National Rural Infrastructure Development Agency
Ministry of Rural Development
Government of India

Azadi Ka Amrit Mahotsav

Pradhan Mantri
Gram Sadak Yojana

SURFACE DRESSING

May 2022

SURFACE DRESSING

May 2022

National Rural Infrastructure Development Agency

Ministry of Rural Development
(Government of India)

This document is for wide dissemination amongst the stakeholders connected with construction and maintenance of Rural (low volume) Roads, such as PTAs/STAs, Engineers, Quality Monitors, Contractors, Field Supervisors etc.

ग्रामीण विकास मंत्रालय राष्ट्रीय
ग्रामीण अवसरंचना विकास एजेंसी
भारत सरकार

Azadi Ka Amrit Mahotsav

प्रधान मंत्री
ग्राम सड़क योजना

साध्वी निरंजन ज्योति
मा० राज्यमंत्री ग्रामीण विकास एवं उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण मंत्रालय, भारत सरकार

श्री गिरिराज सिंह
मा० मंत्री ग्रामीण विकास एवं पंचायती राज मंत्रालय, भारत सरकार

श्री फग्गन सिंह कुलस्ते
मा० राज्यमंत्री
ग्रामीण विकास एवं इस्पात मंत्रालय, भारत सरकार

के प्रेरणादायी और कुशल नेतृत्व एवं मार्गदर्शन में
प्रधान मंत्री ग्राम सड़क योजना का सफल क्रियान्वयन हो रहा है।

यह योजना देश की ग्रामीण आबादी को सड़क संपर्क
उपलब्ध करा कर उनके चहुंमुखी विकास में सहायक सिद्ध हो रही है।

इस प्रकार ग्रामीण विकास मंत्रालय राष्ट्र निर्माण
के क्षेत्र में उत्तरोत्तर प्रगति के पथ पर अग्रसर है और निरंतर सफलता की
नई ऊंचाइयों को छू रहा है।

Shri Nagendra Nath Sinha, IAS
Secretary
Ministry of Rural Development
Government of India

MESSAGE

Rural road connectivity is a key component of Rural Development for promoting access to economic and social services. Pradhan Mantri Gram Sadak Yojana (PMGSY) plays a vital role in this direction and the roads constructed thereunder play an important role in increasing access to resources thereby mitigating poverty. Their continued existence is absolutely essential to achieve the intended objective. PMGSY was launched in the year 2000 with an objective of providing all-weather road connectivity to all eligible unconnected habitations in rural areas of country.

Aiming to cover upgradation of existing selected rural roads based on their economic potential and their role in facilitating the growth of rural market centres and rural hubs, PMGSY-II and PMGSY-III schemes were launched in 2013 & 2019 respectively. In the last 21 years, more than 7 Lakh kms of rural roads have been constructed under the PMGSY . They have provided major fillip to the rural economy.

With a view to achieve optimal use of non-conventional materials and cost-effective environment friendly "Green Technologies" in the construction of PMGSY roads, the Ministry has come out with a New Technology Vision 2022 for use of new technologies in construction of PMGSY roads. Out of 112,930 km road length sanctioned under new materials/ green technologies till now, approximately 70,000 km road length has been constructed till 31st March 2022.

It is of utmost importance that water should not penetrate pavement layers which causes deterioration of roads. Low volume rural roads are usually covered with Open Graded Premix Carpet (OGPC) as surface layer which is susceptible to water. Modern mechanized Surface dressing (SD) being an innovative technology improves the quality of surface layer in respect of water proofing as well as cost when compared to Open Graded Premix Carpet (OGPC). I am sure this document on Surface Dressing would help various stakeholders, such as state government departments, consultants, field engineers, implementers etc. for effective use of Surface Dressing in the field.

Dr. Ashish Kumar Goel, IAS
Additional Secretary,
Ministry of Rural Development
& Director General, NRIDA
Government of India

FOREWORD

The Government of India, as a part of the poverty reduction strategy, launched the Pradhan Mantri Gram Sadak Yojana (PMGSY-I) on 25th December 2000 as a Centrally Sponsored Scheme to assist the states for construction of rural roads. The primary objective of the PMGSY was to provide all-weather road connectivity to the eligible unconnected habitations in the rural India. The mandate of PMGSY has been subsequently widened to include new interventions. PMGSY-II was launched in 2013, with a target to upgrade 50,000 km of the existing rural roads. Road Connectivity Project for Left Wing Extremism Affected Areas (RCPLWEA) was launched in 2016 for construction/upgradation of strategically important roads in the remote areas of the country. PMGSY-III was launched in 2019 for consolidation of 1,25,000 km through routes and major rural links connecting habitations to various socio-economic centres. Since inception till 31st March 2022, more than 7 lakh km road length has been completed under various verticals of PMGSY.

PMGSY has helped in better access of marketplace for the rural masses and generated employment in various forms. It has also helped in improving socio- economic condition of rural populace. An evaluation of Centrally Sponsored Schemes in Rural Development Sector, including Pradhan Mantri Gram Sadak Yojana was carried out by the Development Monitoring and Evaluation Office (DMEO) of NITI Aayog in 2020 and it was found that the scheme is well aligned with India's international goals and is seen to contribute to SDGs (Sustainable Development Goals) 2 & 9 as it addresses the issues of poverty, hunger and infrastructure for growth. Roads constructed under PMGSY have been observed to create positive impacts at the level of the household and community. Roads have impacted in increase access to market and livelihood opportunities, health and education facilities of people.

PMGSY has been pioneer in adopting new and green technologies in construction of rural roads. A new technology vision was formulated in 2013, and as a result more than 1 lakh km of roads have been sanctioned under PMGSY, which have adopted one or more new technologies. Recently, the adoption of new technology has seen an enhanced emphasis. A new Technology Vision 2022 is being adopted by the Ministry.

Surface Dressing for rural roads is a sustainable and cost-effective surface layer which restricts the water to percolate through it and hence prevents premature deterioration of the pavement. The Surface Dressing work consists of application of appropriate grade of bitumen/ emulsion on a previously prepared base followed by application of a coat of aggregates as cover material of appropriate size, grading, and well rolled. Till 31st March 2022, Ministry has sanctioned 2816 km of road length under surface dressing.

This document has been prepared with contributions and suggestions of my NRIDA colleagues Shri B.C.Pradhan, Consultant Director (Technical), Dr. I.K. Pateriya, Director P-III, Shri Pradeep Agrawal, Director P-I, Shri Devinder Kumar, Director (P-II), Shri Satyendra Prasad, Joint Director (Technical), Shri Ashish Srivastava, Joint Director (Technical), Shri Sunil Kumar, Joint Director (P-III), Shri Navneet Kumar, Joint Director (P-I), Shri Pankaj Sharma, YCE, Shri Tejas M Nagrale, YCE and Shri Avinash Panda, YCE.

I also acknowledge the immense contribution made by Dr. Prithvi Singh Kandhal, Associate Director (emeritus), NCAT and Prof A.Veeraragavan, IIT Madras, without whose support and vital guidance, it would not have been possible for us to produce this document.

Finally, I am grateful to Hon'ble Minister, Rural Development, Shri Giriraj Singh Ji for his tremendous encouragement and mentorship of new technology. I am thankful to Hon'ble Ministers of State, Rural Development Sadhvi Niranjan Jyoti and Shri Faggan Singh Kulaste for their constant guidance. I am indebted to Shri Nagendra Nath Sinha, Secretary, Ministry of Rural Development for his invaluable support in developing a vision and strategy for adoption of new technologies and innovative approaches in PMGSY.

CONTENTS

SURFACE DRESSING

1. INTRODUCTION

1.1. Surface Dressing (SD) is a common and cost-effective form of surface treatment, being widely used for the following purposes:

a. To provide a dust free wearing surface over a granular base.

b. To provide surface impermeability against rainwater percolation into the pavement.

c. To arrest disintegration of the road surface.

d. To provide a non-skid riding surface.

e. To serve as a renewal coat for periodic maintenance of bituminous surface.

1.2. The Surface Dressing work consists of application of appropriate grade of bitumen/emulsion on a previously prepared base followed by application of a coat of aggregates as cover material of appropriate size, grading, and well rolled. Surface Dressing does not enhance the structural strength, nor does it restore the riding quality of a surface having large surface irregularities but it is highly effective in waterproofing the road.

1.3. Surface Dressing has been used successfully worldwide for low to medium traffic roads (US, Europe & Australia). Detailed guidelines for design and construction of surface dressing can be referred from IRC: 110-2005.

2. TYPES OF SURFACE DRESSING

2.1. Surface Dressing is of two types:

a. Single Coat Surface Dressing

In this, the structure is formed by spraying a layer of binder on the previously prepared pavement surface, spreading one layer of cover aggregates and rolling.

b. Two Coat Surface Dressing

In this, the structure is formed by spraying a layer of binder and then spreading of one layer of cover aggregate and rolling, followed by a second layer of binder, spreading of another layer of cover aggregates and rolling. The size of second layer of aggregates is smaller than that of the first layer aggregate.

2.2. The single-coat Surface Dressing is a versatile treatment and, therefore, it is currently being used worldwide for low to medium traffic roads. Under heavy traffic conditions, the two-coat Surface Dressing is preferred. Traffic on road should be opened on the following day ideally but if not possible then speed of the traffic should be limited to 20 km/hr till the following day as aggregate can get dislodged under fast moving traffic. Excess aggregate should be swept off before opening to traffic.

3. MATERIAL SPECIFICATION

3.1. **Binder:** The binder shall conform to the requirements as specified and provide for in the proposal and satisfy the related specification. The grade of binder to be used would depend upon the climatic conditions. The binder should be fluid enough to permit uniform spraying.

a. Paving bitumen: For Surface Dressing using paving bitumen, the binder shall be paving bitumen of a suitable penetration grade appropriate to the region, traffic, rainfall and other environmental conditions. The binder should have a viscosity at the time of application, such that it is fluid enough to permit uniform spraying.

b. Cationic bituminous emulsion: For Surface Dressing using bitumen emulsion, the binder shall be of cationic type bitumen emulsion of appropriate grade (Rapid Setting) and having bitumen content of 65 per cent minimum by weight. The emulsion is said to have set when the water breaks away leaving the black residual.

3.2. **Aggregate:** The aggregates shall consist of crushed stone, crushed gravel or other crushed aggregates as specified, and shall have clean, strong, durable, and fairly cubical fragments free from disintegrated pieces, salt, alkali, vegetable matter, dust and adherent coating. Uncrushed rounded gravel should not be used. The aggregate shall preferably be hydrophobic in nature and of low porosity.

Table 1 Physical Requirements of Aggregates

S. No.	Property	Method of test	Value
1.	Abrasion value Los Angeles machine or, Aggregate impact value	IS2386 (Part 4) IS2386 (Part 4)	Max 40% Max 30%
2.	Combined Flakiness and Elongation index	IS2386 (Part 1)	Max 30%
3.	Stripping value	IS6241	Minimum retained coating 95%
4.	Polished stone value	BS812 (Part 114)	Min 60
5.	Water absorption	IS2386 (Part 3)	Max 1%
6.	Soundness: (a) Loss with sodium sulphate-5 cycles (in case of slag only) (b) Loss with magnesium sulphate-5 cycles	 IS2386 (Part 5) -do-	 Max 12% Max 18%
7.	Unit weight or bulk density (in case of slag only)	IS2386 (Part 3)	Min 1120 kg/m^3

3.3. **Grading and size of aggregates:** The size of aggregates to be used shall depend on the type of surface over which it is laid and the traffic intensities. The recommended gradations for various aggregate sizes are given in Table 2. The aggregates shall conform to one of these gradings.

Table 2 **Grading Requirements for Aggregates used for Surface Dressing**

IS sieve designation (mm)	Cumulative per cent by weight of total aggregates passing for the following nominal sizes (mm)			
	19	13	10	6
26.5	100	-	-	-
19.0	85-100	100	-	-
13.2	0-40	85-100	100	-
9.5	0-7	0-40	85-100	100
6.3	-	0-7	0-35	85-100
4.75	-	-	0-10	-
3.35	-	-	-	0-35
2.36	0-2	0-2	0-2	0-10
0.60	-	-	-	0-2
0.075	0-1.5	0-1.5	0-1.5	1-5
Minimum 65% by weight of aggregate	Passing 19 mm, retained 13.2 mm	Passing 13.2 mm, retained 9.5 mm	Passing 9.5 mm, retained 6.3 mm	Passing 6.3 mm, retained 3.35 mm

4. CONSTRUCTION METHOD

4.1. Preferably, the surface dressing work shall be carried out when atmospheric temperature in shade is 16ºC or above for penetration grade bitumen and 10ºC or above when cationic bitumen emulsion is used.

4.2. The road to be treated shall be closed to traffic in length equal to one day's work.

4.3. Spraying and compaction should be carried out by synchronized equipment for better control and uniformity in construction.

4.4. The underlying surface course on which Surface Dressing is to be laid shall be prepared, shaped and conditioned to a uniform grade, camber and section as specified. If base to be treated consists of granular material, a suitable bituminous primer should be applied uniformly, by a mechanical bitumen sprayer only. Manual spraying using tin containers should not be allowed.

4.5. After the surface to be treated has been prepared, the binder heated to appropriate temperature as specified shall be sprayed uniformly over the surface using appropriate mechanical sprayers.

4.6. Immediately after the application of binder, clean, dry aggregates free from dust (in the case of emulsion, the aggregate may be damp) of the size and quantity shall be spread uniformly by means of a mechanical grit spreader so as to cover the coated surface completely with a single layer of aggregates.

4.7. After that entire surface shall be rolled, by a pneumatic tyre roller, or with a 60 to 80 KN smooth wheeled road roller.

4.8. Traffic is allowed to ply over the first coat for 2-3 weeks before placing of second coat of surface dressing.

4.9. Second coat of binder is applied over cleaned, dust free surface of cover material of first coat in the same manner as done for binder of first coat.

4.10. Immediately after application of binder, aggregates shall be spread uniformly by means of a mechanical grit spreader so as to cover the coated surface completely.

4.11. Soon after aggregates are spread uniformly, rolling shall be done by a pneumatic tyre roller or with a 60 to 80 KN static roller.

5. EQUIPMENT

5.1. All equipment necessary for the proper construction of work shall be on the site of the work in good condition. The description of some of the equipment used for surface dressing is given in IRC:SP:34 "General Guidelines about the Equipment for Bituminous Surface Dressing". Surfacing Dressing equipment like Bitumen Pressure Distributors, Chip Spreaders and Road Rollers are being manufactured in India. Details of some of the manufacturers of chip spreader are as under:

S.No.	Company Name	S.No.	Company Name
a	Chamunda Engineering, Visnagar	g	S.P. Enterprise, Ahmedabad
b	Marshal Equipments, Mehsana	h	Venus Equipments, Mahsana
c	Himakshi Road-Cons. Equipments Pvt. Ltd.	i	Riddhi Siddhi Enterprise, Ahmadabad
d	Capious Roadtech Pvt. Ltd.	j	Sidharatha Equipments, Mehsana
e	Apple Equipment, Mehsana	k	Perfect Road Equipments, Mehsana
f	Universal Engineers, Ahmadabad	l	Dhruvi Road Equipment Private Limited, Mehsana

Note: The information indicated above is not exhaustive. There may be other manufacturers also. Agencies should explore the market to choose the best option.

6. FINISHING

6.1. The surface evenness of the completed work in longitudinal and transverse directions shall be within the limits specified in Table 6. Frequency of surface unevenness in 300 m length in longitudinal profile shall be within the limits specified in Table 3.

Table 3 Maximum Permissible Surface Unevenness

Type of Construction	Longitudinal profile (Maximum permissible surface unevenness measured with 3 metre straight edge)	Transverse profile (when measured with camber template)
Mechanized	10 mm	8 mm
Manual	12 mm	10 mm

6.2. It is emphasized that surface dressing by itself cannot remove any undulations present in the base or the surface on which it is applied. It is, therefore, essential that all operations of rectification to meet the requirements set out above be carried out on the receiving surface before the work of Surface Dressing is begun. For detailed guidance in this respect, reference may be made to **IRC: SP:16**-2019 "Guidelines on Measuring Road Roughness and Norms".

7. EXAMPLES OF ROADS PAVED WITH SURFACE DRESSING

7.1. It is pertinent to mention that manual surface dressing has been executed in past under PMGSY programme in some of the roads in state of Orissa. Details of these roads are given below.

S.No.	State	District	Package No.	Road Name
1.	Odisha	Malkangiri	OR20167	L042- Ramchandrapur to Machhaguda
2.	Odisha	Malkangiri	OR20169	L037- Mudulipada to Littamguda
3.	Odisha	Malkangiri	OR20170	L036- Mudulipada to Kirsanipada
4.	Odisha	Malkangiri	OR20171	T07- Pwd Road to Tungabahal
5.	Odisha	Malkangiri	OR20172	L039- Khairiput to Kenduguda
6.	Odisha	Malkangiri	OR20173	L041- Banuguda to Pallakaguda
7.	Odisha	Malkangiri	OR20174	L061- T2 Sh47 to Goudaput
8.	Odisha	Malkangiri	OR20183	T05- Link Road to Mahulput
9.	Odisha	Malkangiri	OR20215	L028- Tarakapada to Gidmali
10.	Odisha	Malkangiri	OR20293	T01- Khairiput to Ramliguda
11.	Odisha	Malkangiri	OR20295	L038- Mudulipada to Baunsapada
12.	Odisha	Malkangiri	OR20297	L035- Gulangapadar to Bondapada
13.	Odisha	Malkangiri	OR20299	L063- Kenduguda to Baghadangar
14.	Odisha	Malkangiri	OR20301	L023- Godhiguda to Kandhaguda
15.	Odisha	Malkangiri	OR20302	L022- Madakapadar to Maliguda

Photographs of some of these roads are enclosed as **Annexure A**.

8. IRC GUIDELINES

8.1. IRC: SP:72-2015 recommends that surface dressing should be preferred as bituminous surfacing in all cases of traffic categories T1 to T5. However, 20 mm premix carpet can be used as an alternative to surface dressing for traffic categories T6 to T9.

8.2. Further in all cases of stabilized base and subbase courses it is recommended that bituminous surface treatment as surface dressing or premix carpet be provided using polymer modified bitumen or cold mix technology.

8.3. Detail guidelines on surface dressing are available in IRC:110-2005 & detailed specifications of surface dressing are available in MoRD book of specification for Rural Road – 2014. However, for reasons mentioned in the document, mechanized surface dressing is superior to PMC/OGPC.

9. RATE ANALYSIS FOR SURFACE DRESSING

9.1. Rate analysis of 2 coat surface dressing including pre-coating of chips for both the coats, based on SoR rates of Karnataka state is attached as **Annexure B**. Rate analysis of OGPC (including tack coat & seal coat) based on SoR 2019-2020 rates of Karnataka is attached as **Annexure C**.

10. SUMMARY OF COST ANALYSIS OF SURFACE DRESSING (BASED ON ENCLOSED RATE ANALYSIS)

S.No.	Items	Rs. (per sqm)
A	Cost of Single coat surface dressing (without pre coating of chips)	57.45
B	Cost of Single coat surface dressing (with pre coating of chips)	66.97
C	Cost of Two coat surface dressing (without pre coating of chips)	108.21
D	Cost of Two coat surface dressing (first coat without pre coating chips & second coat with pre coating of chips)	115.84
E	Cost of Two coat surface dressing (with pre coating of both coats of chips)	125.36

It may be seen from Annexure B & Annexure C that two coat surface dressing including pre-coating of chips is approx. 27% cheaper as compared to OGPC (including tack coat & seal coat). Further if single coat surface dressing is adopted, it is approx. 60% cheaper than OGPC (including tack coat & seal coat). To attain further cost saving without compromising quality, the first layer of chips may not be pre-coated and only the second layer of chips may be pre-coated for the purpose of visual satisfaction of the stakeholders.

REFERENCES

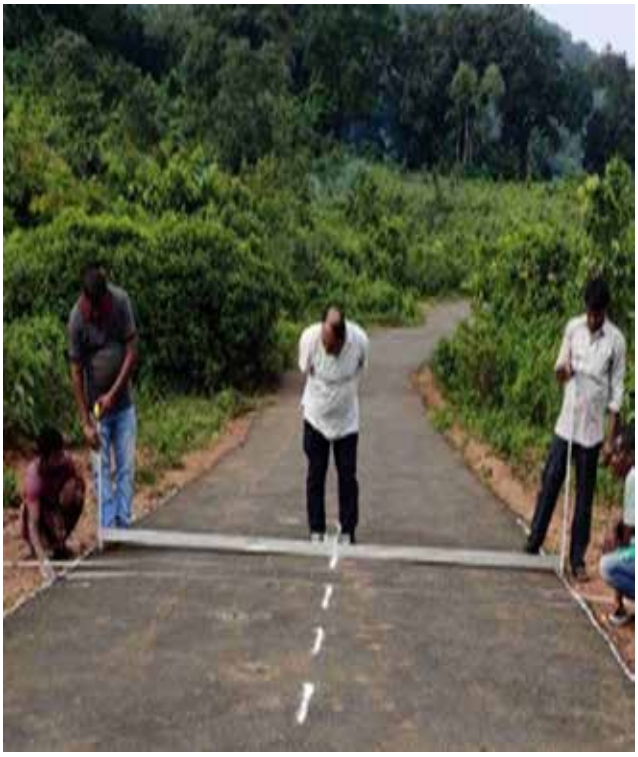
a. IRC:110-2005 "Standard Specifications and Code of Practice for Design & Construction of Surface Dressing".

b. IRC: SP-72-2015 "Guidelines for the Design of Flexible Pavements for Low Volume Rural Roads.

c. MoRD Book of Specification for Rural Road – 2014.

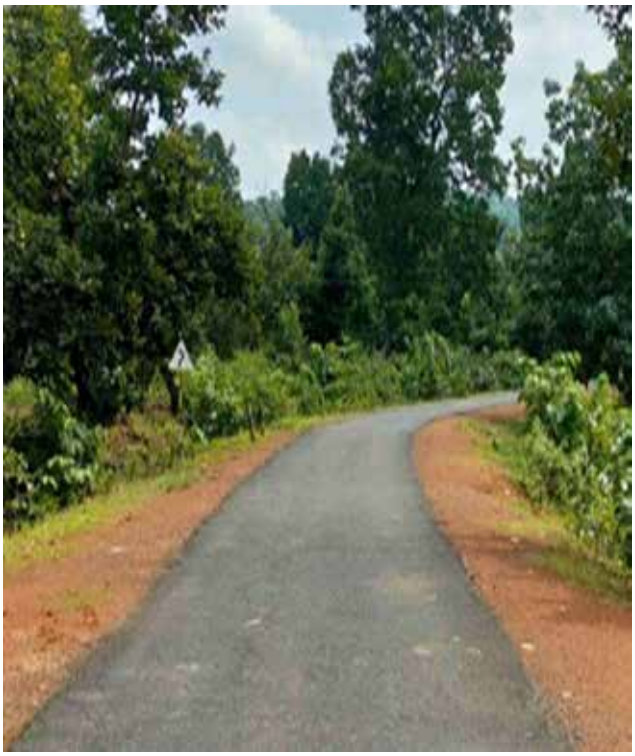
ANNEXURE A

OR10167 (L042- Ramchandrapur to Machhaguda)



OR20169 (L037- Mudulipada to Littamguda)

OR20172 (L039- Khairiput to Kenduguda)



OR20174 (L061- T2 Sh47 to Goudaput)

OR20215 (L028- Tarakapada to Gidmali)

OR20301 (L023- Godhiguda to Kandhaguda)

ANNEXURE B

First Coat of Surface Dressing using Bituminous (Penetration grade/modified bitumen) Binder (without pre-coating)				
Providing and laying surface dressing as wearing course consisting of a layer of bituminous binder laid on the prepared surface, followed by a cover of crushed stone aggregates of specified size and rolling with three-wheel 80-100 KN static roller including clearing the road surface as per Technical Specification Clause 507.				
Reference to MoRD Specification (5.6/507)				
By Mechanical Means				
Nominal chipping size 13.2 mm				
Taking output = 7500 sqm				
				Bitumen S-65
Description	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
a) Labour				
Mate	day	0.44	421.2	185.328
Mazdoor (Unskilled)	day	9	411.2	3700.8
Mazdoor (Skilled)	day	2	411.2	822.4
b) Machinery				
Hydraulic broom @ 1250 sqm per hour	hour	6	262	1572
Air compressor 210 cfm	hour	6	244.12	1464.72
Hydraulic self-propelled chip spreader @ 1500 sqm per hour	hour	6	1695	10170
Tipper 5.5, 10 t capacity for carriage of stone chips from stockpile on roadside to chip spreader	hour	6	213.5	1281
Front end loader 1 cum bucket capacity	hour	6	593	3558
Bitumen pressure distributor @1750 sqm per hour	hour	6	564	3384
Three wheel 80-100 KN static roller weight	hour	18.75	367	6881.25
c) Material				
Bitumen (S-65) @ 1.00 kg per sqm	t	7.5	35750.92	268131.9
Crushed stone chipping, 13.2 mm nominal size @ 0.010 cum per sqm	cum	75	1091.43	81857.25
(a+b+c)				383008.648
Overhead and Contractor Charges (d=12.5% of (a+b+c)				47876.081
Cost of 7500 sqm = a+b+c+d				430884.729
Rate per sqm = (a+b+c+d+e)/7500				**57.4512972**

Pre-Coating Chips (1st Layer)				
Pre-coating of chips with 1 % of paving bitumen by weight of chips in a suitable mixer duly heated to 160 degree C as per Technical Specification Clause 507.2.5.				
Unit = cum				
Taking output = 30 cum				
Description	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
a) Labour				
Mate	day	0.6	421.2	252.72
Mazdoor (Unskilled)	day	15	411.2	6168
b) Machinery				
bitumen boiler oil fired, capacity 1000 litre	hour	6	133	798
Mixall 6-10 t capacity	hour	6	169.5	1017
c) Material				
Bitumen @1 percent by weight of chips (30x1.6)/100	t	0.48	35750.92	17160.4416
(a+b+c)				25396.1616
Overhead and Contractor Charges (d=12.5% of (a+b+c)				3174.5202
Cost of 30 cum = a+b+c+d				28570.6818
Rate per cum = (a+b+c+d+e)/30				952.35606
Amount of pre-coating - Crushed stone chipping, 13.2 mm nominal size required for 7500 sqm surface dressing (cum)		75	952.3561	71426.7045
Rate per sqm				**9.5235606**
Rate of 1st coat of SD including Pre coating chips				**66.9748578**

Total Rate for Single Coat surface dressing with pre coating chips = Rs. 66.975/-

Second Coat of Surface Dressing using Bituminous (Penetrations grade / modified bitumen) Binder (without pre-coating)

Providing and laying surface dressing as wearing course consisting of a layer of bituminous binder laid on the prepared surface, followed by a cover of crushed stone aggregates of specified size and rolling with three-wheel 80-100 KN static roller including clearing the road surface as per Technical Specification Clause 507.

Reference to MoRD Specification (5.6 / 507)

By Mechanical Means

Nominal chipping size 9.5 mm

Taking output = 7500 sqm

Bitumen S-65

Description	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
a) Labour				
Mate	day	0.44	421.2	185.328
Mazdoor (Unskilled)	day	9	411.2	3700.8
Mazdoor (Skilled)	day	2	411.2	822.4
b) Machinery				
Hydraulic broom @ 1250 sqm per hour	hour	6	262	1572
Air compressor 210 cfm	hour	6	244.12	1464.72
Hydraulic self-propelled chip spreader @ 1500 sqm per hour	hour	6	1695	10170
Tipper 5.5 10 t capacity for carriage of stone chips from stockpile on roadside to chip spreader	hour	6	213.5	1281
Front end loader 1 cum bucket capacity	hour	6	593	3558
Bitumen pressure distributor @1750 sqm per hour	hour	6	564	3384
Three wheel 80-100 KN static roller weight	hour	15	367	5505
c) Material				
Bitumen (S-65) @ 1.00 kg per sqm	t	6.75	35750.92	241318.71
Crushed stone chipping, 9.5 mm nominal size @ 0.008 cum per sqm	cum	60	1091.43	65485.8
(a+b+c)				338447.758
Overhead and Contractor Charges (d=12.5% of (a+b+c)				42305.96975
Cost of 7500 sqm = a+b+c+d				380753.7278
Rate per sqm = (a+b+c+d+e)/7500				**50.7671637**

Pre-Coating Chips (2nd layer)				
Pre-coating of chips with 1 % of paving bitumen by weight of chips in a suitable mixer duly heated to 160 degree C as per Technical Specification Clause 507.2.5.				
Unit = cum				
Taking output = 30 cum				
Description	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
a) Labour				
Mate	day	0.6	421.2	252.72
Mazdoor (Unskilled)	day	15	411.2	6168
b) Machinery				
bitumen boiler oil fired, capacity 1000 litre	hour	6	133	798
Mixall 6-10 t capacity	hour	6	169.5	1017
c) Material				
Bitumen @1 percent by weight of chips (30x1.6)/100	t	0.48	35750.92	17160.4416
(a+b+c)				25396.1616
Overhead and Contractor Charges (d=12.5% of (a+b+c)				3174.5202
Cost of 30 cum = a+b+c+d				28570.6818
Rate per cum = (a+b+c+d+e)/30				952.35606
Amount of pre-coating - Crushed stone chipping, 9.5 mm nominal size required for 7500 sqm surface dressing (cum)		60	952.3561	57141.3636
Rate per sqm				**7.61884848**
Rate of 2nd coat of SD including pre coating chips				**58.38601218**

Total Rate for Two Coat surface dressing with the pre coating of both layers of chips = Rs. 125.361/- (66.975+ 58.386)

ANNEXURE C

20 mm thick Open-Graded Premix Carpet using Bituminous (penetration grade/modified bitumen) Binder				
Providing, laying and rolling of open-graded premix carpet of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregate either using penetration grade bitumen or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a three wheel 80-100 KN static roller capacity, finished to required level and grades to be followed by seal coat of either Type A or Type B or Type C as per Technical Specification Clause 508.				
Reference to MoRD Specification (5.9 / 508)				
By Mechanical Means				
Taking output = 4000 sqm (80 cum)				
				Bitumen S-65
Description	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
a) Labour				
Mate	day	0.52	421.2	219.024
Mazdoor (Unskilled)	day	10	411.2	4112
Mazdoor (Skilled)	day	3	411.2	1233.6
b) Machinery				
HMP 30/40 t per hour	hour	6	3881	23286
Electric generator set 125 KVA	hour	6	533.89	3203.34
Front end loader 1 cum bucket capacity	hour	6	593	3558
Tipper 5.5 10 t capacity	hour	3.64	213.5	777.14
Paver finisher	hour	6	745.75	4474.5
Three wheel 80-100 KN static roller	hour	16	367	5872
c) Material				
Bitumen (S-65) @ 14.60 kg per 10 sqm	t	5.84	35750.92	208785.3728
Crushed stone chipping, 13.2 mm to 5.6 mm @ 0.27 cum per 10 sqm	cum	108	1091.43	117874.44
(a+b+c)				373395.4168
Overhead and Contractor Charges (d=12.5% of (a+b+c)				46674.4271
Cost of 4000 sqm = a+b+c+d				420069.8439
Rate per sqm = (a+b+c+d)/4000				**105.01746**

Seal Coat (Type A)				
Providing and laying seal coat sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall using Type A as per Technical Specification Clause 510.				
Reference to MoRD Specification (5.12 / 510)				
By Mechanical Mean				
Taking output = 7500 sqm (67.5 cum)				
				Bitumen (S-65)
Description	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
a) Labour				
Mate	day	0.24	421.2	101.088
Mazdoor (Unskilled)	day	6	411.2	2467.2
b) Machinery				
Hydraulic self-propelled chips spreader	hour	6	1695	10170
Tipper 5.5 cum capacity	hour	6	213.5	1281
Front end loader 1 cum bucket capacity	hour	6	593	3558
Bitumen pressure distributor	hour	6	564	3384
Three wheel 80-100 KN static roller	hour	15	367	5505
c) Material				
Bitumen (S-65) @ 9.80 kg per 10 sqm	t	7.35	35750.92	262769.262
Crushed stone chipping of 6.7 mm size 100 per cent passing 11.2 mm sieve and retained on 2.36 mm sieve applied @ 0.09 cum per 10 sqm	cum	67.5	1072.86	72418.05
(a+b+c)				361653.6
Overhead and Contractor Charges (d=12.5% of (a+b+c)				45206.7
Cost of 7500 sqm = a+b+c+d				406860.3
Rate per sqm = (a+b+c+d)/7500				**54.24804**

Tack Coat				
Providing and applying tack coat with Bitumen emulsion (RS-1) using emulsion distributor at the rate of 0.25 to 0.30 kg per sqm on the prepared granular surfaces treated with primer & cleaned with Hydraulic broom as per Technical Specification Clause 503.				
Reference to MoRD Specification (5.2 / 503)				
Taking output = 1750 sqm				
Description	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
a) Labour				
Mate	day	0.04	421.2	16.848
Mazdoor (Unskilled)	day	1	411.2	411.2
b) Machinery				
Hydraulic broom @ 1250 sqm per hour	hour	1.4	262	366.8
Air compressor 210 cfm	hour	1.4	244.12	341.768
Emulsion pressure distributor @1750 sqm per hour	hour	1	564	564
c) Material				
Bitumen emulsion (RS-1) @ 0.275 kg per sqm	t	0.48	38093.92	18285.0816
(a+b+c)				19985.6976
Overhead and Contractor Charges (d=12.5% of (a+b+c)				2498.2122
Cost of 1750 sqm = a+b+c+d				22483.9098
Rate per sqm = (a+b+c+d)/1750				**12.84794**

Rate of OGPC + Seal coat + Tack Coat per sqm = Rs. 172.113/- (105.017 + 54.248 + 12.848)

NOTES

NOTES

Pradhan Mantri
Gram Sadak Yojana

National Rural Infrastructure Development Agency
15 NBCC Tower, 5th Floor, Bhikaji Cama Place
Rama Krishna Puram, New Delhi-110066
Tel: 011-26716930, 011-26716933, 011-26716936, 011-26716939 | Fax: (91)-011-26179555
Email: nrrda@pmgsy.nic.in | Web: www.pmgsy.nic.in