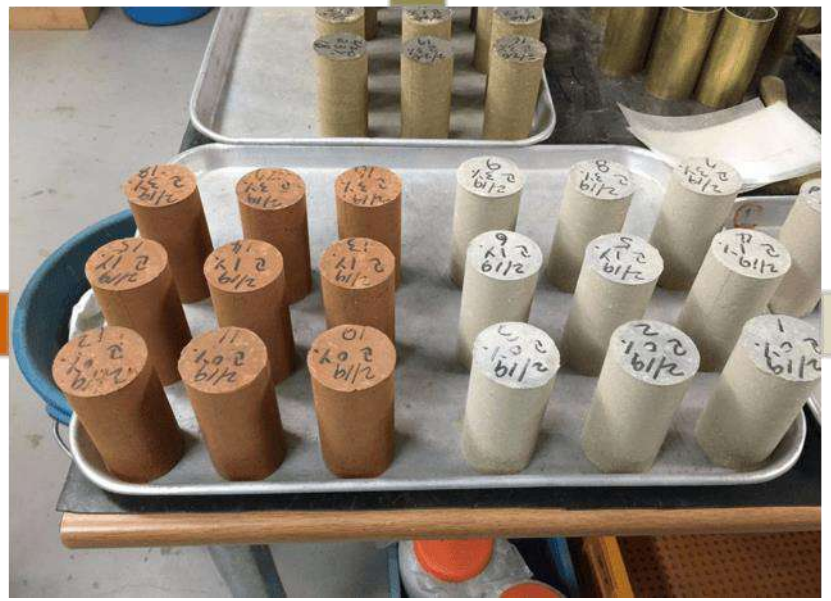
Easy and Beneficial Maintenance

Surface Smoothness Secure

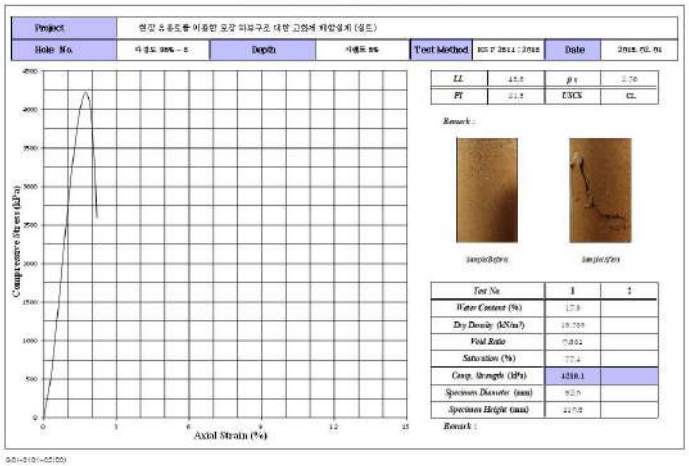
Applied to Various Soil (Sand, Silt, Clay etc.)

SM : Sand

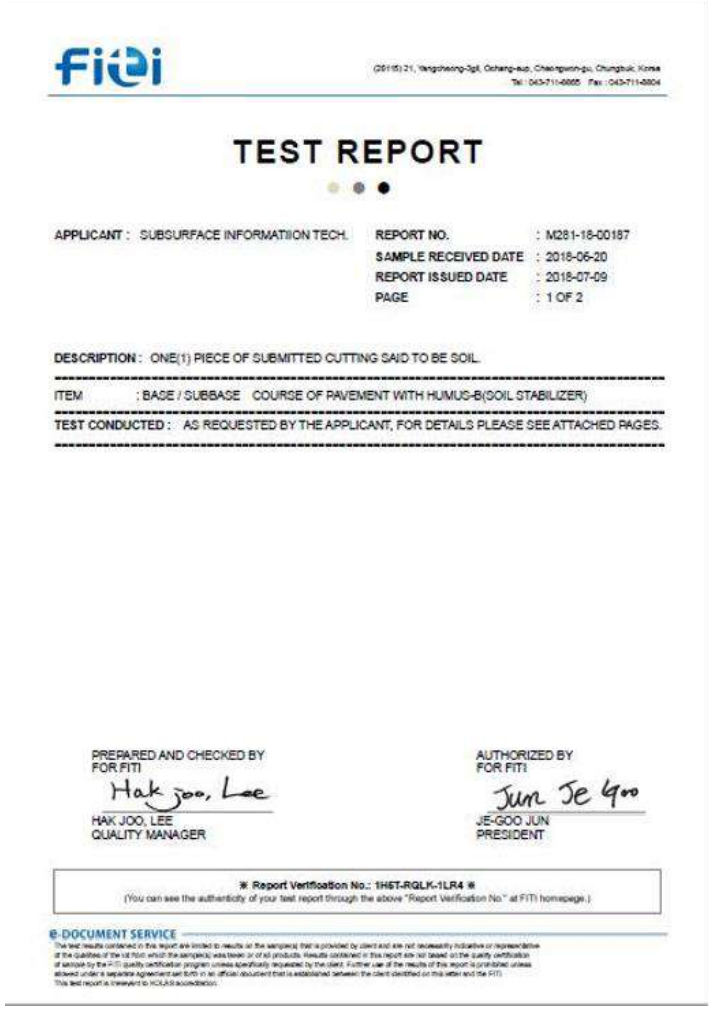
CL : Clay



ML : Silt



Recyclable (Harmless and No Soil Pollution)



FITI

(28115) 21, Yangcheong-3gil, Ochang-eup, Cheongwon-gu, Chungbuk, Korea
Tel : 043-711-6865 Fax : 043-711-6804

TEST REPORT

APPLICANT : SUBSURFACE INFORMATIION TECH.

REPORT NO. : M281-18-00187
SAMPLE RECEIVED DATE : 2018-06-20
REPORT ISSUED DATE : 2018-07-09
PAGE : 1 OF 2

DESCRIPTION : ONE(1) PIECE OF SUBMITTED CUTTING SAID TO BE SOIL.

ITEM : BASE / SUBBASE COURSE OF PAVEMENT WITH HUMUS-B(SOIL STABILIZER)

TEST CONDUCTED : AS REQUESTED BY THE APPLICANT, FOR DETAILS PLEASE SEE ATTACHED PAGES.

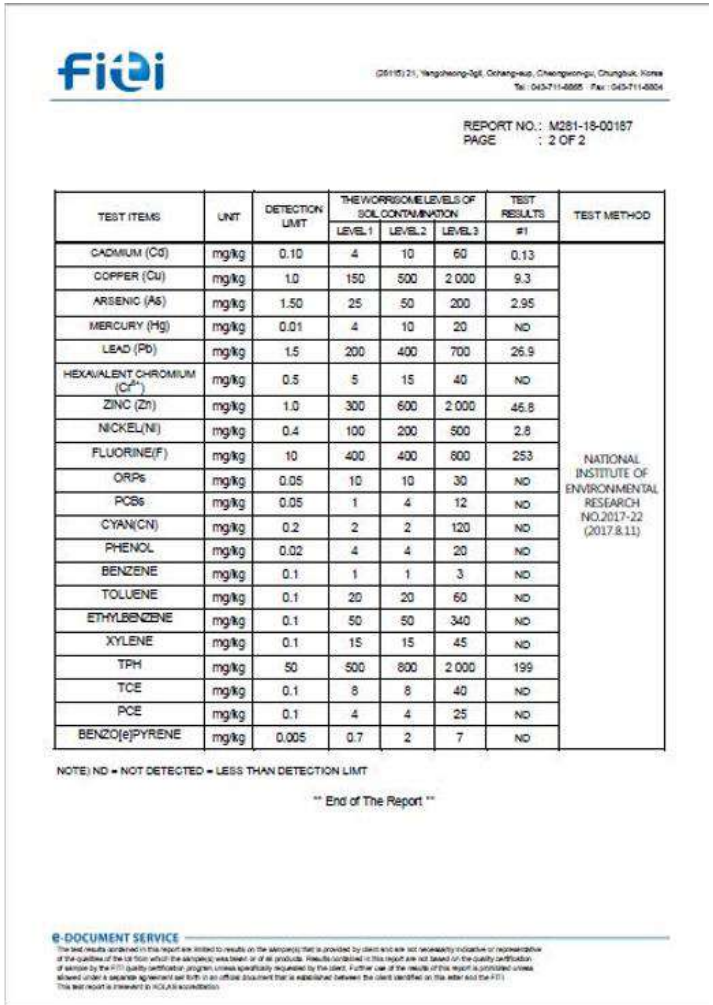
PREPARED AND CHECKED BY
FOR FITI
Hak Joo, Lee
HAK JOO, LEE
QUALITY MANAGER

AUTHORIZED BY
FOR FITI
Jun Je Goo
JE-GOO JUN
PRESIDENT

※ Report Verification No.: 1H6T-RQLK-1LR4 ※
(You can see the authenticity of your test report through the above "Report Verification No." at FITI homepage.)

e-DOCUMENT SERVICE

The test results contained in this report are limited to results on the sample(s) that is provided by client and are not necessarily indicative or representative of the qualities of the lot from which the sample(s) was taken or of all products. Results contained in this report are not based on the quality certification of service by the FITI quality certification program unless specifically requested by the client. Further use of the results of this report is prohibited unless allowed under a separate agreement set forth in an official document that is established between the client identified on this letter and the FITI.
This test report is irrelevant to KOLAS accreditation.



FITI

(28115) 21, Yangcheong-3gil, Ochang-eup, Cheongwon-gu, Chungbuk, Korea
Tel : 043-711-6865 Fax : 043-711-6804

REPORT NO.: M281-18-00187
PAGE : 2 OF 2

TEST ITEMS	UNIT	DETECTION LIMIT	THE WORRISOME LEVELS OF SOIL CONTAMINATION			TEST RESULTS	TEST METHOD
			LEVEL 1	LEVEL 2	LEVEL 3	#1	
CADMIUM (Cd)	mg/kg	0.10	4	10	60	0.13	NATIONAL INSTITUTE OF ENVIRONMENTAL RESEARCH NO.2017-22 (2017.8.11)
COPPER (Cu)	mg/kg	1.0	150	500	2 000	9.3	
ARSENIC (As)	mg/kg	1.50	25	50	200	2.95	
MERCURY (Hg)	mg/kg	0.01	4	10	20	ND	
LEAD (Pb)	mg/kg	1.5	200	400	700	26.9	
HEXAVALENT CHROMIUM (Cr^{6+})	mg/kg	0.5	5	15	40	ND	
ZINC (Zn)	mg/kg	1.0	300	600	2 000	45.8	
NICKEL(Ni)	mg/kg	0.4	100	200	500	2.8	
FLUORINE(F)	mg/kg	10	400	400	600	253	
ORPs	mg/kg	0.05	10	10	30	ND	
PCBs	mg/kg	0.05	1	4	12	ND	
CYAN(CN)	mg/kg	0.2	2	2	120	ND	
PHENOL	mg/kg	0.02	4	4	20	ND	
BENZENE	mg/kg	0.1	1	1	3	ND	
TOLUENE	mg/kg	0.1	20	20	60	ND	
ETHYLBENZENE	mg/kg	0.1	50	50	340	ND	
XYLENE	mg/kg	0.1	15	15	45	ND	
TPH	mg/kg	50	500	800	2 000	199	
TCE	mg/kg	0.1	8	8	40	ND	
PCE	mg/kg	0.1	4	4	25	ND	
BENZO[e]PYRENE	mg/kg	0.005	0.7	2	7	ND	

NOTE) ND = NOT DETECTED = LESS THAN DETECTION LIMT

** End of The Report **

e-DOCUMENT SERVICE

The test results contained in this report are limited to results on the sample(s) that is provided by client and are not necessarily indicative or representative of the qualities of the lot from which the sample(s) was taken or of all products. Results contained in this report are not based on the quality certification of service by the FITI quality certification program unless specifically requested by the client. Further use of the results of this report is prohibited unless allowed under a separate agreement set forth in an official document that is established between the client identified on this letter and the FITI.
This test report is irrelevant to KOLAS accreditation.

Coring & Compressive Test (at LH Dongtan 5–1 in Korea)

K-TI (주)한국건설품질시험연구원
Korea Construction Quality Test Institute

시 험 성 적 서

시 료 명	: 휴머스 B (H-30cm) 좌측, 우측, (H-40cm) 좌측, 우측	접 수 번 호	: KTI1B-LRS-0706-01
시료채취장소	: 동탄 5-1 급구 진입로 시험시공(도로포장) 구간	발 급 번 호	: KTI1B-TRS-0711-01
시 험 용 도	: 시험시공 후 일축압축강도 평가	접 수 일	: 2018년07월06일
업 체 명	: 지하정보기술㈜	발 급 일	: 2018년07월11일
의 뢰 자	: 김창동	페 이 지	: 1/3
주 소	: 경기도 의왕시 이미로 40 인덕원 IT 밸리 D동 609 호		

귀하가 의뢰한 위 시료에 대해서 아래 시험 방법에 따라 시험한 결과를 다음과 같이 알려드립니다.

- 결 과 -

시험항목		시험방법	단위	시험결과	비고
압축강도	#(H-30cm) 좌측	의뢰자 제시	MPa	5.20	
	#(H-30cm) 우측		MPa	5.98	
	#(H-40cm) 좌측		MPa	5.96	
	#(H-40cm) 우측		MPa	5.21	

ity Test Institute

ATTACHMENT

Comparison of Estimation calculation(Bangladesh)

Normal Road type VS GRSS (using Soil Stabilizer)

S/L	Specifications	Details		
		Low Quality GRSS ($7)	High Quality GRSS ($20)	Normal Method
1	Basic Road detail			
	Length of Road	1000 m	1000 m	1000 m
	Width of Road	7 m	7 m	7 m
	Surface Layer	0 m	0	0
	Base Layer (Below Surface layer)	0.15 m	0.15 m	0.3 m
	Volume	1050 m3	1050 m3	2100 m3
	Area	7000 m2	7000 m2	7000 m2
2	GRSS Details			
	Total Cost of GRSS (BDT)	1,896,300	5,418,000	NA
	Cost of GRSS ($)	22,050	63,000	NA
	Total quantity of GRSS (kg)	3,150	3,150	NA
3	Cement Details			
	Total quantity of Cement (kg)	105,000	105,000	NA
4	Road Cost			
	Total Cost of Road	3,431,700	6,953,400	0
	Total Cost of Road (Excluding SS cost)	1,535,400	1,535,400	NA
	Korean Consultant Cost	Not included	Not included	NA
	Total % saving using SS	**71.25%**	**41.75%**	

Comparison of Estimation calculation(Bangladesh)

Normal Road type VS GRSS (using Soil Stabilizer)

S/L	Classification	GRSS ($7)		Normal Road		Difference in amount (NR-GRSS - LQ)		Remarks
		BDT	USD	BDT	USD	BDT	USD	
1	Material	3366300	39143.02	9840113.52	114,419.92	6,473,813.52	75,276.90	
2	Equipment	60000	697.67	1047204.38	12,176.80	987,204.38	11,479.12	
3	Labour	5400	62.79	1048915.00	12,196.69	1,043,515.00	12,133.90	
	Total Sum=	3431700	39903.49	11936232.89	138,793.41	8,504,532.89	98,889.92	
	Total % saving using GRSS		**71.25%**					

S/L	Classification	GRSS ($20)		Normal Road		Difference in amount (BDT-GRSS - HQ)		Remarks
		BDT	USD	BDT	USD	BDT	USD	
1	Material	6888000	80093.02	9840113.52	114419.92	2,952,113.52	34,326.90	
2	Equipment	60000	697.67	1047204.38	12176.80	987,204.38	11,479.12	
3	Labour	5400	62.79	1048915.00	12196.69	1,043,515.00	12,133.90	
	Total Sum=	6953400	80853.49	11936232.89	138793.41	4,982,832.89	57,939.92	
	Total % saving using GRSS		**41.75%**					

Note : Above shown estimation calculations are for reference purpose only. The actual price may be subject to change .

1. Road Design.	
Length	1000 m
width	7 m
Surface Layer	0 m
Base Layer Depth	0.15 m
Dollar Rate(1$=BDT)	86
Soil Stabilizer rate($)	7

2. Component Consumption	
HUMMUS	3 kg/m3
CEMENT	100 kg/m3
Soil	1800 kg/m3
Volume	1050 m3

Road Design Spec.	Layer	Specification	Depth
	1. Wearing	Premix Carpet	0cm
	2. Base layer	GRSS - Low Quality	20 cm

3. Quotation Detail

Classification	Process & Standard	unit	quantity	material Cost		Labour cost			Equipment cost			SUM.		
				unit price	sum	unit price	Work day	sum	unit price	Work day	sum	unit price	sum(BDT)	USD
Material for GRSS (Soil Stabilizer) Compaction	GRSS- LQ	m3	3150 kg	602.00	1,896,300							602	1,896,300	22,050
	Cement	m3	105000 kg	14.00	1,470,000							14.00	1,470,000	17,093
	Soil	m3	1890000 kg	-	-							-	-	-
	Premix carpet	m3	-		-							0	-	-
	Sub-Total				3,366,300								3,366,300	39,143
Equipment for paving	Back Hoe (6W)	hr	1						12,000	1	12,000		12,000	140
	Roller (Tandum)	hr	1						12,000	2	24,000		24,000	279
	Asphalt Finisher	hr	1						12,000	-	-		-	-
	Tipper/Truck	hr	1						12,000	2	24,000		24,000	279
														-
	Sub-Total												60,000	698
Labour for pavement	Labour Local	person	3			900	2	5,400					5,400	63
	Korean Expert	person	1			51,600	-	-					-	-
	Sub-Total							5,400					5,400	63
Grand Total					3,366,300			5,400			60,000		3,431,700	39,903

Daily Transportation : Daily 40MT 500-1000 Trucks

Total Days: 2 Days

1. Road Design.	
Length	1000 m
width	7 m
Surface Layer	0 m
Base Layer Depth	0.15 m
Dollar Rate(1$=BDT)	86
Soil Stabilizer rate($)	20

2. Component Consumption	
GRSS	3 kg/m3
CEMENT	100 kg/m3
Soil	1800 kg/m3
Volume	1050 m3

Road Design Spec.	Layer	Specification	Depth
	1. Wearing	Premix Carpet	4 cm
	2. Base layer	GRSS	20 cm

3. Quotation Detail

Classification	Process & Standard	unit	quantity	material Cost		Labour cost			Equipment cost			SUM.			Percentage
				unit price	sum	unit price	Work day	sum	unit price	Work day	sum	unit price	sum(BDT)	USD	
Material for GRSS (Soil Stabilizer) Compaction	GRSS - HQ	m3	3150 kg	1,720.00	5,418,000							1,720	5,418,000	63,000	
	Cement	m3	105000 kg	14.00	1,470,000							14.00	1,470,000	17,093	
	Soil	m3	1890000 kg	-	-							-	-	-	
	Premix carpet	m3	-	-	-							0	-	-	
	Sub-Total				6,888,000								6,888,000	80,093	
Equipment for paving	Back Hoe (6W)	hr	1						12,000	1	12,000		12,000	140	
	Roller (Tandum)	hr	1						12,000	2	24,000		24,000	279	
	Asphalt Finisher	hr	1						12,000	-	-		-	-	
	Tipper/Truck	hr	1						12,000	2	24,000		24,000	279	
														-	
	Sub-Total												60,000	698	
Labour for pavement	Labour Local	person	3			900	2	5,400					5,400	63	
	Korean Expert	person	1			51,600	-	-					-	-	
	Sub-Total							5,400					5,400	63	
Grand Total					6,888,000			5,400			60,000		6,953,400	80,853	0%

Daily Transportation : Daily 40MT 500-1000 Trucks

Total Days: 2 Days

1. Road Design.	
Length	1000 m
width	7 m
Surface Layer	0 m
Base & subbase Layer Depth	0.3 m
Surface Area	7000 m2
Volume(upto Base)	2100 m3
Dollar Rate(1$=BDT)	86

Road Design Spec.	Layer	Specification	Depth
	Surface Layer	Premix carpet	0
	Base Layer	CRM	0.15 m
	Sub Base Layer	Aggregates	0.15 m
	Sub Grade Layer	Soil Compaction & levelling	

	2. Quotation Detail													
S.No.	Classification	Process & Standard	unit	Specification			quantity	Unit price	sum	Sum		Percentage	Sum	Sum
				Length	Width	Depth				BDT	USD		BDT	BDT
	1.Material													
1	Earthworks	Roadway excavation of soil,construction of shoulders including disposal of excavated material at approved environmentally safe tipping sites.	cum	1000 m	7 m	0.3 m	2,415	942.63	2,276,456	2,276,456.28	26,470.4			
2	Sub grade	Preparation of subgrade to designed grade and camber including watering and compaction.	sqm	1000 m	7 m	-	7,000	14.03	98,210	98,210.00	1,142.0			
3	Sub Base Layer	Supply, place and compact quarry sieved subbase material.	cum	1000 m	7 m	0.15 m	1,050	2,446.28	2,568,594	2,568,594.00	29,867.4			
4	Base Layer	Providing, laying, spreading, levelling and compaction of crusher run materials (CRM) for base course.	cum	1000 m	7 m	0.15 m	1,050	2,896.41	3,041,234	3,041,233.65	35,363.2			
5	Surface Layer	Providing, mixing, laying and compaction of premixed carpet - all complete as mentioned in the specification and directed by the Engineer.	cum	1000 m	7 m	0 m	-	19,041.01	-	-	-			
6	Prime Coat	Providing and spraying bituminous prime coat MC30/MC70 including cleaning the road surface using wire, brushes, broom etc before applying prime coat as mentioned in the specification. Spray rate as instructed by engineer	sqm	1000 m	7 m	-	7,000	176.73	1,237,080	1,237,079.73	14,384.6			
7	Tack Coat	Providing and spraying bituminous tack coat MC30/MC70 including cleaning the road surface using wire, brushes, broom etc before applying tack coat as mentioned in the specification. Spray rate as instructed by engineer	sqm	1000 m	7 m	-	3,500	176.73	618,540	618,539.86	7,192.3			
8	Sand Seal	Providing and laying Sand seal over premix carpet	sqm	1000 m	7 m	-	-	129.11	-	-	-			
		Sub-Total								9,840,113.52	114419.92		-	-

S.No.	Classification	Process & Standard	unit	Specification			quantity			Sum		Percentage	Sum	Sum
				Length	Width	Depth		Unit price	sum	BDT	USD		BDT	BDT
	2. Equipment													
1	Earthworks	Roadway excavation of soil,construction of shoulders including disposal of excavated material at approved environmentally safe tipping sites.	cum	1000 m	7 m	0.3 m	2,415	50.60	122,199	122,199.00	1,420.9			
2	Sub grade	Preparation of subgrade to designed grade and camber including watering and compaction.	sqm	1000 m	7 m	-	7,000	62.10	434,700	434,700.00	5,054.7			
3	Sub Base Layer	Supply, place and compact quarry sieved subbase material.	cum	1000 m	7 m	0.15 m	1,050	150.54	158,062	158,061.75	1,837.9			
4	Base Layer	Providing, laying, spreading, levelling and compaction of crusher run materials (CRM) for base course.	cum	1000 m	7 m	0.15 m	1,050	191.07	200,626	200,626.13	2,332.9			
5	Surface Layer	Providing, mixing, laying and compaction of premixed carpet - all complete as mentioned in the specification and directed by the Engineer.	cum	1000 m	7 m	0 m	-	2,300.00	-	-	-			
6	Prime Coat	Providing and spraying bituminous prime coat MC30/MC70 including cleaning the road surface using wire, brushes, broom etc before applying prime coat as mentioned in the specification. Spray rate as instructed by engineer	sqm	1000 m	7 m	-	7,000	12.54	87,745	87,745.00	1,020.3			
7	Tack Coat	Providing and spraying bituminous tack coat MC30/MC70 including cleaning the road surface using wire, brushes, broom etc before applying tack coat as mentioned in the specification. Spray rate as instructed by engineer	sqm	1000 m	7 m	-	3,500	12.54	43,873	43,872.50	510.1			
8	Sand Seal	Providing and laying Sand seal over premix carpet	sqm	1000 m	7 m	-	-	20.70	-	-	-			
		Sub-Total								**1,047,204.38**	**12,176.80**		-	-

S.No.	Classification	Process & Standard	unit	Specification			quantity			Sum		Percentage	Sum	Sum
				Length	Width	Depth		Unit price	sum	BDT	USD		BDT	BDT
	3. Labour													
1	Earthworks	Roadway excavation of soil,construction of shoulders including disposal of excavated material at approved environmentally safe tipping sites.	cum	1000 m	7 m	0.3 m	2,100	15.53	32,603	32,602.50	379.1			
2	Sub grade	Preparation of subgrade to designed grade and camber including watering and compaction.	sqm	1000 m	7 m	-	7,000	132.25	925,750	925,750.00	10,764.5			
3	Sub Base Layer	Supply, place and compact quarry sieved subbase material.	cum	1000 m	7 m	0.15 m	1,050	54.63	57,356	57,356.25	666.9			
4	Base Layer	Providing, laying, spreading, levelling and compaction of crusher run materials (CRM) for base course.	cum	1000 m	7 m	0.15 m	1,050	31.63	33,206	33,206.25	386.1			
5	Surface Layer	Providing, mixing, laying and compaction of premixed carpet - all complete as mentioned in the specification and directed by the Engineer.	cum	1000 m	7 m	0 m	-	5,951.25	-	-	-			
6	Prime Coat	Providing and spraying bituminous prime coat MC30/ MC70 including cleaning the road surface using wire, brushes, broom etc before applying prime coat as mentioned in the specification. Spray rate as instructed by engineer	sqm	1000 m	7 m	-	7,000	58.08	406,525	N/A	N/A			
7	Tack Coat	Providing and spraying bituminous tack coat MC30/MC70 including cleaning the road surface using wire, brushes, broom etc before applying tack coat as mentioned in the specification. Spray rate as instructed by engineer	sqm	1000 m	7 m	-	3,500	58.08	203,263	N/A	N/A			
8	Sand Seal	Providing and laying Sand seal over premix carpet	sqm	1000 m	7 m	-	-	33.35	-	-	-			
		Sub-Total								1,048,915.00	12,196.69		-	-

Asian Development Bank

Private Sector Operations Department

26 July 2020

Dear Mr. Yoon Suk Lee:

Subject: **TA 9620 REG: Preparation of the ADB Ventures Facility — Approval of SEED grant**

On the 15 June 2020, the Asian Development Bank (ADB) approved [redacted] reimbursable technical assistance (TA) funding to InnoCSR Co. Ltd. ("InnoCSR") that provides ADB the right to invest equity from ADB Ventures investment fund [redacted] Details of this arrangement between ADB and InnoCSR are contained in the Technical Assistance Agreement (TAA) and Reimbursement Alternative Agreement (RAA).

Korea-based InnoCSR developed the Good Bricks System, a solution that enables brick manufacturers to harden bricks without the need for kiln baking. The Good Bricks System uses a proprietary soil stabilizer and a press machine to catalyze a chemical and physical bonding process that yields industry-grade bricks. ADB Ventures believes this technology has potential to generate climate impact so provided reimbursable TA funding to support InnoCSR expand their operations in Nepal.

Sincerely,

Dominic Mellor
Senior Investment Specialist
ADB Ventures
Private Sector Operations Department

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