

# ANALYSIS ON DETERIORATION BEHAVIOUR OF FLEXIBLE PAVEMENT WITH POLYPROPYLENE FIBER

Nirbhay Pratap Vishwakarma<sup>1</sup>, Shivam Singh Patel<sup>2</sup>

<sup>1</sup>M.Tech (Civil Engineering with specialization in Highway Engineering) Scholar, Maharishi University of Information Technology, Lucknow

<sup>2</sup>Assistant Professor (Civil Engineering Department), Maharishi University of Information Technology, Lucknow Uttar Pradesh, India

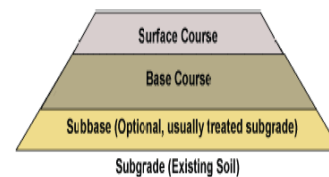
\*\*\*

**Abstract** - utilizing various types of filaments to improve the lead of asphalt isn't new these days. There are a few sorts of fiber materials are accessible in the market, for example, carbon fiber, glass fiber, polyester fiber, polypropylene fiber, and so on., Among these fiber materials we have choosed polypropylene fiber considering the way that the outcome of this undertaking exhibits that the reinforcing of adaptable asphalt with polypropylene fiber overhauls the overall execution of asphalt and the impact of asphalt when it is incompletely supplanted with polypropylene fiber and how the malleability esteem, entrance esteem, relaxing point esteem is differing by including 1%, 2%, 3%, 4%, 5% polypropylene fiber by changing bitumen. The current examination was completed to propose the utilization of polypropylene covered total in the adaptable asphalt so as to improve their presentation and physical properties. The primary point of our undertaking isn't just reinforcing the adaptable asphalt yet additionally improves the street life by diminishing the splits and way gaps.

**Key Words:** Flexible Pavement, Polypropylene Fibres, Bitumen, Aggregate, Fibres.

## 1. INTRODUCTION

A nation improvement relies upon the availability of better places with street systems. Streets assume significant job in the transportation of conveying products and travelers. India is a bigger nation where having colossal asset of materials. In the event that these assets are utilized appropriately, the expense of street development can be decreased. In India, there are 98% streets are having adaptable asphalts. There are parcel of investigates have been made by utilizing the Waste materials however the job of these materials is as yet restricted. As we realize that life and quality of the unbending asphalt is more than the adaptable asphalt. The expense of unbending of the asphalt is high when contrasted with adaptable asphalt. It is important to. The quality of the adaptable asphalt. So we are utilizing polypropylene fiber expand



## Polypropylene Fiber

It is a thermoplastic compound utilized for different applications in structural designing. It is made through the chain development of substance change of the monomer propylene. Synthetic recipe of polypropylene is  $(C_3H_6)_n$ . These filaments are utilized as a solid added substance to expand its quality and to decrease breaking. These strands are additionally used to deliver jugs and bunches of plastic things for clinical research center since they can withstand high temperature. In this task we are utilizing 6mm fiber length.

## 1.2 Physical Properties of Polypropylene Fiber

Table -1 : Physical Properties

Tensile strength (gf/den)	3.5 to 5.5
Elongation (%)	40 to 100
Abrasion resistance	Good
Moisture absorption (%)	0 to 0.05
Softening point (°C)	140
Melting point (°C)	165
Chemical resistance	Generally excellent
Relative density	0.91
Thermal conductivity	6.0 (with air as 1.0)
Electric insulation	Excellent
Resistance to mildew	Excellent

## 2. OBJECTIVE

- To increment the life and solidness of the adaptable asphalt.
- To increment the heap withstanding limit of the adaptable asphalt.
- To study the impact of asphalt when the bitumen is incompletely altered with the polypropylene fiber.
- To lead the different tests on regular bitumen and adjusted bitumen.
- To diminish the expense of adaptable asphalt development.

## 3. METHODOLY ADOPTED

- To direct the Standard tests for Conventional total and Nominal Bitumen.
- To use polypropylene fiber as added substance with total and test all the fundamental test boundaries.
- To use polypropylene fiber as added substance with bitumen and test all the fundamental test boundaries.

## 4. TESTS ON MATERIALS

The tests are directed on total and 60/70 evaluation bitumen.

### 4.1 AGGREGATE

Totals structure the significant segment of asphalt structure and they structure the prime materials used in asphalt development. Totals need to hold up under burdens happening because of the wheel masses on the asphalt and on a superficial level course they even need to oppose wear in view of rough activity of traffic.

**Table -2** Test on Conventional Aggregate

S.NO	NAME OF TEST	RESULTS	IS STANDARDS
1.	Aggregate Impact Value	25.1 %	Not exceed 30%
2.	Aggregate Crushing Value	5.9 %	< 10%
3.	Aggregate Abrasion Value	29.6 %	Max. 35%
4.	Specific Gravity Value	2.51	2.5 - 2.9

## 4.2 BITUMEN

Bitumen is a typical folio used in the adaptable asphalt development. It is primarily gotten as a remaining item in oil treatment facilities after higher portions like gas, petroleum, lamp oil, diesel, and so forth., are expelled. In this venture, we are utilized 60/70 evaluation bitumen.

**Table -3** Test on Nominal Bitumen

S.NO	NAME OF THE TESTS	RESULTS	SPECIFIED VALUES
1.	Penetration Test	60 mm	60-70 mm
2.	Softening Point Test	70 °C	Min 67 °C
3.	Ductility Test	45 cm	Min 40 cm

## 5. METHODS ADOPTED FOR ADDING POLYPROPYLENE FIBER

There are techniques embraced in the expansion of polypropylene fiber in the adaptable asphalt, for example,

- Wet Mix Process
- Dry Mix Process

### Wet Mix Process

In this procedure, the polypropylene fiber is mixed with hot bitumen at 160°C and afterward mixed viably. At that point the polypropylene fiber is blended in with the bitumen and adjusted bitumen is readied. This adjusted bitumen is done for leading tests.

### Dry Mix Process

In this procedure, the polypropylene fiber is mixed with the hot total at 160°C and blended completely. Polypropylene gets covered on the outside of total consistently, this is called as Poly coated total. This Poly coated total is completed for leading tests.

### 5.1 TEST ON POLYCOATED AGGREGATE

**Table -4** Test of Polycoated Aggregate

S.No	NAME OF TEST	1% P.P	2% P.P	3% P.P	4% P.P	5% P.P
1.	Aggregate Impact Value (%)	23.7	20.2	18.6	15.1	13.2
2.	Aggregate Crushing Value(%)	5.4	4.83	4.3	3.55	3
3.	Aggregate Abrasion Value (%)	28.8	28.1	27	22	20.6

5.2 TEST ON MODIFIED BITUMEN

Table -5 Test of Modified Bitumen

S.No	NAME OF TEST	1% P.P	2% P.P	3% P.P	4% P.P	5% P.P
1.	Penetration Test	51	49	28	14	10
2.	Softening Point Test, °C	75	90	102	110	120
3.	Ductility Test, cm	30	25	16	13	10



Fig -1: Ductility Test of Modified Bitumen

6. CONCLUSIONS

In view of the examination and exploratory information for the altered bitumen and polycoated total contrasted and ostensible bitumen and traditional total, the accompanying end can be drawn-

- i) The test results demonstrated that polypropylene fiber can be conventionally utilized as a modifier for the bituminous blend.
- ii) By the expansion of polypropylene fiber to the bitumen, the entrance esteem, mellowing point esteem is expanded and the malleability esteem is diminished when contrasted with the ostensible bitumen.
- iii) By the expansion of polypropylene fiber to the total, the physical properties like Aggregate Impact Value, Aggregate Abrasion Value, Aggregate Crushing Value of polycoated total were improved considerably when contrasted with traditional total.
- iv) The process is modest and eco-accommodating and it very well may be utilized viably in the generally frail stone total by making them nearly more grounded by giving reasonable plastic covering over it by the dry procedure strategy.
- v) This shows the utilization of polypropylene fiber will fortify the adaptable asphalt, expands the existence time frame and there will be less support for a significant stretch of time .

REFERENCES

[1] D Sri Harsha.K, Nikhil.M, "Incomplete Replacement of Bitumen with Glass Fiber in Flexible Pavement", International diary of structural building and innovation (IJCIET) Vol.8, Issue 4, April 2017.

[2] Apurva J Chavan, "Utilization of Plastic Waste in Flexible Pavement", International Journal of Application or Innovation in Engineering of Management Vol.2, Issue 4, April 2013.

[3] Prof.C.E.G.Justo, "Need for Some of the Road Improvement in Measures in Bangalore City" (2009).

[4] IRC,"Guidelines for the structure of adaptable asphalt", IRC: 37-1970 Indian Road Congress.

[5] ISI, "Indian Standard strategies for test for totals for concrete "IS: 2386, Indian Standars Institution.