



TC-6042

**Advanced Diagnostic Laboratory**  
Dr. Fixit Institute of Structural Protection and Rehabilitation  
Ramkrishna Mandir Road, Andheri (E),  
Mumbai-400 059, Phone: 28357822

**DR. FIXIT INSTITUTE**

OF STRUCTURAL PROTECTION & REHABILITATION

## TEST REPORT

Report No.	: TC604223000000641F	Date:	11/01/2024
Job Reference	: 2114		
Name & address of client	: National High Speed Rail Corporation Limited (NHSRCL)		
Engineer	: TCAP		
Customer Sample Reference	: Rock Boulder (Fine Aggregate Wash Sand, Ultramold Sand) Source: Kanchad Wada Palghar M/s Skoop Dredging & De-silting Pvt Ltd RFI No. : 0000000748		
Project	: Design and Construction of 135.450 km Long Viaduct (MAHSR Ch. +21.150 km- +156.600 km) including 3 stations (Thane, Virar, Boisar), Tunnels, Earth Structures And Maintenance Depot for MAHSR Project		
Date of Sample Received	: 26/12/2023		
Description of sample	: Rock Boulder		
Duration of testing	: 08/01/2024 to 11/01/2024		
Test Method Followed	: As per IS-2386: Part VIII-1963 (Reaffirmed 2021)		
Discipline	: Mechanical		
Group	: Building Material		



### 1.1 Sample detail

Approximately 15 Kg boulder sample was sent by M/s Kratos Concrete, Thane to Advanced Diagnostic Laboratory, Dr. Fixit Institute, Andheri (E), Mumbai for petrographic examination of rock boulders for aggregate as per IS 2386: Part VIII.

### 1.2 Visual/Macroscopic Observations

Rock boulders were observed to be dark grey coloured, fine grained, mafic volcanic igneous rock. The rock was identified to be basaltic rock. Rock particles were observed to be hard, mainly fresh to faintly weathered and dense. Surface texture was found to be crystalline (**Figure-1**). Any kind of organic coating was not





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found in the particles. In the one boulder (boulder marked as -2 in Figure-1) minor calcite minerals were observed.



**Figure-1:** Photograph showing particles of rock boulders with crystalline surface texture

### 1.3 Microscopic Observations

Two representative thin sections were prepared one from each boulder for microscopic observations. Microscopic analysis was performed under optical microscope using low to high magnification. Quantification (modal analysis) of the rock was done by using automatic point counter. Petrographic description of the basaltic rock particles is as follows.

**Petrography of boulder-1:** This is fresh basaltic rock in which minerals were identified to be plagioclase feldspar, clinopyroxene, altered mafic and opaque minerals (**Figure-2 A to C**). In the groundmass, lath shaped multi-oriented plagioclase feldspar grains were found to be most abundant and found uniformly distributed throughout the groundmass of the basaltic rock. Condition of plagioclase feldspar grains were observed to be in slightly altered condition. Minor alteration was observed along the margins and cleavage planes of plagioclase feldspar grains.





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Clinopyroxene grains were observed to be mostly in subhedral shaped and found uniformly distributed along with plagioclase feldspar. Condition of clinopyroxene grains were found to be mainly in slightly altered condition. Ophitic texture was commonly observed in the rock that is intergrowth texture between plagioclase and pyroxene.

Altered mafic grains were also observed in the rock. These grains were formed due to complete alteration of mafic grains particularly olivine grains were that were converted in chlorite grains. Opaque minerals were found cubic formed, randomly distributed throughout the rock. Grains were found to be mostly in slightly altered condition and mineral was identified to be iron oxide. Modal analysis of the groundmass of the rock is given **Table-1**.

**Table-1:** Modal analysis of groundmass of the fresh and faintly weathered basaltic rock

Mineralogy	Modal Analysis (Approximate %age)	Modal Analysis (Approximate %age)
	Fresh Basaltic Particles- Boulder-1	Faintly Weathered Basaltic Particles-Boulder-2
Plagioclase Feldspar	49	48
Clinopyroxene	38	36
Altered Mafic	04	07
Opaque	08	07
Others	01	02

**Petrography of Boulder-2:** In this rock boulder, in groundmass similar mineralogy and textural properties was found as in fresh basaltic rock (**Figure-2 D to F**). However, alteration in major minerals was observed more common than fresh rock boulder. Sericitization in plagioclase feldspar grains were commonly observed. Chloritization in the minerals were formed due to alteration of clinopyroxene minerals. Opaque minerals were minor and found mostly in altered condition. Minor calcite grains were also observed along the plagioclase phenocrysts as altered form. Plagioclase phenocrysts in the rock shows porphyritic texture. Modal analysis of the groundmass of the rock is given **Table-1**.





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## 2. Overall Evaluation

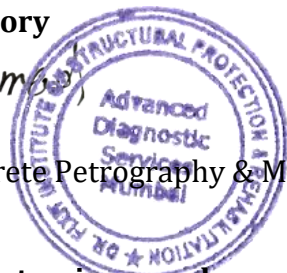
On the basis of mineralogy, textural characteristics, microstructures and modal analysis, the summary of overall evaluation is given in Table-2.

**Table-2: Summary of observations**

<b>Aggregate Type</b>	Rock boulder	
<b>Maximum Size</b>	NA	
<b>Particle Shape</b>	NA	
<b>Cementing Materials</b>	None	
<b>Rock Type</b>	Basaltic Rock of Basalt group of rocks as per Appendix-C of IS 383-2016.	
<b>Surface Texture</b>	Crystalline	
<b>Inorganic Coating</b>	Negligible	
<b>Organic Coating</b>	None	
<b>Deleterious Materials</b> (Strained quartz and other reactive minerals)	None	
<b>Expansive Mineral(s)</b>	None	
<b>Condition</b>	Fresh to Faintly Weathered	100%
	Slightly Weathered	None
	Highly Weathered	None
<b>General Comment</b>	Rock boulders were observed to be hard, fresh to faintly weathered and dense. Grains were well interlocked through intergrowth texture. Minor calcite grains were observed in boulder-2. Boulder-2 was observed to be in altered condition with tightly interlocked groundmass. Deleterious content was not found in both the rock boulders.	
<b>Concluding Remarks</b>	Overall, Rock boulders were found in “ <b>Satisfactory</b> ” condition as per petrographic examination. Rock boulders were found as chemically innocuous	

### Authorized Signatory

*Mashud Ahmad*  
Dr. Mashud Ahmad  
Section Head-Concrete Petrography & Microscopic Services



**Note: Enclosed Photomicrographs**





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**Remarks:**

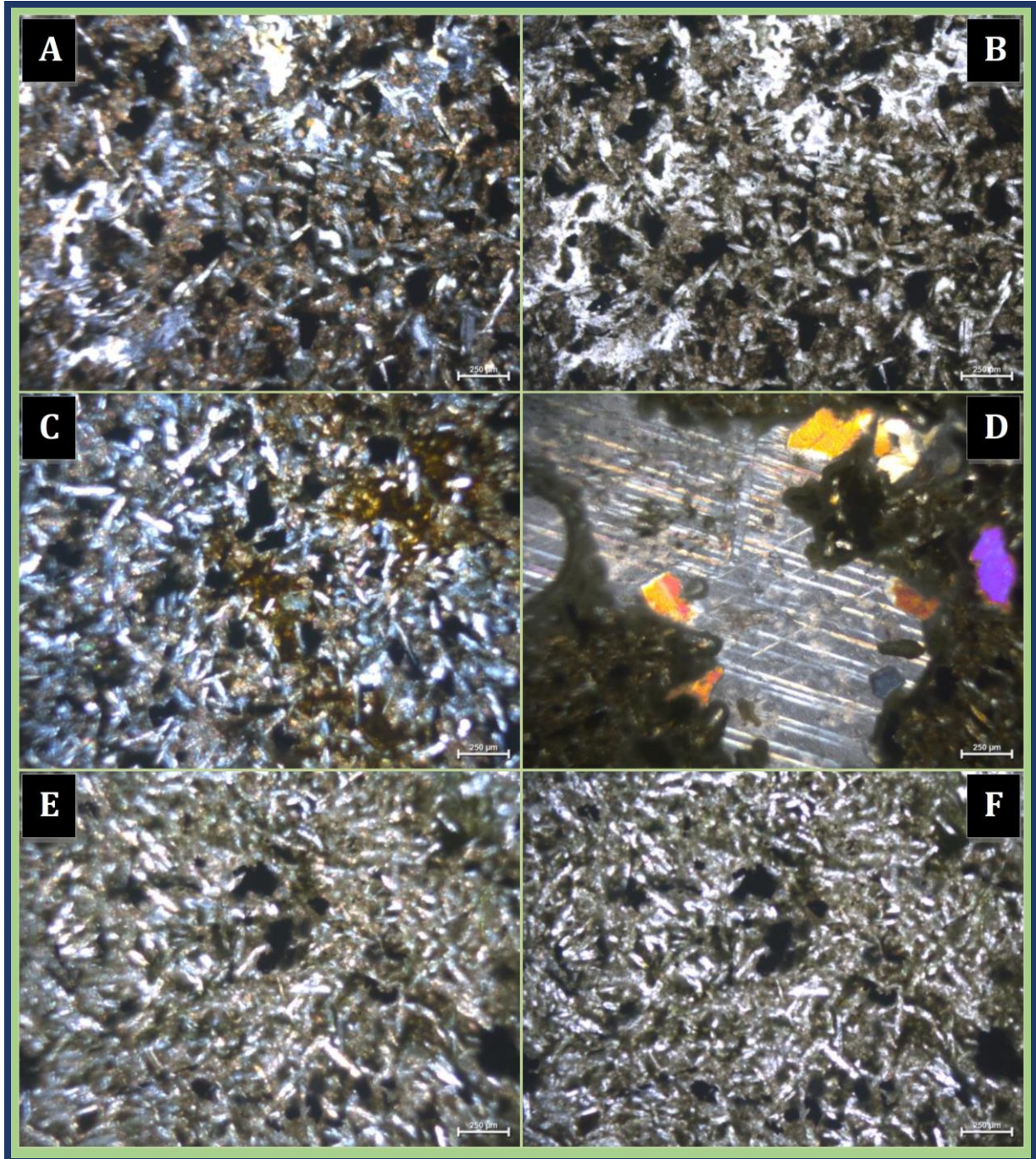
1. DFI-SPR has not drawn the sample and hence does not vouch for its representativeness. The report and comments refer only to the sample tested.
2. This petrographic report shall not be reproduced wholly or in part and cannot be used evidence in the court of law without written approval of Dr. Fixit Institute, Mumbai.





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## Photomicrographs



**Figure-2:** Photomicrographs of basaltic rock, **A to C)** Distribution of plagioclase feldspar, clinopyroxene, altered mafic and opaque minerals in the fresh basaltic rock (boulder-1) and **D to F)** Photomicrographs are showing Distribution of plagioclase feldspar, clinopyroxene, altered mafic and opaque minerals and plagioclase phenocrysts in the faintly weathered basaltic rock (boulder-2). (A, C, D, E & F: 5x, XPL and B: same photomicrograph as A in PPL). [XPL = Cross polarised light and PPL = Plane polarised light].

