Ministry of Rural Development, GoI

Department of Rural Development, GoUP

National Rural Infrastructure Development Agency

UP Rural Roads Development Agency

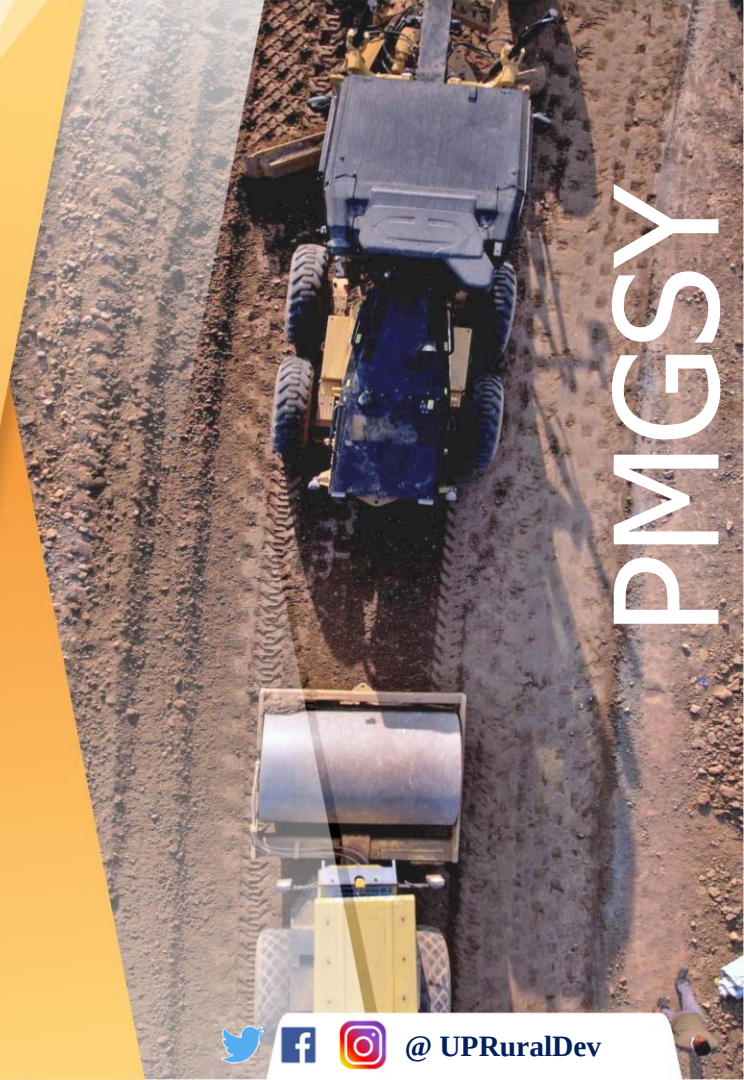
Era of Adoption of New Technology

FULL DEPTH RECLAMATION

24th May 2022, New Delhi

Manoj Kumar Singh, IAS

Agriculture Production Commissioner, GoUP
Additional Chief Secretary (Rural Development & Panchayti Raj)
Government of Uttar Pradesh



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State's Achievements under PMGSY

100% Connectivity provided to habitations of 500+

PMGSY-I & PMGSY-II completed

PMGSY-III : 18770 kms (2534 Roads) sanctioned
- Conventional Roads – 13306 Kms
- FDR Roads – 5436 Kms

100% Geo-tagging of Facilities & Amenities completed

Pradhan Mantri Gram Sadak Yojna-State Brief

Scheme	Sanctioned Length (Kms.)	Completed Length (Kms.)	Sanctioned Cost (Cr.)	Expenditure Cost (Cr.)
PMGSY - I	50,331.53	49,427.01	13,781.71	13,026.39
PMGSY – II	7,617.28	7,508.67	4,540.26	3,975.65
RCPLWEA	541.30	338.30	408.67	203.56
PMGSY – III	18,770.65	3,932.00	14,203.41	2,318.00

Background for Adoption of FDR Technology

Proposal Submission for PMGSY-III FY 2020-21

1215 proposals for sanction to MoRD, GoI under Batch 1 with conventional technology

Sanctions & Observations

MoRD, GoI sanctioned **898** proposals under conventional technology.
299 proposals were returned due to high pavement cost

Initiation of FDR

Presentation of FDR Technology before Hon'ble Chief Minister, UP on 06.02.2021 and decision taken to study the FDR technology and submit the proposal

Field Visit of FDR Roads

Field visit were organized to study FDR
1. ACS (RD), GoUP visit to Service Road of Purvanchal Expressway, Sultanpur
2. JS (MoRD) with team of NRIDA, UPRRDA, PWD & RED visit to Vijayawada

Sanction & Execution of Pilot FDR

9 roads sanctioned on FDR technology as pilot projects which are under execution

Average Cost (Lakh/Kms) during FY 2020-21

S. No.	State (Road of 5.5 meters width)	Per kilo meter cost in Rs. Lakh
1	Madhya Pradesh	76.73
2	Rajasthan	59.45
3	Chhattisgarh	71.28
4	Andhra Pradesh	69.10
5	Tamil Nadu	68.24
6	Karnataka	89.58
7	Telangana	73.27
8	Kerala	101.83
9	Uttar Pradesh	135.98

Reasons for Higher Cost

The cost of construction per kilometre appeared to be the highest among all the states in India. Factors contribute to the higher cost:

- **Very high usage of fresh aggregates and other construction materials & scarcity**
- **Long hauls for the aggregates and materials contributing to higher transportation cost**
- **Low life of the pavement, contributing to frequent repairs and re-construction**

Constraints in Implementation of New Technology-FDR

- Non-availability of approved Schedule of Rate (SoR)
- Past experience of failure/poor performance of stabilized roads constructed manually/low end equipments
- Scarcity of FDR equipments in India
- Lack of experience of FDR work in Contractors

Stepping to New Technology-FDR

Briefing about FDR Technology to Chief Minister, Uttar Pradesh on 06.02.2021

Project Management Unit (PMU) for FDR works

Consortium of Translink Infrastructure Consultants (P) Ltd & Trans Asian Techno Pvt. Ltd.
(Indian Partner of Japanese Company SAKAI) & MK Soil Testing Lab Pvt. Ltd.

Site Visit by ACS (RD,GoUP) with PMU & PIU

Task Assigned

1. DPR Preparation
2. Assistance in Planning & Execution
3. Trial Patch Clearance
4. Assistance in Quality Control

Train of Specific Equipment for FDR

01 **Computer-controlled Binder** (Cement) Spreader

02 **Water Tanker**

03 **Additive Spreader**

04 **Recycler** (working width 2 to 2.4 meter)

05 **Motor Grader** (Blade width 3.35/3.70/4.30 m)

06 **Pad Foot Roller** (20 Ton) + Single Drum Compactor (10 -12 Ton)

07 **Vibratory Tandem Roller** (8 to 10 Ton)

08 **Pneumatic Tyre Roller** (14 Ton)

Brief of Process, Execution & Testing

1. Lab Establishment
2. Deployment of Technical Manpower, Plants & Machineries
3. Additive accreditation certificate of IRC/equivalent organization/ Source of Origin/Toxicity, Leaching test reports & OPC Grade 43 Test Reports
4. Construction work programme
5. Sampling & Testing of existing pavement crust
6. Test reports of combine gradation of crust material, Atterberg limits (LL, PI), Proctor compaction test, 7/28 days test of UCS, durability, residual & flexure strength
7. Mix Design for FDR Base
8. Execution of Trial length for FDR base
9. 7/28 days test of UCS, durability, residual & flexure strength
10. Clearance for execution of main carriageway

FDR Pilot Project Details

FDR No.	District	Name of the work	Traffic Category	Length (Kms)	Construction Cost (Lakh)	Status
UPFDR-01	Prayagraj	T-03 G.T. Road Hanumanganj to AG road Phoolpur	T9	15.2	1492.54	Under progress
	Prayagraj	MRl04 Jam road km 424 to Laktaha Ghat	T9	9.5	1065.33	Under progress
	Chitrakoot	T05 Archha Barehi Kamsin road	T9	17.9	1715.63	FDR base completed
UPFDR-02	Agra	T04- Etmadpur to Barhan	T9	10.65	1084.98	FDR base completed
	Hathras	T01- Baldev Mai to Khandoli	T9	14.35	1571.7	Under progress
	Mainpuri	MRL12-Tarapur to Bhogoan	T7	9.5	962.54	Under progress
UPFDR-03	Hamirpur	T02-T02 T01 (km 413) to Charkhari	T9	11.58	1000.76	FDR base completed
	Hamirpur	T03-L060 Nouranga-Bakrai- Khota to Tooka	T9	11.50	1184.39	Under progress
	Jhansi	MRL06-T01 to Gobara (Length-10.00 Km)	T9	10.00	939.58	Under progress
Grand Total				**110.18**	**11017.45**	

Mix Design Details of Pilot projects

Project Name/ District	Average MDD (Kg/Cum)	OMC (%)	Cement (%)	Additive (%) by weight	Mix Design Prepared by/used additive	Average UCS (MPa)
Archha Barethi Kamsin Road (Chitrakoot)	2120	9.20	5	Terrasil: 0.85kg/cum of RPM & Zycobond: 0.85kg/cum of RPM	IIT Roorke (Additive-Terrasil & Zycobond)	4.77 (7 days) 5.26(28 days)
T-03 G.T. Road Hanumanganj to AG Road phoolpur (Prayagraj)	2120	9.20	5	100 ml/cum	IIT Roorke (Additive-Roadstab)	5.18 (7 days) 6.93 (28 days)
MRl04 Jam road km 424 to Laktaha ghat (Prayagraj)	2060	10	4	650 ml/cum	IIT Roorke (Additive-Baseseal)	4.51 (7 days) 5.26 (28 days)
T02 T01 (km 413) to Charkhari (Hamirpur)	2000	8.66	5	2% of cement	Terrastab/TIMAB NLBB, Netherlands (Additive-Geocrete)	5.15 (7 days) 8.77 (28 days)
L060 Nouranga- Bakrai – Khota to Tooka (Hamirpur)	2000	9.73	5	1.5% of cement	Terrastab/TIMAB NLBB, Netherlands (Additive-Geocrete)	5.66 (7 days) 8.65 (28 days)
MRL06 – T01 to Gobara (Jhansi)	2000	5.30	5	1.5% of cement	Terrastab/TIMAB NLBB, Netherlands (Additive-Geocrete)	5.41 (7 days) 8.62 (28 days)
T04- Etmadpur to Barhan (Agra)	2352	6.50	4	3.5% of cement	IIT Roorke (Additive-Geopave)	5.26 (28 days)
T01- BaldevMai to Khandoli (Hathras)	1987	7.58	4	4% of cement	IIT Roorke (Additive-Geopave)	4.89 (7 days) 6.03 (28 days)
MRL12-Tarapur to Bhogoan (Mainpuri)	2086	7.85	5	4% of cement	IIT Roorke (Additive-Geopave)	4.56 (7 days) 6.75 (28 days)

Combined gradation of existing crust materials for

T05 Archha Barehi Kamasin Road (District-Chitrakoot)

Sieve Size (mm)	Percentage passing %	*Specified Limits as per IRC:SP:89 & MoRTH	Mean
53	97.07	100	100
37.5	92.15	95-100	100
19	81.35	45-100	72.5
9.5	69.91	35-100	67.5
4.75	54.81	25-100	62.5
0.6	36.29	8-65	36.5
0.3	31.75	5-40	22.5
0.075	3.88	0-10	10

UCS Results of Mix Design for 7 days & 28 days

T05 Archha Barehi Kamasin Road , Chitrakoot

Cube Number	Date of Casting	Date of Testing	Age (Days)	UCS (MPa)
1	25.12.2021	31.12.2022	7	4.56
2	25.12.2021	31.12.2022	7	4.70
3	25.12.2021	31.12.2022	7	5.05
Averaged 7 days UCS=4.77 MPa				
4	25.12.2021	22.01.2022	28	5.35
5	25.12.2021	22.01.2022	28	5.20
6	25.12.2021	22.01.2022	28	5.36
7	25.12.2021	22.01.2022	28	5.23
8	25.12.2021	22.01.2022	28	5.26
9	25.12.2021	22.01.2022	28	5.26
Averaged 28 days UCS=5.276 MPa				

Test result of trial length of FDR Pilot Project

Project Name	Average UCS at 7 days (MPa)	Average UCS at 28 days (MPa)	Flexural Strength test (MPa)	Residual Strength (MPa)	Durability Test (Wetting & drying 12cycles)
Archha Barethi Kamsin Road (District Chitrakoot)	3.26	5.38	—	3.66	5.89%
T02 T01 (km 413) to Charkhari (District-Hamirpur)	4.62	5.76	—	3.11	9.84%
T04- Etmadpur to Barhan (District Agra)	4.45	7.08	2.09	6.04	7.75%

T06 Archha Barehi Kamsin Road

(Length 17.90 Km) District Chitrakoot

Existing Width – 3.00m and Crust Thickness – 220mm ,
Thickness of aggregate after spreading in 5.80m = 113 mm
Thickness of FDR base = 250mm

Details of Material to be used in FDR

1. Old Granular Material available at site which is to be used in FDR base = 11814.00 cum
2. New Granular Material for FDR base = 0
3. (a) % of Granular Material in FDR base = 45%
   (b) % of Sub grade soil used in FDR base = 55%
4. Material saving details in FDR V/s Conventional Technology

Sl. No.	Component	Required New Material in FDR Technology(cum)	Required New Material in Conventional Technology (cum)
1.	Sub-base and base	0	46767.62
2	Surfacing Course	5661.00	8908.33
	Total	**5661.00**	**55675.33**

Total saving of aggregate in FDR Technology
50014.00 cum i.e., 2800 cum/km

FDR Site Visit of Chitrakoot
by Secretary (MoRD, GoI) & Addl. Secretary / DG (MoRD, GoI) on 03.04.2022

भारत सरकार

ग्राम विकास विभाग

व्हाट्सएप हेल्पलाइन नंबर : 9454465555, 9454464999

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हेल्पलाइन नंबर : 1800-180-5999

FDR Site Visit of Chitrakoot
by Secretary (MoRD, GoI) & Addl. Secretary / DG (MoRD, GoI) on 03.04.2022

दैनिक भास्कर

देश का विश्वसनीय अखबार

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सफल हुआ तो देश के अन्य हिस्सों में बनाई जाएगी सड़

क से बन रही सड़क का केंद्रीय टीम ने किया निरीक्षण, नीदरलैंड से मंगाए गए केमिकल का हो रहा है उपयोग

सड़क पांच साल से अधिक चलेगी

निर्माण इकाई के अधिकारियों को फटकारा

Pilot FDR-01 at Chitrakoot (UP1985)

T05 Archha Barehi Kamsin Road

Pilot FDR-02 at Agra (UP0192)

T04 Etmadpur to Barhan

Pilot FDR-03 at Hamirpur (UP3280)

T02-T02 T01 (Km 413) to Charkhari

State Experience on FDR

- FDR Technology is economical compared to conventional technology.
- Life expectancy of more than 15 years
- Lesser maintenance cost
- Conservation of national resources as course aggregate/fine aggregate
- Environment friendly, minimal air quality problems during construction
- Reduced Carbon Footprint.
- Positive impact on socio-economic development.

State Experience on FDR

- Effective in the most distress pavement constructed on conventional technology along with improved riding quality
- Reuse of existing material of pavement crust
- Very speedy construction (300 to 700 meters single lane carriageway per day)
- Lesser hindrance to traffic/public and improved performance of low volume roads
- 1.Approximate saving of 2500-2700 cum aggregate per km in sub base /base layer of pavement (5.5 meter carriageway T8/T9 traffic category rural road)

Full Depth Reclamation Sanctions under FY 2021-22

3.75 Meter Carriageway				
Traffic Category	**No. of Roads**	**Length (Kms)**	**Average Pavement Cost (Lacs/Km)**	**Average Total Cost (Lacs/Km)**
T3	12	70.86	57.19	70.79
T4	136	854.09	62.47	74.75
T5	73	494.37	64.10	75.09
T6	23	165.42	68.78	81.75
T7	9	73.68	71.72	87.19
Grand Total	**253**	**1658.41**	**63.77**	**75.93**

5.5 Meter carriageway				
Traffic Category	**No. of Roads**	**Length (Kms)**	**Average Pavement Cost (Lacs/Km)**	**Average Total Cost (Lacs/Km)**
T4	11	82.81	86.47	97.14
T5	90	690.18	95.23	105.57
T6	106	907.51	100.07	113.69
T7	24	187.27	95.06	105.01
T9	204	1827.46	99.57	114.34
Grand Total	**435**	**3695.23**	**98.36**	**111.69**

Capacity building of Bihar RRDA Officers

Capacity building of Tripura RRDA Officers

Department of Rural Development,
Government of Uttar Pradesh

Uttar Pradesh Rural Roads Development Agency
Lucknow

Thank You

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