

**BEFORE THE NATIONAL GREEN TRIBUNAL, PRINCIPAL
BENCH, NEW DELHI**
ORIGINAL APPLICATION NO. 304 OF 2019

3159

IN THE MATTER OF:

M. Haridasan

...Applicant

VERSUS

State of Kerala & Ors.

Respondent(s)

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VOLUME -5**

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20.	<u>ANNEXURE R-17</u> :- A Copy of the half yearly compliance Report for the period between April 2023 to September 2023.	3161-3263
21.	<u>ANNEXURE R-18</u> :- A copy of the Air Quality Monitoring Reports for a period between 03.10.2023-07.10.2023 at the Quarry Project Site.	3264
22.	<u>ANNEXURE R-19</u> :- A copy of the Air Quality Monitoring Reports for a period between 03.10.2023-07.10.2023 from distance of 1 Km from Quarry Site.	3265
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27.	ANNEXURE R-24 :- A copy of the Blasting Induced Noise and Vibration study report of Anna University for period 16.03.2021-17.03.2021.	3270-3408
28.	ANNEXURE R-25 :- A copy of the amended notification dated 22.6.2017 issued by KSPCB vide SRO No.346 of 2017.	3409-3420

FILED BY



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ADVOCATE FOR THE INTERVENOR/RESPONDENT-AVVPL
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NEW DELHI - 110 001
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PLACE: NEW DELHI
DATED: 05.12.2023

4. Royalty is payable to Government as per Rule 32 of the Kerala Minor Mineral Concession Rules, 2015 in respect of minor mineral quarried and moved out of the quarry subject to revision from time to time on the basis of amendments to the schedule I of the said Rules.
5. Dead rent is realizable under 40(1) (d) of the said rules subject to revision from time to time on the basis of amendments to the schedule II of the said rules.
6. Surface rent realizable under 40(1)(e) of the said rules will be equal to the land revenue assessed by the Revenue Department subject to revision from time to time on the basis of the land revenue.
7. The lessee shall also deposit an amount of Rs.24,706/- (Rupees twenty four thousand seven hundred and six only) being the security deposit at the rate of Rs.10,000/- per hectare as security deposit for the observance of the terms and conditions of the lease before the deed is executed as per rule 42 of the said rules
8. The lessee shall produce financial guarantee for Rs.7,41,180/- (Rupees seven lakh forty one thousand one hundred and eighty only) as stipulated in rule 62 of KMMC Rules 2015, before execution of lease deed.
9. The lessee shall pay tax related to Revenue Department, if any, as directed by them and the details should be furnished to the District Geologist periodically.
10. The lessee shall pay 10% of the amount of royalty/consolidated royalty as the case may be paid by them, being the District Mineral Foundation Trust Fund in addition to the royalty/ consolidated royalty, as per rule 63 of KMMC Rules, 2015.
11. In addition to the royalty, rents, funds, fees etc. that are required to be remitted by the lessee as per the Mines and Minerals (Development and Regulation) Act, 1957 and Rules made thereunder, the lessee shall pay all other fees, rents, taxes etc. as required by other agencies including Goods and Service Tax (GST) for royalty.
12. The quarrying shall be carried out as per the conditions stipulated in Kerala Minor Mineral Concession Rules 2015 and storage and transportation of mineral shall be carried out as per Kerala Minerals (Prevention of Illegal Mining, Storage and Transportation) Rules 2015.



13. The quarrying operations shall be strictly as per the approved mining plan and schemes of mining.
14. The lessee shall review the progressive quarry closure plan every five years from the date of opening of the quarry and shall submit to the competent authority for its approval. The lessee shall submit to the competent authority in this behalf an yearly report before 1st July of every year describing protective works including reclamation and rehabilitation work carried out as envisaged in the approved quarry closure plan and if there is any deviation, reasons thereof.
15. The lessee shall submit a scheme of mining for the next five years or remaining period of the lease to the competent authority for approval at least one hundred and twenty days before the expiry of the first five year period for which it was approved on the last occasion.
16. The lessee shall submit final quarry closure plan one year prior to the proposed closure of the quarry and close the quarry as per the approved quarry closure plan.
17. The production of Granite (Building Stone) from the area covered under this grant shall be subject to the year-wise quantity specified in the approved Mining Plan and Scheme of mining.
18. The lessee shall not win and dispose of any type of dimension and decorative stones from the area over which the quarrying lease has been sanctioned on the strength of this order.
19. The Lessee shall comply with any and all laws, ordinances, rules and orders related to quarrying operations of any and all governmental or quasi-governmental authorities.
20. The lessee shall comply with all the conditions mentioned in other statutory license required for carrying out quarrying operations.
21. The lessee shall stop all quarrying activities in the event of expiry of any other statutory licenses which is required for carrying out quarrying activities in the State as per the prevailing Acts and Rules. Any quarrying activity undertaken violating the above condition will be treated as illegal and lessee will be solely responsible for such act and lessee will be liable to pay the penalty imposed by any officer competent to enforce such Acts and Rules.
22. In case the lessee makes any breaches in the conditions of the lease deed or violates the conditions stipulated in relevant Act and Rules based on which all Statutory Licenses are



issued for quarrying, then the lessee will be solely responsible for any such breaches and violation and in such cases, the lessee will be solely liable to pay such sum of money as fixed by competent authorities as due and penalty.

23. The Lessee shall indemnify and keep indemnified the State Government against all actions, proceedings, suits, claims, demands, losses, damages, costs, charges, and expenses incurred or suffered by them as a reason of any non-observance or non-performance of rules and regulations.

24. This lease is granted in good faith based on the documents/licenses submitted by the lessee. The lessee is solely responsible for the authenticity of the documents / licenses submitted. At any stage, if it is observed that the documents submitted are incorrect or fake or forged or if it is found that some information was omitted or suppressed, then this lease is liable to be cancelled. In such an event the quarrying carried out with the strength of this lease will be treated as quarrying conducted without any lawful authority.

25. The lessee shall properly maintain the boundary pillars erected as per the demarcation certificate issued by the Village Officer till the expiry of lease.

26. The lessee shall erect a notice board in Malayalam at a prominent place with a minimum size of 1 meter x 1.5 meters in a metallic board near to the entrance of the quarry to the effect that it shall contain the name and address of the lessee, mineral concession number and date, validity of concession, the name of the mineral quarried, proposed annual production etc. In addition details of other statutory licenses shall be displayed.

27. The lessee shall erect by the side of the road leading to quarry (preferably 100 m away from quarry), a warning board with danger sign regarding operation of the quarry and use of explosives.

28. The lessee should take effective preventive measures for the safety of labourers as well as the general public. In due course of quarrying, if any part of the quarry become unsafe, then the lessee shall properly fence that area for preventing accidents by falling of human beings, animals, vehicles, or any objects into the pit formed by the quarrying.

29. The lessee shall not carry out any quarrying operations within 7.5 meters from the boundary of the lease area and quarrying operations shall be carried out in benches.

30. The lessee shall send a notice in form D appended to KMMC Rules 2015 to the Director (Mining), Directorate General of Mines Safety, No.5, 14th Main (100ft) Road, 4th B Block,



Koramangla, Bengaluru - 560034 and to the District Magistrate concerned before commencing the quarrying operation and shall intimate the same to the District office of the Department of Mining and Geology concerned.

31. The lessee shall keep book of accounts of production and dispatch of granite (building stone) and shall file monthly and annual returns in Form F and Form G appended to KMMC Rules 2015.

32. The quarrying permit granted from the district office, if any, in the area of this quarrying lease hereby stands cancelled from the date of this order.

33. In this case, the anticipated royalty to be remitted for the mineral extracted per year at the present rate of royalty of Rs.48/- per metric ton with an average annual production of 1,56,219 metric ton is 74,98,512/- (Rupees seventy four lakhs ninety eight thousand five hundred and twelve only). In this case, the surface rent to be remitted per year at the present rate of Rs.5 per Are per year is Rs.1235/- (Rupees one thousand two hundred and thirty five only) and in the event of non - functioning of quarry the Dead Rent to be realized for the 1st year - NIL; 2nd year - Rs.600/- (Rupees six hundred only) and 3rd year onwards - Rs.2,400/- (Rupees two thousand and four hundred only) per hectare subject to revision from time to time. The terms and conditions stated in this order will be subject to such further modifications as may be made by the State Government from time to time.



Signed by
Devidas N. IAS

Devidas N. IAS
DIRECTOR

Date: 25-04-2023 10:29:51

To:

M/s.Adani Vizhinjam Port Private Limited,

2nd floor, Vipanchika Tower, Thycaud,

Thiruvananthapuram District - 695014

(Represented by its Chief Executive Officer, **Shri.Rajesh Kumar Jha**)

Copy to:

- 1) The Director (Mining), Directorate General of Mines Safety, No.5, 14th Main (100ft) Road,4th B Block, Koramangla, Bengaluru- 560034
- 2) Member Secretary, SEIAA, Thampanoor Bus Terminal Complex,Thiruvananthapuram
- 3)The Chairman, SEIAA, Thampanoor Bus Terminal Complex

Thiruvananthapuram.

- 4) The Deputy Chief Controller of Explosives, PESO, C2-IIIFloor, CGO Complex, Kakkanad, Ernakulam
- 5) The Environmental Engineer, Kerala State Pollution Control Board, District Office, Thiruvananthapuram
- 6) The Secretary, Nagaroor Grama Panchayath, Thiruvananthapuram District.
- 7) The Tahsildar, Chirayinkeezh Taluk Office, Thiruvananthapuram District.
- 8) The Village officer, Nagaroor Village, Thiruvananthapuram District.
- 9) The Senior Geologist, District Office of the Dept. of Mining and Geology, Thiruvananthapuram
- 10) Stock File
- 11) File Copy



Rajesh

3166

**Annexure 11:
Explosive License for Magazine**



भारत सरकार | Government of India
वाणिज्य और उद्योग मंत्रालय | Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पेसो) | Petroleum & Explosives Safety Organisation (PESO)
पूर्व नाम- विस्फोटक विभाग | Formerly- Department of Explosives
केन्द्रीय भवन, ब्लाक सी-2, तीसरी मंजिल | Kendriya Bhavan, Block C-2, 3rd Floor
CSEZ पी.ओ.कक्कनाड कोच्ची | CSEZ PO Kakkanad Dist. Emakulam Ernakulam 682037
फोन (Phone):- 2427286 | फैक्स (Fax):- 2427276

संख्या (No.): E/SE/KL/22/331(E121778)

दिनांक (Date): 13/09/2022

सेवा में | To,

Shri RAJESH KUMAR JHA,
CEO, M/s. Adani Vizhinjam Port Pvt. Ltd. Floor No.2, Vpanchika Tower, Thycaud, Town/Village - Kottukul
District-THIRUVANANTHAPURAM, State-Kerala, Pincode - 695003

विषय: Survey No.117/15-1-2,117/13,117/14., ग्राम Kottukul, Neyyattinkara, जिला THIRUVANANTHAPURAM, राज्य Kerala में मेसर्स Shri RAJESH KUMAR JHA द्वारा विस्फोटक के मैगजीन में उपयोग के लिए कब्जा हेतु विस्फोटक नियम, 2008 के अंतर्गत LE-3 में जारी अनुज्ञापति सं E/SE/KL/22/331(E121778) के संशोधन संदर्भ में।
(औरखण / सुविधाएं / परिवर्तन)

Subject: Possession for Use of Explosives from magazine situated at Survey No.:117/15-1-2,117/13,117/14., Kottukul, Neyyattinkara, Dist. THIRUVANANTHAPURAM, Kerala - Licence No.: E/SE/KL/22/331(E121778) granted in Form LE-3 of Explosives Rules, 2008 - (Amendment in Drawings/Facilities/Premises).

महोदय | Sir,

आपका उपर्युक्त विषय पर पत्र संख्या Nil दिनांक 13/09/2022 का संदर्भ ग्रहण करें।
Please refer to your letter no. Nil dated 13/09/2022.

अनुज्ञापति संख्या E/SE/KL/22/331(E121778) (1.) INTIMATION REGARDING QUARRYING OPERATIONS AT BLOCK NO 29, R. SY. NO. 120/10 OF MANICKAL VILLAGE, NEDUMANGAD TALUK, THIRUVANANTHAPURAM DISTRICT, VIDE LETTER OF INDENT NO. 5219/M3/2019 DATED 27/02/2020 & BLOCK NO. 37, R. SY. NO. 554/1, 554/5, 554/6, OF NAGAROO VILLAGE, CHIRIYINKEEZHU TALUK, THIRUVANANTHAPURAM DISTRICT VIDE LETTER OF INDENT NO. 12118/M3/2018 DATED 23/11/2018 OF THE DIRECTORATE OF MINING & GEOLOGY, THIRUVANANTHAPURAM ARE HEREBY ACKNOWLEDGED AND THE ONLINE OFFICE RECORD IS UPDATED. (2.) NO USE OF EXPLOSIVES IS PERMITTED UNLESS VALID QUARRY PERMIT IS OBTAINED AND COPY SUBMITTED TO THIS OFFICE. LOCAL STATE GOVERNMENT AUTHORITIES APPROVAL/ENVIRONMENTAL CLEARANCE AS APPLICABLE AND RENEWED FROM TIME TO TIME SHALL BE IN POSSESSION (3.) LICENSED EXPLOSIVES VAN SHALL BE USED FOR TRANSPORTATION OF EXPLOSIVES FROM MAGAZINE TO BLASTING SITE. (4.) EXPLOSIVES AND DETONATORS SHALL NOT BE TRANSPORTED IN THE SAME VAN AND TO BE TRANSPORTED SEPARATELY FROM MAGAZINE TO THE BLASTING SITE. (5.) VAN SHALL NOT BE USED FOR STORAGE OF EXPLOSIVES AT SITE. (6.) IF ANY CHANGE OF QUARRY OR ADDITIONAL QUARRY IS INVOLVED, NECESSARY PRIOR APPROVAL/ENDORSEMENT SHALL BE OBTAINED FROM THE LICENSING AUTHORITY. (7.) OPENING OF QUARRY SHALL BE INFORMED TO THE DGMS AND BLASTING OPERATIONS SHALL BE CONDUCTED AS PER MINES ACT. (8.) APPROVED BLASTER SHALL BE APPOINTED IN THE QUARRY FOR BLASTING. (9.) ALL RECORDS OF USE OF EXPLOSIVES IN RE-3, RE-5, RE-7, RE-13 SHALL BE MAINTAINED. (10.) DAILY PASS FOR USE OF EXPLOSIVES (RE-13) SHALL BE GENERATED ONLINE. (11.) NECESSARY APPROVALS/LICENCES FROM OTHER DEPARTMENTS SHALL BE OBTAINED AS PER THE RULES के संदर्भ में यथा संशोधित कर भेजी जा रही है।

The Licence No.: E/SE/KL/22/331(E121778) is forwarded herewith duly amended in respect of followings :

(1.) INTIMATION REGARDING QUARRYING OPERATIONS AT BLOCK NO 29, R. SY. NO. 120/10 OF MANICKAL VILLAGE, NEDUMANGAD TALUK, THIRUVANANTHAPURAM DISTRICT, VIDE LETTER OF INDENT NO. 5219/M3/2019 DATED 27/02/2020 & BLOCK NO. 37, R. SY. NO. 554/1, 554/5, 554/6, OF NAGAROO VILLAGE, CHIRIYINKEEZHU TALUK, THIRUVANANTHAPURAM DISTRICT VIDE LETTER OF INDENT NO. 12118/M3/2018 DATED 23/11/2018 OF THE DIRECTORATE OF MINING & GEOLOGY, THIRUVANANTHAPURAM ARE HEREBY ACKNOWLEDGED AND THE ONLINE OFFICE RECORD IS UPDATED. (2.) NO USE OF EXPLOSIVES IS PERMITTED UNLESS VALID QUARRY PERMIT IS OBTAINED AND COPY SUBMITTED TO THIS OFFICE. LOCAL STATE GOVERNMENT AUTHORITIES APPROVAL/ENVIRONMENTAL CLEARANCE AS APPLICABLE AND RENEWED FROM TIME TO TIME SHALL BE IN POSSESSION (3.) LICENSED EXPLOSIVES VAN SHALL BE USED FOR TRANSPORTATION OF EXPLOSIVES FROM MAGAZINE TO BLASTING SITE. (4.) EXPLOSIVES AND DETONATORS SHALL NOT BE TRANSPORTED IN THE SAME VAN AND TO BE TRANSPORTED SEPARATELY FROM MAGAZINE TO THE BLASTING SITE. (5.) VAN SHALL NOT BE USED FOR STORAGE OF EXPLOSIVES AT SITE. (6.) IF ANY CHANGE OF QUARRY OR ADDITIONAL QUARRY IS INVOLVED, NECESSARY PRIOR APPROVAL/ENDORSEMENT SHALL BE OBTAINED FROM THE LICENSING AUTHORITY. (7.) OPENING OF QUARRY SHALL BE INFORMED TO THE DGMS AND BLASTING OPERATIONS SHALL BE CONDUCTED AS PER MINES ACT. (8.) APPROVED BLASTER SHALL BE APPOINTED IN THE QUARRY FOR BLASTING. (9.) ALL RECORDS OF USE OF EXPLOSIVES IN RE-3, RE-5, RE-7, RE-13 SHALL BE MAINTAINED. (10.) DAILY PASS FOR USE OF EXPLOSIVES (RE-13) SHALL BE GENERATED ONLINE. (11.) NECESSARY APPROVALS/LICENCES FROM OTHER DEPARTMENTS SHALL BE OBTAINED AS PER THE RULES.

किसी भी एक समय में ताइसेस क्षमता निम्नलिखित वर्ग तथा मात्रा से अधिक नहीं होगी।

The licence capacity at any one time shall not exceed the kinds and quantities mentioned below :

संख्या No	विस्फोटक Explosive(s)	वर्ग Class	प्रभाग Div	उप-प्रभाग Sub Div	क्षमता Capacity	इकाई Unit
1	Nitrate Mixture	2	0	0	500	Kg.
2	Electric Delay Detonators	6	3	0	10000	Nos.
3	Non Electric (Nonel) detonators	6	3	0	10000	Nos.

किसी एक कलेंडर मास में खरीदे जाने वाले विस्फोटक की मात्रा (अनुच्छेद 3 (ख) और (ग) के अधीन अनुज्ञापति के लिए लागू) : 5 गुना
Quantity of explosives to be purchased in a calendar month [applicable for licence under article 3(b) and (c)] : 5 times as above.

यह अनुज्ञापति दिनांक 31 मार्च 2026 तक प्रवृत्त रहेगी।
This Licence shall remain valid till 31st day of March 2026.

अनुज्ञापति के आगामी नवीकरण हेतु कृपया विस्फोटक नियम, 2008 के नियम 112 के अंतर्गत प्रक्रिया का पालन करें। कृपया पावती दें।
For further revalidation (if required), please follow the procedure under Rule 112 of Explosives Rules, 2008. Receipt of this letter may please be acknowledged.

भवदीय | Your's faithfully

(पी.के.राणा | Dr. P. K. Rana)

उप मुख्य विस्फोटक नियंत्रक | Deputy Chief Controller of Explosives

कोच्ची | Ernakulam

प्रतितिपि प्रेषित | Copy Forwarded to:

- District Magistrate, THIRUVANANTHAPURAM, Kerala with reference to his Noc No: DCTVM-2985/2019 Dated: 26/07/2021
- Superintendent of Police, THIRUVANANTHAPURAM, Kerala.

Rajesh

उप मुख् वलस्फोटक नलर्यत्रक | Deputy Chief Controller of Explosives
कोची | Ernakulam

(अधलक जानकारी जैसे आवेदन की स्थलतल, शुल्क आदल के तलए हमारी वेबसाइट <http://peso.gov.in> देखें.)
(For more information regarding status, fees and other details please visit our website <http://peso.gov.in>)

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.



Digitally signed by Dr. P. K. RANA
Reason: Licence No. : E/SE/KL/22/331
Location:Ernakulam [E121778]
Date:2022.09.13 05:48:22 +05:30

अनुज्ञप्ति प्ररूप एल. ई.-3 | LICENCE FORM LE-3

(विस्फोटक नियम, 2008 की अनुसूची 4 के भाग 1 के अनुच्छेद 3(क) से (घ) देखिए।)
(See article 3(a) to (d) of Part 1 of Schedule IV of Explosives Rules, 2008)(ग) उपयोग के लिए एक समय पर वर्ग 1,2,3,4,5 या वर्ग 7 के विस्फोटक या किसी मैगजीन में वर्ग 6 के विस्फोटक रखने के लिए अनुज्ञप्ति
Licence to possess : (c) for use,explosives of class 1, 2,3,4,5,6 or 7 in a magazine

अनुज्ञप्ति सं. (Licence No.) : E/SE/KL/22/331(E121778)

वार्षिक फीस रूपए (Annual Fee Rs): 2400/-



1. Licence is hereby granted to

Shri RAJESH KUMAR JHA (अधिभोगी / Occupier : Shri RAJESH KUMAR JHA), CEO, M/s. Adani Vizhinjam Port Pvt. Ltd. Floor No.2, Vipanchika Tower, Thycaud, Town/Village - Kottukal, District-THIRUVANANTHAPURAM, State-Kerala, Pincode - 695003

को अनुज्ञप्ति अनुदत्त की जाती है।

2. अनुज्ञप्तिधारी की प्रास्थिति। Status of licensee : Company

3. अनुज्ञप्ति निम्नलिखित प्रयोजनों के लिए विधिमन्य है।

Licence is valid only for the following purpose.

possess for use of Nitrate Mixture, Electric Delay Detonators, Non Electric (Nonel) detonators, - के उपयोग के लिए

4. अनुज्ञप्ति विस्फोटकों के निम्नलिखित किस्मों, प्रकार और मात्रा के लिए विधिमन्य है।

Licence is valid for the following kinds and quantity of explosives: -- (क) (a)

क्र Sr. No.	नाम और विवरण Name and Description	वर्ग और प्रभाग Class & Division	उप-प्रभाग Sub-division	मात्रा किसी एक समय में Quantity at any one time
1.	Nitrate Mixture	2,0	0	500 Kg.
2.	Electric Delay Detonators	6,3	0	10000Nos.
3.	Non Electric (Nonel) detonators	6,3	0	10000 Nos.

(ख) किसी एक कलेंडर मास में खरीदे जाने वाले विस्फोटक की मात्रा [अनुच्छेद 3(ख) और (ग) के अधीन अनुज्ञप्ति के लिए] 5 times as above.
(b) Quantity of explosives to be purchased in a calendar month [applicable for licence under article 3(b) and (c)] :

5. निम्नलिखित रेखाचित्र (रेखाचित्रों) से अनुज्ञप्त परिसर की पुष्टि होती है।

The licensed premises shall conform to the following drawing(s) :

रेखाचित्र क्र. (Drawing No.) E/SE/KL/22/331 (E121778)

दिनांक (Dated) 13/09/2022

6. अनुज्ञप्ति परिसर निम्नलिखित पते पर स्थित हैं। The licensed premises are situated at following address:

Survey No. 117/15-1-2, 117/13, 117/14, ग्राम (Town/Village) - Kottukal, Neyyattinkara पुलिस थाना (Police Station) : Thiruvananthapuram

जिला (District)	THIRUVANANTHAPURAM	राज्य (State)	Kerala	पिनकोड (Pincode)	695521
दूरभाष (Phone)	7752011111	ई. मेल (E-Mail)	rajesh.jha@adanl.com	फैक्स (Fax)	

7. अनुज्ञप्ति परिसर में निम्नलिखित सुविधाएं अंतर्विष्ट हैं।

The licensed premises consist of following facilities.

Two B type magazines fabricated by M/s. Industrial Explosives Pvt.Ltd. Nagpur

8. अनुज्ञप्ति समय - समय पर यथासंशोधित विस्फोटक अधिनियम, 1884 और उनके अधीन विरचित विस्फोटक नियम, 2004 के उपबंधों, शर्तों और अतिरिक्त शर्तों और निम्नलिखित उपाबंधों के अधीन रहते हुए अनुदत्त की जाती है।

The licence is granted subject to the provision of Explosives Act 1884 as amended from time to time and the Explosives Rules, 2004 framed there under and the conditions, additional conditions and the following Annexures.

1. उपर्युक्त क्रम सं. 5 में यथा कथित रेखाचित्र (स्थान, सन्निरमाण संबंधी और अन्य विवरण दर्शित करते हुए)।

Drawings (showing site, constructional and other details) as stated in serial No. 5 above.

2. अनुज्ञप्ति प्राधिकारी द्वारा हस्ताक्षरित इस अनुज्ञप्ति की शर्तों और अतिरिक्त शर्तों।

Conditions and Additional Conditions of this licence signed by the licensing authority.

3. दूरी प्ररूप DE-2 | Distance Form DE-2.

9. यह अनुज्ञप्ति तारीख 31 मार्च 2026 तक विधिमन्य रहेगी। This licence shall remain valid till 31st day of March 2026.

यह अनुज्ञप्ति, अधिनियम या उसके अधीन विरचित नियमों या अनुसूची V के भाग 4 के प्रति निर्दिष्ट सेट-VII के अधीन तथा उपवर्णित इस अनुज्ञप्ति की शर्तों का अधिकरण करने या यदि अनुज्ञप्त परिसर योजना या उससे संलग्न उपबंध में दर्शित विवरण के अनुरूप नहीं पाए जाने पर निलंबित या प्रतिसंहत की जा सकती है, जहां वह लागू हो।

This licence is liable to be suspended or revoked for any violation of the Act or Rules framed there under or the conditions of this licence as set forth under Set VIII, wherever applicable, referred to in Part 4 of Schedule V or if the licensed premises are not found conforming to the description shown in the plans and Annexure attached hereto.

तारीख | The Date - 13/09/2021

उप मुख्य विस्फोटक नियंत्रक | Dy. Chief Controller of Explosives
Ernakulam

Amendments :

• Amendment in Drawings/Facilities/Premises dated : 13/09/2022

नवीनीकरण के पृष्ठांकन के लिए स्थान
Space for Endorsement of Renewal

नवीकरण की तारीख Date of Renewal	समाप्ति की तारीख Date of Expiry	अनुज्ञापन प्राधिकारी के हस्ताक्षर और स्टाम्प Signature of licensing authority and stamp
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कानूनी चेतावनी : विस्फोटकों को गलत ढंग से चलाने या उनका दुरुपयोग विधि के अधीन गंभीर दंडिक अपराध होगा।
Statutory Warning : Mishandling and misuse of explosives shall constitute serious criminal offence under the law.

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Digitally signed by Dr. P.K. RANA
Reason: Licence No. : E/SE/KL/22/331
Location:Ernakulam [E121778]
Date:2022.09.13 05:48:37 +05:30

सेट VIII (Set VIII)

मैगजीन में वर्ग 1, 2, 3, 4, 5, 6, और 7 के विस्फोटकों को विक्री या प्रयोग हेतु रखने के लिए प्ररूप एल.ई. 3 (अनुच्छेद 3 (ख) से (ग)) में मुख्य विस्फोटक नियंत्रक या विस्फोटक नियंत्रक द्वारा प्रदान किए जाने वाले अनुज्ञापति सं. E/SE/KL/22/331 (E121778) की शर्तें निम्नलिखित हैं।
The following are the conditions of licence number E/SE/KL/22/331 (E121778) to possess for sale or use, explosives of Class 1, 2, 3, 4, 5, 6 and 7 in a magazine in Form LE-3 (articles 3(b) to (c)) granted by Chief controller of Explosives or Controller of Explosives.

- परिसर में किसी भी समय विस्फोटकों की मात्रा अनुज्ञापन पोष्य सामर्थ्य से अधिक नहीं होगी।
The quantity of explosives on the premises at any one time shall not exceed the licensable capacity.
- विस्फोटकों के भंडारण के लिए प्रयुक्त होने वाली मैगजीन अनुसूची III और अनुज्ञापति के उपाबंध में विनिर्दिष्ट सुरक्षा दूरी बनाए रखना होगा।
The magazine used for storage of explosives shall maintain safety distance specified in Schedule III and annexure to the licence.
- मैगजीन का प्रयोग उन सभी विस्फोटकों के, जो इस अनुज्ञापति में विनिर्दिष्ट हैं, रखे जाने के लिए और ऐसे रखे जाने से संबद्ध आधान या औजार या उपकरणों के रखे जाने के लिए ही किया जाएगा; अन्यथा नहीं।
The magazine shall be used only for keeping all explosives specified in this licence and of receptacles for, or tools or implements for work connected with the keeping of such explosives.
- पैकजों को खोलने का कार्य और विस्फोटकों को तोलने तथा पैक करने का कार्य मैगजीन में नहीं किया जाएगा।
The opening of packages and the weighing and packing of explosives shall not be carried on in the magazine.
- दो या दो से अधिक वर्णन के विस्फोटकों को, जिन्हें मैगजीन में रखे जाने की अनुज्ञा दी जा सकती है, मैगजीन में तभी रखे जाएंगे जब उनमें से प्रत्येक को, ऐसे पदार्थ या स्वरूप का कोई मध्यवर्ती विभाजक लगाकर या उनके बीच ऐसा मध्यवर्ती स्थान छोड़कर, परस्पर पृथक कर दिया जाए कि किसी वजह से विस्फोटक में लगने वाली आग या होने वाला विस्फोट किसी अन्य वर्णन के विस्फोटक तक न पहुंच सके: परंतु—
(घ) 2 (नाइट्रेट मिश्रण), वर्ग 3 (नाइट्रो यौगिक) के विभिन्न विस्फोटक, वर्ग 6 प्रथम प्रभाग के अंतर्गत आने वाले सुरक्षा पत्तीते और वर्ग 6 प्रभाग 2 के अंतर्गत आनेवाले विस्फोटक प्रेरक पत्तीते, जिनमें कोई खुला लोहा या इस्पात नहीं है, एक दूसरे के साथ बिना किसी मध्यवर्ती विभाजक या स्थायन के रखे जा सकते हैं।
(ङ) वर्ग 6 प्रभाग 3 के अंतर्गत आनेवाले विस्फोटक प्रेरक अलग रखे जाएंगे।
(च) वर्ग 1 के अंतर्गत आने वाले बारूद को अलग रखा जाएगा।
Two or more description or explosives which may be permitted to be kept in the magazine shall be kept only if they are separated from each other by an intervening partition of such substance or character, or by such intervening space, as will effectually prevent explosion or fire in the one communicating with the other; Provided that—
(d) the various explosives of Class 2 (nitrate-mixture), Class 3 (nitro-compound), safety fuses belonging to Class 6 Division 1 and detonating fuses belonging to Class 6 Division 2 as do not contain any exposed iron or steel, may be kept with each other without any intervening partition or space;
(e) Detonators belonging to Class 6 Division 3 shall be kept separately.
(f) Gun powder belonging to Class 1 shall be kept separately.
- वर्ग 3 (नाइट्रो यौगिक) के विस्फोटकों को, उनके विनिर्माण की तारीख से एक वर्ष बीत जाने के पश्चात सिवाय अनुज्ञापन प्राधिकारी की विशेष मंजूरी के मैगजीन में नहीं रखा जाएगा।
Explosives of Class 3 (nitro compound) shall not be kept in the magazine after the expiration of one year from the date of their manufacture except with the special sanction of licensing authority.
- वर्ग 3 (नाइट्रो यौगिक) के विस्फोटकों को, उनके विनिर्माण की तारीख से एक वर्ष बीत जाने के पश्चात मैगजीन में तभी रखा जाएगा जब कि किसी विस्फोटक नियंत्रक ने इसके लिए विशेष मंजूरी दे दी हो।
(i) जब ऐसी मंजूरी दे दी गई हो तो प्रत्येक निरीक्षण पर किसी विस्फोटक नियंत्रक से ऐसा लिखित प्रमाणपत्र अभिप्राप्त कर लिया जाए जिसमें दी गई मंजूरी के अंतर्गत आनेवाली अवधि दर्शित की गई हो और ऐसे प्रमाणपत्र के अनुज्ञापतिधारी अपने पास रखेगा और मांग की जाने पर प्रस्तुत करेगा।
(ii) जब कोई विस्फोटक मानक शुद्धता का न रह जाने के कारण या द्रवणीकरण या नाइट्रो ग्लिसरीन या द्रव नाइट्रो यौगिक के निकल जाने के चिन्ह प्रकट होने के कारण मैगजीन में भण्डारित किए जाने के उपयुक्त नहीं रह जाता है तो अनुज्ञापतिधारी अपने ही व्यय पर ऐसे विस्फोटक के निपटारे के लिए ऐसे निदेशों का अनुपातन करेगा जो मुख्य नियंत्रक या विस्फोटक नियंत्रक जारी करें।
Explosives of Class 3 (nitro compound) shall not be kept in the magazine after the expiration of one year from the date of their manufacture except with the special sanction of the Controller of Explosives.
(i) When such sanction has been given, a written certificate showing the period covered by the sanction shall be obtained from the Controller of Explosives at each inspection, and shall be kept by the licensee and produced on demand.
(ii) When an explosive owing to its being no longer of standard purity or owing to signs of liquefaction or of exuded nitro-glycerin or liquid nitro-glycerin or liquid nitro compound is no longer fit for storage in the magazine or store house the licensee shall comply, at his own expense, with such directions as to its disposal as the Chief Controller or Controller of Explosives may issue.
- मैगजीन के भीतरी भाग या उसमें लगी बेंचो, शेल्फों और उसकी फिटिंग का इस प्रकार सन्निर्माण किया जाएगा या उन्हें इस प्रकार अंतर्गत या अवतरित किया जाएगा कि विस्फोटक का किसी लोहे या इस्पात के साथ संपर्क रोका जा सके। भीतरी भाग में लगी बेंचो, शेल्फें और फिटिंग यथासाध्य ग्रिट से मुक्त एवं साफ रखे जाएंगे तथा ऐसे विस्फोटक, जो जल से खतरनाक रूप में प्रभावित हो सकते हैं, इस बावत सम्यक सावधानी बरती जाएगी कि वहां कोई जल मौजूद न रहे; परंतु किसी लोहे या इस्पात के खुले होने के विरुद्ध सावधानी से संबंधित इस शर्त का वह भाग ऐसे किसी भवन में बाध्यकर नहीं होगा जिसमें वर्ग 6 (गोला बारूद) के प्रथम के विस्फोटक से भिन्न कोई विस्फोटक रखा गया है।
The interior of the magazine and the benches, shelves and fittings therein shall be so constructed or so lined or covered as to prevent the exposure of any iron or steel contact with the explosives. Such interior, benches, shelves and fittings shall so far as is reasonably practicable, be kept free from grit and shall otherwise be clean; and in the case of any explosives liable to be dangerously affected by water, due precautions shall be taken to exclude water there from; Provided that so much of this condition as relates to precautions against the exposure of any iron or steel shall not be obligatory in a building in which no explosive other than explosive of the 1st Division 6th (Ammunition) Class is kept.
- यदि तडित चालक का परीक्षण विस्फोटक नियंत्रक करता है तो अनुज्ञापतिधारी ऐसे परीक्षण के लिए विहित फीस का संदाय करेगा यदि परीक्षण असमाधानकारी साबित होता है तो उतनी ही फीस अनुज्ञापतिधारी द्वारा पश्चात्तरी प्रत्येक परीक्षण के लिए तब तक दी जाती रहेगी जब तक कि परीक्षण अधिकारी तडित चालक को समाधानप्रद घोषित नहीं कर देता परंतु किसी एक परीक्षण के लिए देय फीस किसी एक दिन के दौरान किसी चालक के किए गए सभी परीक्षणों के लिए प्रभार्य होगा।
परंतु यह और कि यदि दो या अधिक तडित चालक एक ही मैगजीन से संबद्ध हैं तो ऐसे सभी चालकों के परीक्षण के लिए फीस ऐसी किसी फीस से अधिक नहीं होगी जो किसी एक तडित चालक के परीक्षण के लिए हर स्थिति में विहित की गई है।
If the lighting conductor is tested by the Controller of Explosives, the licensee shall pay the fees prescribed for test. In the event of the test proving unsatisfactory, the same fees shall be payable by the licensee for each subsequent test until the lighting conductor is passed by the testing officer as satisfactory: Provided that the fees payable for a single test shall be charged for all tests made on a conductor during any one day:
Provided further that where two or more lighting conductors are attached to one and the same magazine, the fee for the testing of all such conductors shall not exceed the fee prescribed in this condition for testing a single lighting conductor.
- उपयुक्त तथा जब रहित कार्यकरण वस्तु, उपयुक्त जूतों के प्रयोग द्वारा तथा तलाशी लेकर या अन्यथा अथवा ऐसे किन्हीं साधनों द्वारा इस बावत सम्यक उपबंध किया जाएगा कि फैक्ट्री परिसर में अग्नि, दियासलाई अथवा ऐसी कोई वस्तुएं या पदार्थ, जिससे विस्फोट हो सकता है या आग लग सकती हो, किन्तु इस शर्त के कारण ऐसी संरचना, स्थिति या स्वरूप में किसी कृत्रिम बत्ती का प्रवेश वर्जित नहीं है जिससे आग लगने या विस्फोट होने का खतरा न हो।
परंतु इस शर्त का वह भाग, जो लोहे या इस्पात के अपवर्जन को लागू होता है, ऐसे किसी भवन के संबंध में बाध्य कर नहीं होगा जिससे भिन्न कोई विस्फोटक नहीं रखा गया है।
Due provisions shall be made, by the use of suitable working clothes without pockets, suitable shoes and by searching or otherwise or by such means, for preventing the introduction into danger area of the factory premises of fire, Lucifer matches or any substance or article likely to cause explosion or fire, but this condition shall not prevent the introduction of an artificial light of such construction, position or character as not to cause any danger of fire or explosion: Provided that so much of this condition as applies to the exclusion of iron or steel, shall not be obligatory in a building in which no explosive other than an explosive of the 1st Division of the 6th (Ammunition) Class is kept.

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11. अनुज्ञापिधारी प्ररूप आर.ई.-3 और आर.ई.-4 या आर.ई.-5, जैसी स्थिति हो, में सभी विस्फोटकों का अभिलेख और लेखा रखेगा और विस्फोटक नियम, 2008 के अधीन प्राधिकृत किसी भी अधिकारी के समक्ष उसके द्वारा ऐसा करने की मांग की जाने पर स्टॉक पुस्तक और अभिलेख प्रस्तुत करेगा। स्टॉक पुस्तक विहित प्रोफार्मा में पृष्ठ संख्यांकित होगी।
The licensee shall keep records and accounts of all explosives in Forms RE-3 and RE-4 or RE-5, as the case may be, and exhibit the stock books and records to any of the officers authorised under the Explosives Rules, 2008 whenever such officer may call upon him to do so. The stock books in the prescribed proforma shall be page numbered.
12. परिसरों में कोई परिवर्तन या तबदीली अनुज्ञापन प्राधिकारी के पूर्वानुमोदन बिना नहीं की जाएगी और अनुज्ञापिधारी ऐसी किसी शर्त का अनुपालन करेगा जो इस निमित्त अनुज्ञापन प्राधिकारी विनिर्दिष्ट करे।
No changes or alterations shall be carried out to the premises without prior approval of the licensing authority and the licensee shall comply with any condition that may be specified by the licensing authority in this behalf.
13. मैगजीन सभी समयों पर अच्छी मरम्मत की स्थिति में बनाई रखी जाएगी (या अच्छी हालत में बनाई रखी जाएगी)। यदि किसी कारणवश किसी विस्फोटक के भण्डारण के लिए मैगजीन अनुपयुक्त हो जाती है तो अनुज्ञापिधारी इस बात की सूचना अनुज्ञापन प्राधिकारी को तुरंत देगा।
Magazine shall at all times be kept in state of good repair (or maintained in good condition). The licensee shall report to licensing authority forthwith, if the magazine becomes unfit for storage of any explosives for any reason whatsoever.
मैगजीन का अनुज्ञापिधारी इन नियमों के नियम 24 के उप-नियम 3 के अनुसार त्रैमासिक विवरणी प्रस्तुत करेगा।
The licensee of the magazine shall submit quarterly return as per sub-rules (3) and (4) of rule 24 of these rules.
14. यदि सुरक्षा दूरी का कोई अधिक्रमण होता है तो उसकी सूचना अनुज्ञापन प्राधिकारी को आवश्यक सलाह और कार्यवाही के लिए तुरंत दी जाएगी।
Any encroachment of the safety distance shall be immediately communicated to the licensing authority for necessary advice and action.
15. यदि कोई विस्फोटक विनष्ट हुआ अथवा अनुपयोगी जाया जाता है तो उसकी सूचना अनुज्ञापन प्राधिकारी को, सलाह प्राप्त करने के लिए, तुरंत दी जाएगी।
The licensing authority shall be immediately informed for advice if any explosive is found deteriorated or unserviceable.
16. विस्फोटकों के पैकेटों के चूड़े इस प्रकार लगाए जाएंगे कि कम से कम एक व्यक्ति भण्डार किए गए सभी पैकेजों की हालत की जांच करने और प्रत्येक पैकेज की विनिर्माण विशेषियों को पढ़ने के लिए उनके बीच से होकर आ जा सके।
The explosive packages shall be stocked in such a way so as to allow movement of at least one person to check the condition of all packages stored and to read the manufacture particulars of each package.
तड़ित चालकों की भूमि के लिए प्रतिरोध यथासंभव न्यूनतम होगा और किसी भी दशा में 10 ओह्म से अधिक नहीं होगा।
The resistance of the lightning conductor to earth shall be as low as possible and in no case be more than 10 ohms.
17. मैगजीन के चारों ओर 15 मीटर की दूरी के अंतर्गत कोई शुल्क घास या झाड़ी या ज्वलनशील सामग्री नहीं रहने दी जाएगी।
A distance of 15 meters surrounding the magazine or store house shall be kept clear of dried grass or bush or flammable materials.
18. विस्फोटकों के प्रत्येक पैकेट की, जब उसे मैगजीन के भीतर लिया जा रहा हो, ठीक दशा जानने के लिए परीक्षा की जाएगी।
Every package of explosive at the time of bringing inside the magazine shall be examined for its sound condition.
19. किसी मैगजीन/भंडारगृह में किसी एक समय में चार व्यक्तियों से अधिक को नहीं रहने दिया जाएगा।
Not more than 4 persons shall be allowed inside the magazine or store house at any one time.
20. विस्फोटकों के खाली पैकेजों को शीघ्रतः वहां से हटा दिया जाएगा और नष्ट कर दिया जाएगा।
Empty packages of the explosives shall be removed at the earliest and destroyed.
21. अनुज्ञापिधारी और कर्मचारियों को परिसर के भीतर आपातकाल के दौरान की जाने वाली प्रक्रियाओं से अवगत होना चाहिए।
The licensee and the employee shall be conversant with procedure to be taken during the emergency within the premises.
22. निरीक्षण या नमूना अधिकारी को सभी युक्तियुक्त समयों पर अनुज्ञापन परिसर में अबाध रूप से पहुंचने दिया जाएगा और यह सुनिश्चित करने के लिए कि अधिनियम और इन नियमों के उपबंधों और सुरक्षा स्थितियों को सम्यक्तः अनुपालन किया जा रहा है, अधिकारी को प्रत्येक सुविधा प्रदान की जाएगी।
Free access to the licensed premises shall be given at all reasonable times to any inspecting or sampling officer and every facility shall be afforded to the officer for ascertaining that the provisions of the Act and these rules and the safety conditions are duly observed.
23. यदि अनुज्ञापन प्राधिकारी या विस्फोटक नियंत्रक अनुज्ञापिधारी को अनुज्ञापन परिसरों या मशीनरी, टूल या उपकरण में ऐसी कोई मरम्मत या परिवर्तन या परिवर्तन करने या सिफारिशों को लागू करने को लिखित रूप में सूचित करता है जो परिसर के अंदर या बाहर या व्यक्तियों की सुरक्षा के लिए आवश्यक है, अनुज्ञापिधारी सिफारिशों को निष्पादित करेगा और विनिर्दिष्ट अवधि के भीतर अनुपालन रिपोर्ट ऐसे प्राधिकारी को देगा।
If the licensing authority or a Controller of Explosives informs in writing, the holder of the licence to execute any repairs or to make any additions or alterations to the licensed premises or machinery, tools or apparatus or carry out recommendations, which are in the opinion of such authority may pose unacceptable risk and so necessary for the safety of either on-site or off-site of the premises or persons, the holder of the licence shall execute the recommendations and report compliance within the period specified by such authority.
24. अनुज्ञापिधारी मैगजीन में रखने और बिक्री के लिए प्राधिकृत विस्फोटक सूची में उल्लिखित अनुज्ञापन फैक्टरी या कंपनी से प्राधिकृत विस्फोटक / आतिशबाजी या सुरक्षा पल्लो खरीदेगा।
The licensee shall purchase authorised explosives/ fireworks or safety fuse as mentioned in the list authorised explosives from a licensed factory or company for possession and sale from the magazine.
25. निम्न से अधिक ध्वनि स्तर उत्पन्न करने वाले आतिशबाजियों पटाखों की बिक्री और रखने के लिए –
(क) जो फटने की जगह से चार मीटर की दूरी पर है, 125 डी.बी.(ए1) या 145 डी. बी.सी.पी.के. प्रतिबंधित होंगे;
(ख) श्रृंखला (जुड़े हुए पटाख) को गठन करने वाले व्यक्तिगत पटाखों के लिए उपर्युक्त उल्लिखित सीमा 5 लॉग₁₀(N) डी.बी. (सी) पी.के. प्रतिबंधित होंगे;
The possession and sale of fire-crackers generating noise level exceeding;
a) 125 dB(A) or 145 dB(C)pk at 4 meters distance from the point of bursting shall be prohibited;
b) For individual fire-cracker constituting the series (joined fire-crackers), the above mentioned limit be reduced by 5 log₁₀(N) dB, where N = number of crackers joined together.
26. आग या विस्फोट द्वारा दुर्घटना या नुकसान पटाखों की कमी या चोरी, तुरंत पास के पुलिस थाने और अनुज्ञापन प्राधिकारी और अनुज्ञापन प्राधिकारी के स्थानीय कार्यालय को रिपोर्ट की जाएगी।
Accidents by fire or explosion and losses, shurtage or theft of explosives shall be immediately reported to the nearest police station and the licensing authority and local office of the licensing authority.

अतिरिक्त शर्तें / Additional Conditions :

1. अनुज्ञापिधारी विदेशी मूल के आतिशबाजी को न प्रदर्शित करेगा, न रखेगा और न ही उसकी बिक्री करेगा। The licensee shall not exhibit, possess and sell fireworks of foreign origin.

कृते उप मुख्य विस्फोटक नियंत्रक
For Dy. Chief Controller of Explosives
एरणकुलम | Ernakulam

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Digitally signed by Dr. P. K. RANA
Reason: Licence No. : E/SE/KL/22/331
Location:Ernakulam [E121778]
Date:2022.09.13 05:48:51 +05:30

Form DE-2

(See rule 113 of the Explosives Rules, 2008)
(Distance Form to be attached to the licence)

Safety distances required to be kept clear around magazine for high explosives or fire works or factory licence number E/SE/KL/22/331(E121778) in form LE-3 granted to Shri RAJESH KUMAR JHA, CEO, M/s.Adani Vizhinjam Port Pvt. Ltd. Floor No.2, Vipanchika Tower,Thycaud, Kerala-695521 .

Type of Structure(s)	Safety distances meters	
	M	UM
Inside Safety Distances(ISD)		
1 Room or Workshop used in Connection with the Magazine	19	29
2 Any other Explosives Magazine or store House or Factory of the Applicant		
3 Magazine Office		
Middle Safety Distances(MSD)		
4 Magazine Keeper`s or Chowkidar`s Dwelling house		
5 Railway including Minerals and Private Railways		
6 Canal (in active use) or other navigable water		
7 Dock or Pier or Jetty		
8 Public Highway or Public Road		48
9 Private Road which is PRINCIPAL means of access to a Temple, Mosque, Church, Gurudwara or other places of worships, Hospital, College, School or Factory		
10 River Embankment or Sea Embankment or Public Well		
11 Reservoir or Bounded tank/rope way		
12 Windmillor or Solar panel for Power Generation		
Outside Safety Distances(OSD)		
13 Dwelling House		
14 Govt. and Public Building		
15 Temple, Mosque, Church or Gurudwara or other Places of Worships		
16 Shops, Market place, Public recreation and Sports Ground, College, School, Hospital, Theater, Cinema or other Building where the public are accustomed to assemble		
17 Factory		
18 Buildings or Works used for the Storage in Bulk of Petroleum, Sprit, gas, or other inflammable or hazardous substances		95
19 Building or Works used for Storage and Manufacture of Explosives or of articles which contain Explosives		
20 Aerodrome		
21 Furnace, Kiln or Chimney		
22 Quarry or mine pit head		
23 Power House or Electric Substation		
24 Wireless Station		
25 Warehouse or other Storage Building		
26 Any other Protected works		
Overhead Electric lines		
27 Electric Power over head Transmission Lines above 440V		90
28 Electric Power over head Transmission Lines upto 440V		15

The Date : 13/09/2021

For Dy. Chief Controller of Explosives
Ernakulam

Amendments :

- Amendment in Drawings/Facilities/Premises dated : 13/09/2022

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Digitally signed by Dr. P .K. RANA
Reason: Licence No. : E/SE/KL/22/331
Locallon:Ernakulam [E121778]
Date:2022.09.13 05:49:06 +05:30

**Annexure 12:
Explosive Van License for Van 1 and
Van 2**

3174

KL01CP2414 Explosives Van
License



GOVERNMENT OF INDIA
MINISTRY OF COMMERCE & INDUSTRY
PETROLEUM AND EXPLOSIVES SAFETY ORGANISATION(PESO)
(Formerly Department of Explosives)
Kendriya Bhavan, Block C-2, 3rd Floor
CSEZ PO Kakkanad Dist. Ernakulam Ernakulam 682037
Tele: 2427286 Fax: 2427276
Email: dycceernakulam@explosives.gov.in

ANNEXURE No:

20

No E/SE/KL/25/99(E135886)

Dated : 22/09/2021

To,
Ms. ADANI VIZHINJAM PORT PVT LTD.,
3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram
Town/Village - Thiruvananthapuram
Distt. THIRUVANANTHAPURAM, State. Kerala. Pincode-695003

Subject: Road Van for the carriage of Explosives - Registration No KL01CP2414 Licence No.:E/SE/KL/25/99(E135886) granted in Form LE-7 under Explosives Rules, 2008 -Endorsement regarding -Endorsement of Licence.

Sir(s),

Reference memo No.: E/SE/KL/25/99(E135886) Dated 22/09/2021 from Dy. Chief Controller of Explosives, Ernakulam and inspection of the subject premises by an officer of this organization on 03/09/2021.

The subject licence No. E/SE/KL/25/99(E135886) valid upto 31st March 2026 duly endorsed is forwarded herewith.

For further renewal of licence, please submit following documents so as to reach this office on or before 31/03/2026.

- Application in Form RE-1 duly filled in and signed.
- Licence fees renewable for one to five years, to be submitted online through e-payment facility available on online application portal under the Explosives Rules, 2008.
- Original licence with approved plan.
- In this connection, please also refer to Rule 112 of Explosives Rules, 2008.

Please follow following instructions strictly:

1. The records of explosives transported by the licenced Roadvan shall be maintained in the proforma RE-6 under Part 5 of schedule V of Explosives Rules 2008.
2. Please ensure that persons whose antecedents verified by the local Police shall only be employed with the licenced explosives roadvan/compressor mounded truck as drivers or cleaners. List of such drivers and cleaner's alongwith the personal particulars shall be made available to the local police in advance. The re-verification of such staff shall also be made at least once in a year in compliance to Rule 61(3) of Explosives Rules 2008.
3. Please note that during transportation of explosives, the Roadvan shall always be attended to by two armed guards. If the consignment of explosives is likely to pass through sensitive areas notified by Ministry of Home Affairs, it should be escorted by armed Police escort / guard provided by District Police Administration as required in Rule 67(7) of Explosives Rules 2008.

Yours faithfully,

(Dr. R.Venugopal)
Deputy Chief Controller of Explosives
Ernakulam

Copy Forwarded to:

1. District Magistrate, THIRUVANANTHAPURAM, Kerala with reference to his Noc No: E/KL/TVM/NA/1(N8) Dated: 26/07/2021.

Deputy Chief Controller of Explosives
Ernakulam

[For more information regarding status, fees and other details, please visit our web site <http://explosives.gov.in>]

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Rafel



GOVERNMENT OF INDIA
 MINISTRY OF COMMERCE & INDUSTRY
 PETROLEUM AND EXPLOSIVES SAFETY ORGANISATION (PESO)
 (Formerly Department of Explosives)
 Kendriya Bhavan, Block C-2, 3rd Floor
 CSEZ PO Kakkannad Dist. Ernakulam Ernakulam 682037
 Tele: 2427286 Fax: 2427276

No.: E/SE/KL/25/99(E135886)

Dated: 22/09/2021

MEMORANDUM

Subject: Road Van for the carriage of Explosives - Registration No KL01CP2414 of M/s. ADANI VIZHINJAM PORT PVT LTD., 3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram, Distt. THIRUVANANTHAPURAM, State. Kerala - Grant of Licence.

Two copies of Licence No.: E/SE/KL/25/99(E135886) granted to M/s. ADANI VIZHINJAM PORT PVT LTD., Survey No. 117/15-1, 117/15-2, 117/14, 117/13, Kottukal Vill, THIRUVANANTHAPURAM, Kerala for the period ending 31st March 31/03/2026 to transport Explosives by Road Van between SY NO. 117/15-1, 117/15-2, 117/14, 117/13, KOTTUKAL (V), NEYYATINKKARA (TK), THIRUVANANTHAPURAM DT. TO KADAVILA-1 STONE QUARRY AT SY NO. 555/2, NAGARO are forwarded herewith to this office, with the request that if he is satisfied that all the conditions prescribed in the licence have been complied with, the original copy of the same be endorsed and forwarded to the licensee directly with an intimation to the District Magistrate, THIRUVANANTHAPURAM, Kerala and this office, retaining the other copy of the licence for his office record. If, however, he decides not to endorse the licence he shall immediately return the same to this office together with a statement of his reasons for not endorsing the licence, not later than three months.

(Dr. R. Venugopal)
 Deputy Chief Controller of Explosives

To,
 this office

Copy Forwarded to:

1. M/s. ADANI VIZHINJAM PORT PVT LTD., 3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram, Distt. THIRUVANANTHAPURAM, State. Kerala - 695003 with reference to their application dated 22/09/2021. The Vehicle shall not be taken into use unless inspected by an officer and licence duly endorsed under Rule 107(3) of Explosives Rules 2008

The records of explosives transported by the licenced Roadvan shall be maintained in the proforma RE-6 under Part 5 of schedule V of Explosives Rules 2008.

Please ensure that persons who are antecedents verified by the local Police only shall be employed with the licenced explosives roadvan/compressor mounded truck as drivers or cleaners. List of such drivers and cleaner's alongwith the personal particulars shall be made available to the local police in advance. The re-verification of such staff shall also be made at least once in a year in compliance to Rule 63 (3) of Explosives Rules 2008.

For further renewal please submit the following documents so as to reach this office on or before 31/03/2026.

- o Application in RE-1 duly filled in and signed.
 - o Licence fees renewable for one to five years, to be submitted online through e-payment facility available on online application portal under the Explosives Rules, 2008.
 - o Original licence with approved plan.
 - o In this connection, please also refer to Rule 112 of Explosives Rules 2008.
2. Superintendent of Police, THIRUVANANTHAPURAM, Kerala
 A copy of Licence along with approved plan is enclosed for his office record.

Deputy Chief Controller of Explosives
 Ernakulam

[For more information regarding status, fees and other details, please visit our web site <http://peso.gov.in>]

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Rajesh

अनुज्ञापि प्ररूप एलई - 7 | LICENCE FORM LE-7
(विस्फोटक नियम 2008 की अनुसूची 4 के भाग 1 का अनुच्छेद 7 देखें)
(See article no 7 of Part 1 of Schedule IV of Explosives Rules, 2008)

अनुज्ञापि : सडक वैन में विस्फोटकों के परिवहन के लिए
Licence to : transport explosives in a road van



अनुज्ञापि संख्या / Licence No. : E/SE/KL/25/99(E135886)
वार्षिक फीस रूपए / Annual Fee Rs : 2500/-

अनुज्ञापि प्रष्टांकित
LICENCE ENDORSED

D. C. E. Ernakulam
उ. म. वि. नि. एरनाकुलम

- अनुज्ञापि एतदद्वारा जारी की जाती है
Licence is hereby granted to : **M/s.ADANI VIZHINJAM PORT PVT LTD., (Occupier : Rajesh Kumar Jha)**
3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram,
District-THIRUVANANTHAPURAM, State-Kerala, Pincode-695003
- अनुज्ञापिधारी की प्रास्थिति / Status of licensee : **Company**
- सडक वैन की विशिष्टियाँ / Particulars of the road van:

पंजीकरण संख्या / Registration No.	KL01CP2414
यान का मेक एवं मॉडल / Make and model of vehicle	TATA SFC 407 EX/31 HT BS IV
लदान रहित वजन / Unladen weight	2950 Kg(s)
लदान सहित अधिकतम वजन / Maximum laden weight	6250 Kg(s)
परिवहन के लिए अनुज्ञेय विस्फोटकों की अधिकतम मात्रा Maximum quantity of explosives permitted for transport	3300 Kg(s)
इंजिन संख्या / Engine No.	4SPCR11EYPY621445
चैसिस संख्या / Chassis No.	MAT505242K8E10649
अन्य फिटिंग्स का विवरण / Description of Other Fittings	
वाहन के लिए अनुमत्य विस्फोटकों की मात्रा / Quantity of Explosives permitted to carry	3300 Kg(s)

- अनुज्ञापि परिसर निम्नलिखित आरेखण (आरेखणों) के अनुरूप होना चाहिए / The licensed premises shall conform to the following drawing(s):
आरेखण संख्या / Drawing No : E/SE/KL/25/99(E135886) दिनांक / dated : 22/09/2021
- समय समय पर यथा संशोधित विस्फोटक अधिनियम, 1884 और उसके अधीन बनाए गए विस्फोटक नियम, 2008 के उपबन्धों और शर्तों एवं निम्नलिखित अनुलग्नकों के अधीन अनुज्ञापि प्रदान की जाती है।
The licence is granted subject to the provision of Explosives Act 1884 as amended from time to time and the Explosives Rules, 2008 framed thereunder and the conditions and the following annexures....
(क) उपर्युक्त क्रम संख्या 4 में यथाकथित सडक वैन का आरेखण / (a) Drawings of the road van as stated in serial no.4 above.
(ख) अनुज्ञापन प्राधिकारी द्वारा हस्ताक्षरित शर्तें / (b) Conditions signed by the licensing authority.
- यह अनुज्ञापि तारीख 31 मार्च 2026 तक विधिमान्य रहेगी / This licence shall remain valid till 31st day of March 2026

यह अनुज्ञापि, अधिनियम या उसके अधीन विरचित नियमों या इस अनुज्ञापि की शर्तों के उल्लंघन, अनुसूची 5 के भाग 4 में सन्दर्भित, जहाँ भी लागू हो, या यदि अनुज्ञापि परिसर आरेखण या उससे संलग्न उपाबद्धों में दर्शाए गए विवरण के अनुरूप नहीं पाए जाने पर निलम्बित या प्रतिसंहत की जा सकती है।
This licence is liable to be suspended or revoked for any violation of the Act or rules framed there under or the conditions of this licence as set forth under Conditions, wherever applicable, referred to in Part 4 of Schedule V or if the licensed premises are not found conforming to the description shown in the plans and annexure attached hereto.

दिनांक / Date: 22/09/2021

उप मुख्य विस्फोटक नियंत्रक | Dy. Chief Controller of Explosives
एरनाकुलम | Ernakulam

अनुज्ञापि के नवीनीकरण हेतु पृष्ठांकन / Endorsement for renewal of licence:

नवीनीकरण का तिथि Date of Renewal	वैधता समाप्ति की तिथि Date of Expiry	अनुज्ञापन प्राधिकारी के हस्ताक्षर Signature of licensing authority
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वैधानिक चेतावनी : विस्फोटकों का लापरवाही से प्रयोग या दुरुपयोग, विधि के अधीन गम्भीर दण्डित अपराध होगा।
Statutory Warning : Mishandling and misuse of explosives shall constitute serious criminal offence under the law.

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Rajesh

(सिटी Conditions / Conditions)

सड़क वैन में विस्फोटकों के परिवहन के लिए प्ररूप एत.ई.-7 में विस्फोटक निगंत्रक द्वारा प्रदान किए जानेवाले अनुज्ञप्ति संख्या F/SE/KI/25/99(E.1.35886) की शर्तों निम्नलिखित हैं।
The following are the conditions of licence number F/SE/KI/25/99(E.1.35886) to transport explosives in a road van in Form LE-7 granted by Controller of Explosives.

1. यह अनुज्ञप्ति किसी अन्य सड़क वैन को अंतरणीय नहीं है।
This licence is not transferable to any other explosives van.
2. यान, उसकी बोडी और अन्य फिटिंग्स में कोई भी परिवर्तन, अनुज्ञापन प्राधिकारी के अनुमोदन के बिना नहीं किया जाना चाहिए।
No alterations should be made to the vehicle, its body and other fittings without approval from the licensing authority.
3. यह अनुज्ञप्ति या उसकी अभिप्रायित प्रति सदैव वैन में रखी जाएगी एवं निरीक्षण अधिकारी के मांगे जाने पर उसे प्रस्तुत किया जाएगा।
This licence or its authenticated copy shall at all times be kept in the van and produced on demand by an inspecting officer.
4. सड़क यान का, विस्फोटकों के परिवहन के लिए तब तक प्रयोग नहीं किया जाएगा जब तक कि वह ठीक हालत में नहीं है और विस्फोटक नियम 2008 का अनुपालन नहीं करती है।
The road van shall not be used for transport of explosives unless it is in a fit condition and complies with the Explosives Rules, 2008.
5. सड़क यान का प्रयोग, इस अनुज्ञप्ति द्वारा प्राधिकृत सामग्री से गिरा किसी सामग्री के लिए तब तक नहीं किया जाएगा जब तक कि अनुज्ञापन प्राधिकारी द्वारा इसकी लिखित अनुमति न दे दी हो।
The road van shall not be used for transport of any material other than that authorised by this licence, unless permitted by licensing authority in writing.
6. सड़क यान में धूम्रपान नहीं किया जाएगा न उसमें अग्नि या कृत्रिम प्रकाश या कोई ऐसे वस्तु जिससे आग लग सकती हो, की अनुमति दी जाएगी।
No smoking and no fire or artificial light or any article capable of causing fire shall be allowed on the explosives van.
7. यान का प्रयोग यात्रियों के वहन के लिए नहीं किया जाएगा।
The vehicle shall not be used for carrying passenger.
8. जिस समय सड़क यान पर विस्फोटकों की लदाई या उताराई या परिवहन किया जा रहा हो, उस समय सड़क यान ऐसे किसी सक्षम व्यक्ति के प्रभार में होगी जिसे विस्फोटकों की धरा-उठाई करने का अनुभव है और उनसे पूर्णतः परिचित है। जहाँ यान अनुज्ञप्तिधारी द्वारा न चलाया जा रहा हो वहाँ एक ऐसा दस्तावेज, जिस पर अनुज्ञप्तिधारी के हस्ताक्षर हों और उन व्यक्तियों का नाम दर्ज हो जिन्हें यान को चलाने के लिए प्राधिकृत किया गया हो, वैन के साथ ले जाया जाएगा और किसी निरीक्षण अधिकारी द्वारा मांगे की जाने पर उसे पेश किया जाएगा।
Road van, while explosives are being loaded or unloaded or transported shall always be under the charge of competent person who shall be experienced in handling of explosives and fully conversant there under. Where the vehicle is not driven by the licence holder, a document signed by the licensee naming persons authorised to drive and accompany the vehicle shall be carried in the van and produced on demand to an inspecting officer.
9. सड़क यान में किसी भी विस्फोटक का परिवहन तब तक नहीं किया जाएगा जब तक कि वे विस्फोटक नियमों के अनुसार या मुख्य विस्फोटक नियंत्रक द्वारा विनिर्दिष्ट रीति से पैक न कर दिए गए हों।
No explosives unless they are packed in accordance with the Explosives Rules or in a manner specified by the Chief Controller shall be transported in the explosives van.
10. किन्हीं अन्य विस्फोटकों के साथ डिटोनेटर्स का परिवहन नहीं किया जाएगा।
Detonators shall not be transported with any other explosives.
11. यदि सड़क यान में कोई टूट फूट हो जाती है या उसमें आग लग जाती है या विस्फोट हो जाता है अथवा सड़क यान इनमें किसी से अंतर्ग्रस्त हो जाती है तो ऐसी टूट फूट, दुर्घटना, अग्नि या विस्फोट की पूरी रिपोर्ट के साथ इस तथ्य की जानकारी अनुज्ञापन प्राधिकारी को तुरन्त दी जाएगी। यदि ऐसी दुर्घटना, अग्नि या विस्फोट में किसी व्यक्ति की मृत्यु हो जाती है या किसी व्यक्ति या सम्पत्ति को गम्भीर क्षति पहुँचती है तो उसकी रिपोर्ट निकटतम पुलिस स्टेशन को तुरन्त की जाएगी।
Any breakdown, accident, fire or explosion occurring in or involving the road van, shall be immediately reported to the licensing authority together with a full report of such breakdown, accident, fire or explosion. If such accident, fire or explosion is attended with loss of human life or serious injury to person or property, a report shall also be made immediately to the nearest Police Station.
12. विस्फोटकों को यान में परेषक के अनुज्ञापन परिसर में ही लादा जाएगा और परेषिता के अनुज्ञापन परिसर पर ही यान से उतारा जाएगा।
The explosives shall be loaded into the van only at the licensed premises of consignor and unloaded from the van at the licensed premises of the consignee.
13. अनुज्ञप्तिधारी, परिवहन किए जाने वाले विस्फोटकों का लेखाजोखा प्ररूप आर्ई-6 में रखेगा और निरीक्षण अधिकारी द्वारा मांगे जाने पर प्रस्तुत करेगा।
The licensee shall maintain account of explosives transported in Form RE-6 and present the same on demand by an inspecting officer.
14. अनुज्ञप्तिधारी और कर्मचारी परिसर के भीतर आपात के दौरान की जाने वाली प्रक्रिया से अवगत होंगे।
The licensee and the employee shall be conversant with procedure to be taken during the emergency within the premises.
15. किसी निरीक्षण करने या नमूना लेने वाले अधिकारी को सभी युक्तियुक्त समय पर अनुज्ञापन परिसर में अबाध पहुँच प्रदान की जाएगी और यह अभिनिश्चित करने के लिए कि अधिनियम और इन नियमों के उपबन्धों तथा सुरक्षा सम्बन्धी शर्तों का सम्यक् रूप से पालन किया जाता है, उस अधिकारी को प्रत्येक सुविधा उपलब्ध कराई जाएगी।
Free access shall be given at all reasonable times to any inspecting or sampling officer and every facility shall be afforded to the officer for ascertaining that the provisions of the Act or these rules and these conditions are duly observed.
16. यदि अनुज्ञापन प्राधिकारी या विस्फोटक नियंत्रक, लिखित में अनुज्ञप्तिधारक को ऐसी संस्तुतियों को क्रियान्वित करने के लिए, जो ऐसे प्राधिकारी की राय में अमान्य जोखिम उत्पन्न कर सकता है और स्थल पर या स्थल से बाहर व्यक्तियों की सुरक्षा के लिए आवश्यक है, सूचित करता है तो अनुज्ञप्तिधारी उन संस्तुतियों को निष्पादित करेगा और ऐसे प्राधिकारी द्वारा विनिर्दिष्ट अवधि के भीतर अनुपालन की रिपोर्ट देगा।
If the licensing authority or a Controller of Explosives informs in writing, the holder of the licence to carry out recommendations, which are in the opinion of such authority may pose unacceptable risk and so necessary for the safety of either on-site or off-site persons, the holder of the licence shall execute the recommendations and report compliance within the period specified by such authority.
17. अग्नि या विस्फोटक के कारण होने वाली दुर्घटना और विस्फोटकों की हानि, कमी या चोरी के बारे में निकटतम पुलिस स्टेशन और अनुज्ञापन प्राधिकारी तथा अनुज्ञापन प्राधिकारी के स्थानीय कार्यालय को तुरन्त रिपोर्ट की जाएगी।
Accidents by fire or explosion and losses, shortage or theft of explosives shall be immediately reported to the nearest police station and the licensing authority and local office of the licensing authority.

कृते उप मुख्य विस्फोटक नियंत्रक
For Dy. Chief Controller of Explosives
एरणाकुलम | Ernakulam

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Rajesh

3178

KL01 CP 2472 Explosives Van
Licence



GOVERNMENT OF INDIA
MINISTRY OF COMMERCE & INDUSTRY
PETROLEUM AND EXPLOSIVES SAFETY ORGANISATION(PESO)
(Formerly Department of Explosives)
Kendriya Bhavan, Block C-2, 3rd Floor
CSEZ PO Kakkanad Dist. Ernakulam Ernakulam 682037
Tele: 2427286 Fax: 2427276
Email: dycceernakulam@explosives.gov.in

No: E/SE/KL/25/98(E135883)

Dated : 22/09/2021

To,
M/s. ADANI VIZHINJAM PORT PVT LTD.,
3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram
Town/Village - Thiruvananthapuram
Distt. THIRUVANANTHAPURAM, State. Kerala, Pincode-695003

Subject: Road Van for the carriage of Explosives - Registration No KL01CP2472 Licence No.: E/SE/KL/25/98(E135883) granted in Form LE-7 under Explosives Rules, 2008 -Endorsement regarding -Endorsement of Licence.

Sir(s),

Reference memo No.: E/SE/KL/25/98(E135883) Dated 22/09/2021 from Dy. Chief Controller of Explosives, Ernakulam and inspection of the subject premises by an officer of this organization on 03/09/2021.

The subject licence No. E/SE/KL/25/98(E135883) valid upto 31st March 2026 duly endorsed is forwarded herewith.

For further renewal of licence, please submit following documents so as to reach this office on or before 31/03/2026.

- Application in Form RE-1 duly filled in and signed.
- Licence fees renewable for one to five years, to be submitted online through e-payment facility available on online application portal under the Explosives Rules, 2008.
- Original licence with approved plan.
- In this connection, please also refer to Rule 112 of Explosives Rules, 2008.

Please follow following instructions strictly:

1. The records of explosives transported by the licenced Roadvan shall be maintained in the proforma RE-6 under Part 5 of schedule V of Explosives Rules 2008.
2. Please ensure that persons whose antecedents verified by the local Police shall only be employed with the licenced explosives roadvan/compressor mounded truck as drivers or cleaners. List of such drivers and cleaner's alongwith the personal particulars shall be made available to the local police in advance. The re-verification of such staff shall also be made at least once in a year in compliance to Rule 61(3) of Explosives Rules 2008.
3. Please note that during transportation of explosives, the Roadvan shall always be attended to by two armed guards. If the consignment of explosives is likely to pass through sensitive areas notified by Ministry of Home Affairs, it should be escorted by armed Police escort / guard provided by District Police Administration as required in Rule 67(7) of Explosives Rules 2008.

Yours faithfully,

(Dr. R. Venugopal)
Deputy Chief Controller of Explosives
Ernakulam

Copy Forwarded to:

1. District Magistrate, THIRUVANANTHAPURAM, Kerala with reference to his Noc No: E/KL/TVM/NA/1(N8) Dated: 26/07/2021.

Deputy Chief Controller of Explosives
Ernakulam

[For more information regarding status, fees and other details, please visit our web site <http://explosives.gov.in>]

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Rajesh



GOVERNMENT OF INDIA
MINISTRY OF COMMERCE & INDUSTRY
PETROLEUM AND EXPLOSIVES SAFETY ORGANISATION (PESO)
(Formerly Department of Explosives)
Kendriya Bhavan, Block C-2, 3rd Floor
CSEZ PO Kakkanad Dist. Ernakulam Ernakulam 682037
Tele: 2427286 Fax: 2427276

No.: E/SE/KL/25/98(E135883)

Dated: 22/09/2021

MEMORANDUM

Subject: Road Van for the carriage of Explosives - Registration No KL01CP2472 of M/s.ADANI VIZHINJAM PORT PVT LTD., 3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram, Distt. THIRUVANANTHAPURAM, State. Kerala -Grant of Licence.

Two copies of Licence No.: E/SE/KL/25/98(E135883) granted to M/s.ADANI VIZHINJAM PORT PVT LTD., Survey No. 117/15-1, 117/15-2, 117/13, 117/14, Kottukal Vill, THIRUVANANTHAPURAM, Kerala for the period ending 31st March 31/03/2026 to transport Explosives by Road Van between SY NO.117/15-1, 117/15-2, 117/13, 117/14, KOTTUKAL (V), NEYYATINKKARA (TK), THIRUVANANTHAPURAM DT. TO KADAVILA-I STONE QUARRY AT SY NO. 555/2, NAGAROO are forwarded herewith to this office, with the request that if he is satisfied that all the conditions prescribed in the licence have been complied with, the original copy of the same be endorsed and forwarded to the licensee directly with an intimation to the District Magistrate, THIRUVANANTHAPURAM, Kerala and this office, retaining the other copy of the licence for his office record. If, however, he decides not to endorse the licence he shall immediately return the same to this office together with a statement of his reasons for not endorsing the licence, not later than three months.

(Dr. R.Venugopal)
Deputy Chief Controller of Explosives

To,
this office

Copy Forwarded to:

1. M/s.ADANI VIZHINJAM PORT PVT LTD., 3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram, Distt. THIRUVANANTHAPURAM, State. Kerala - 695003 with reference to their application dated 22/09/2021.
The Vehicle shall not be taken into use unless inspected by an officer and licence duly endorsed under Rule 107(3) of Explosives Rules 2008.

The records of explosives transported by the licenced Roadvan shall be maintained in the proforma RE-6 under Part 5 of schedule V of Explosives Rules 2008.

Please ensure that persons who are antecedents verified by the local Police only shall be employed with the licenced explosives roadvan/compressor mounded truck as drivers or cleaners. List of such drivers and cleaner's alongwith the personal particulars shall be made available to the local police in advance. The re-verification of such staff shall also be made at least once in a year in compliance to Rule 63 (3) of Explosives Rules 2008.

For further renewal please submit the following documents so as to reach this office on or before 31/03/2026.

- o Application in RE-1 duly filled in and signed.
 - o Licence fees renewable for one to five years, to be submitted online through e-payment facility available on online application portal under the Explosives Rules, 2008.
 - o Original licence with approved plan.
 - o In this connection, please also refer to Rule 112 of Explosives Rules 2008.
2. Superintendent of Police, THIRUVANANTHAPURAM, Kerala
A copy of Licence along with approved plan is enclosed for his office record.

Deputy Chief Controller of Explosives
Ernakulam

[For more information regarding status, fees and other details, please visit our web site <http://peso.gov.in>]

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Rajesh

अनुज्ञापि प्ररूप एलई - 7 | LICENCE FORM LE-7
(विस्फोटक नियम 2008 की अनुसूची 4 के भाग 1 का अनुच्छेद 7 देखें)
(See article no 7 of Part I of Schedule IV of Explosives Rules, 2008)

अनुज्ञापि : सडक वैन में विस्फोटकों के परिवहन के लिए
Licence to : transport explosives in a road van

अनुज्ञापि प्रष्ठांकित
LICENCE ENDORSED

अनुज्ञापि संख्या / Licence No. : E/SE/KL/25/98(E135883)
वार्षिक फीस रूपए / Annual Fee Rs : 2500/-

D C C E. Emakulam
उ. म. वि. नि. एरनाकुलम



- अनुज्ञापि एतदद्वारा जारी की जाती है
Licence is hereby granted to : M/s.ADANI VIZHINJAM PORT PVT LTD., (Occupier : Shri Rajesh Kumar Jha)
3rd Floor, Aspinwall House, Kuruvankonam, Thiruvananthapuram,
District-THIRUVANANTHAPURAM, State-Kerala, Pincod-695003
- अनुज्ञापिधारी की प्रास्थिति / Status of licensee : Company
- सडक वैन की विशिष्टियाँ / Particulars of the road van:

पंजीकरण संख्या / Registration No.	KL01CP2472
यान का मेक एवं मॉडल / Make and model of vehicle	TATA SFC 407 EX/31 HT BS IV
लदान रहित वजन / Unladen weight	2940 Kg(s)
लदान सहित अधिकतम वजन / Maximum laden weight	6250 Kg(s)
परिवहन के लिए अनुज्ञेय विस्फोटकों की अधिकतम मात्रा Maximum quantity of explosives permitted for transport	3310 Kg(s)
इंजिन संख्या / Engine No.	4SPCR11EPY623247
चैसिस संख्या / Chassis No.	MAT505242K8E11332
अन्य फिटिंग्स का विवरण / Description of Other Fittings	
वाहन के लिए अनुमत विस्फोटकों की मात्रा / Quantity of Explosives permitted to carry	3310 Kg(s)

- अनुज्ञापि परिसर निम्नलिखित आरेखण (आरेखणों) के अनुरूप होना चाहिए / The licensed premises shall conform to the following drawing(s):
आरेखण संख्या / Drawing No : E/SE/KL/25/98(E135883) दिनांक / dated : 22/09/2021
- समय समय पर यथा संशोधित विस्फोटक अधिनियम, 1884 और उसके अधीन बनाए गए विस्फोटक नियम, 2008 के उपबन्धों और शर्तों एवं निम्नलिखित अनुलक्षणों के अधीन अनुज्ञापि प्रदान की जाती है।
The licence is granted subject to the provision of Explosives Act 1884 as amended from time to time and the Explosives Rules, 2008 framed thereunder and the conditions and the following annexures...
(क) उपर्युक्त क्रम संख्या 4 में यथाकथित सडक वैन का आरेखण / (a) Drawings of the road van as stated in serial no.4 above.
(ख) अनुज्ञापन प्राधिकारी द्वारा हस्ताक्षरित शर्तें / (b) Conditions signed by the licensing authority.
- यह अनुज्ञापि तारीख 31 मार्च 2026 तक विधिमान्य रहेगी / This licence shall remain valid till 31st day of March 2026

यह अनुज्ञापि, अधिनियम या उसके अधीन विरचित नियमों या इस अनुज्ञापि की शर्तों के उल्लंघन, अनुसूची 5 के भाग 4 में सन्दर्भित, जहाँ भी लागू हो, या यदि अनुज्ञापि परिसर आरेखण या उससे संलग्न उपाबद्धों में दर्शाए गए विवरण के अनुरूप नहीं पाए जाने पर निलम्बित या प्रतिसंहत की जा सकती है।

This licence is liable to be suspended or revoked for any violation of the Act or rules framed there under or the conditions of this licence as set forth under Conditions, wherever applicable, referred to in Part 4 of Schedule V or if the licensed premises are not found conforming to the description shown in the plans and annexure attached hereto.

दिनांक / Date: 22/09/2021

उप मुख्य विस्फोटक नियंत्रक | Dy. Chief Controller of Explosives
एरनाकुलम | Ernakulam
Deputy Chief Controller of Explosives

अनुज्ञापि के नवीनीकरण हेतु पृष्ठांकन / Endorsement for renewal of licence:

नवीनीकरण का तिथि
Date of Renewal

वैधता समाप्ति की तिथि
Date of Expiry

अनुज्ञापन प्राधिकारी का हस्ताक्षर
Signature of licensing authority

वैधानिक चेतावनी : विस्फोटकों का सापरवाही से प्रयोग या दुरुपयोग, विधि के अधीन गम्भीर दण्डित अपराध होगा।
Statutory Warning : Mishandling and misuse of explosives shall constitute serious criminal offence under the law.

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

Rajesh

(सेट Conditions | Conditions)

सड़क वैन में विस्फोटकों के परिवहन के लिए प्ररूप एल.ई.-7 में विस्फोटक नियंत्रक द्वारा प्रदान किए जानेवाले अनुज्ञप्ति संख्या E/SE/KL/25/98(E135883) की शर्त निम्नलिखित हैं।

The following are the conditions of licence number E/SE/KL/25/98(E135883) to transport explosives in a road van in Form LE-7 granted by Controller of Explosives.

1. यह अनुज्ञप्ति किसी अन्य सड़क वैन को अंतरणीय नहीं है।
This licence is not transferable to any other explosives van.
2. यान, उसकी बोडी और अन्य फिटिंग्स में कोई भी परिवर्तन, अनुज्ञापन प्राधिकारी के अनुमोदन के बिना नहीं किया जाना चाहिए।
No alterations should be made to the vehicle, its body and other fittings without approval from the licensing authority.
3. यह अनुज्ञप्ति या उसकी अभिप्रमाणित प्रति सदैव वैन में रखी जाएगी एवं निरीक्षण अधिकारी के मांगे जाने पर उसे प्रस्तुत किया जाएगा।
This licence or its authenticated copy shall at all times be kept in the van and produced on demand by an inspecting officer
4. सड़क यान का, विस्फोटकों के परिवहन के लिए तब तक प्रयोग नहीं किया जाएगा जब तक कि वह ठीक हालत में नहीं है और विस्फोटक नियम 2008 का अनुपालन नहीं करती है।
The road van shall not be used for transport of explosives unless it is in a fit condition and complies with the Explosives Rules, 2008.
5. सड़क यान का प्रयोग, इस अनुज्ञप्ति द्वारा प्राधिकृत सामग्री से भिन्न किसी सामग्री के लिए तब तक नहीं किया जाएगा जब तक कि अनुज्ञापन प्राधिकारी द्वारा इसकी लिखित अनुमति न दे दी हो।
The road van shall not be used for transport of any material other than that authorised by this licence, unless permitted by licensing authority in writing.
6. सड़क यान में धूम्रपान नहीं किया जाएगा न उसमें अग्नि या कृत्रिम प्रकाश या कोई ऐसे वस्तु जिससे आग लग सकती हो, की अनुमति दी जाएगी।
No smoking and no fire or artificial light or any article capable of causing fire shall be allowed on the explosives van.
7. यान का प्रयोग यात्रियों के वहन के लिए नहीं किया जाएगा।
The vehicle shall not be used for carrying passenger.
8. जिस समय सड़क यान पर विस्फोटकों की लदाई या उतराई या परिवहन किया जा रहा हो, उस समय सड़क यान ऐसे किसी सक्षम व्यक्ति के प्रभार में होगी जिसे विस्फोटकों की धरा-उठाई करने का अनुभव है और उनसे पूर्णतः परिचित है। जहाँ यान अनुज्ञप्तिधारी द्वारा न चलाया जा रहा हो वहाँ एक ऐसा दस्तावेज, जिस पर अनुज्ञप्तिधारी के हस्ताक्षर हों और उन व्यक्तियों का नाम दर्ज हो जिन्हें यान को चलाने के लिए प्राधिकृत किया गया हो, वैन के साथ ले जाया जाएगा और किसी निरीक्षण अधिकारी द्वारा मांग की जाने पर उसे पेश किया जाएगा।
Road van, while explosives are being loaded or unloaded or transported shall always be under the charge of competent person who shall be experienced in handling of explosives and fully conversant there under. Where the vehicle is not driven by the licence holder, a document signed by the licensee naming persons authorised to drive and accompany the vehicle shall be carried in the van and produced on demand to an inspecting officer.
9. सड़क यान में किसी भी विस्फोटक का परिवहन तब तक नहीं किया जाएगा जब तक कि वे विस्फोटक नियमों के अनुसार या मुख्य विस्फोटक नियंत्रक द्वारा विनिर्दिष्ट रीति से पैक न कर दिए गए हों।
No explosives unless they are packed in accordance with the Explosives Rules or in a manner specified by the Chief Controller shall be transported in the explosives van.
10. किन्हीं अन्य विस्फोटकों के साथ डिटोनेटर्स का परिवहन नहीं किया जाएगा।
Detonators shall not be transported with any other explosives.
11. यदि सड़क यान में कोई टूट फूट हो जाती है या उसमें आग लग जाती है या विस्फोट हो जाता है अथवा सड़क यान इनमें किसी से अंतर्ग्रस्त हो जाती है तो ऐसी टूट फूट, दुर्घटना, अग्नि या विस्फोट की पूरी रिपोर्ट के साथ इस तथ्य की जानकारी अनुज्ञापन प्राधिकारी को तुरन्त दी जाएगी। यदि ऐसी दुर्घटना, अग्नि या विस्फोट में किसी व्यक्ति की मृत्यु हो जाती है या किसी व्यक्ति या सम्पत्ति को गम्भीर क्षति पहुँचती है तो उसकी रिपोर्ट निकटतम पुलिस स्टेशन को तुरन्त की जाएगी।
Any breakdown, accident, fire or explosion occurring in or involving the road van, shall be immediately reported to the licensing authority together with a full report of such breakdown, accident, fire or explosion. If such accident, fire or explosion is attended with loss of human life or serious injury to person or property, a report shall also be made immediately to the nearest Police Station.
12. विस्फोटकों को यान में परेषक के अनुज्ञप्त परिसर में ही लादा जाएगा और परेषिती के अनुज्ञप्त परिसर पर ही यान से उतारा जाएगा।
The explosives shall be loaded into the van only at the licensed premises of consignor and unloaded from the van at the licensed premises of the consignee.
13. अनुज्ञप्तिधारी, परिवहन किए जाने वाले विस्फोटकों का लेखाजोखा प्ररूप आरई-6 में रखेगा और निरीक्षण अधिकारी द्वारा मांगे जाने पर प्रस्तुत करेगा।
The licensee shall maintain account of explosives transported in Form RE-6 and present the same on demand by an inspecting officer.
14. अनुज्ञप्तिधारी और कर्मचारी परिसर के भीतर आपात के दौरान की जाने वाली प्रक्रिया से अवगत होंगे।
The licensee and the employee shall be conversant with procedure to be taken during the emergency within the premises.
15. किसी निरीक्षण करने या नमूना लेने वाले अधिकारी को सभी युक्तियुक्त समय पर अनुज्ञप्त परिसर में अबाध पहुँच प्रदान की जाएगी और यह अभिनिश्चित करने के लिए कि अधिनियम और इन नियमों के उपबन्धों तथा सुरक्षा सम्बन्धी शर्तों का सम्यक् रूप से पालन किया जाता है, उस अधिकारी को प्रत्येक सुविधा उपलब्ध कराई जाएगी।
Free access shall be given at all reasonable times to any inspecting or sampling officer and every facility shall be afforded to the officer for ascertaining that the provisions of the Act or these rules and these conditions are duly observed.
16. यदि अनुज्ञापन प्राधिकारी या विस्फोटक नियंत्रक, लिखित में अनुज्ञप्तिधारक को ऐसी संस्तुतियों को क्रियान्वित करने के लिए, जो ऐसे प्राधिकारी की राय में अमान्य जोखिम उत्पन्न कर सकता है और स्थल पर या स्थल से बाहर व्यक्तियों की सुरक्षा के लिए आवश्यक है, सूचित करता है तो अनुज्ञप्तिधारी उन संस्तुतियों को निष्पादित करेगा और ऐसे प्राधिकारी द्वारा विनिर्दिष्ट अवधि के भीतर अनुपालन की रिपोर्ट देगा।
If the licensing authority or a Controller of Explosives informs in writing, the holder of the licence to carry out recommendations, which are in the opinion of such authority may pose unacceptable risk and so necessary for the safety of either on-site or off-site persons, the holder of the licence shall execute the recommendations and report compliance within the period specified by such authority.
17. अग्नि या विस्फोटक के कारण होने वाली दुर्घटना और विस्फोटकों की हानि, कमी या चोरी के बारे में निकटतम पुलिस स्टेशन और अनुज्ञापन प्राधिकारी तथा अनुज्ञापन प्राधिकारी के स्थानीय कार्यालय को तुरन्त रिपोर्ट की जाएगी।
Accidents by fire or explosion and losses, shortage or theft of explosives shall be immediately reported to the nearest police station and the licensing authority and local office of the licensing authority

कृते उप मुख्य विस्फोटक नियंत्रक
For Dy. Chief Controller of Explosives
एरणाकुलम | Ernakulam

Note :- This is system generated document does not require physical signature. Applicant may take printout for their records.

**Annexure 13:
Panchayath License**



നമ്പർ: 232/2022-2023/A-2/RPTL19/2139

തീയതി: 25/02/2023

3183

നഗരൂർ ഗ്രാമപഞ്ചായത്ത്

നഗരൂർ പി.ഒ., തിരുവനന്തപുരം (ജില്ല)

പിൻ: 695601, ഫോൺ: 4702672242, ഇ-മെയിൽ : nagaroorgp@gmail.com

വ്യവസായം, വാണിജ്യം, സംരക്ഷണം, മറ്റ് സേവനങ്ങൾക്കുള്ള ലൈസൻസ്

(കെ.പി.ആർ ആക്ട് സെക്ഷൻ 232, FTE & OS ലൈസൻസ് ചട്ടങ്ങൾ 1996)

ലൈസൻസിയുടെപേര്	രാജേഷ് കുമാർ സാ		
ലൈസൻസിയുടെ മേൽവിലാസം	എം.ഡി ആൻഡ് സി.ഇ.ഒ, അദാനി വിഴിഞ്ഞം പോർട്ട് ലിമിറ്റഡ്, 3-ാംനില, ആസ്സിൻ വാൾ ഹൗസ്, കുറവൻക്കോണം, തിരുവനന്തപുരം.		
സ്ഥാപനത്തിന്റെ പേരും, സ്ഥലനാമവും	പാവനനം		
ലൈസൻസ് നൽകിയിട്ടുള്ള പ്രവർത്തനങ്ങൾ	വിഴിഞ്ഞം അദാനി പോർട്ട് പ്രൈവറ്റ് ലിമിറ്റഡ്		
വാർഡ് നമ്പർ/കെട്ടിട നമ്പർ			
ലൈസൻസ് കാലാവധി	25/02/2023	മുതൽ	31/03/3025 വരെ
ലൈസൻസ് ഫീസ് മോട്ടോർ ഫീസ് തൊഴിൽ നികുതി	തുക	രസീത് നമ്പർ	തീയതി
	45000 /- രൂപ	1220104570,71	25/02/2023
	6000 /- രൂപ	1220104570,71	25/02/2023
6250 /- രൂപ	1220104570	25/02/2023	
ലൈസൻസ് അനുവദിക്കുന്നതിന് ഹാജരാക്കിയ നിരാക്ഷേപ പത്രങ്ങളുടെ വിശദാംശങ്ങൾ (നമ്പർ, തീയതി, കാലയളവ്, നൽകിയ അധികാര സ്ഥാപനം)	<p>മെമ്പർഷിപ്പുകളുടെ ലിസ്റ്റ് നമ്പർ 11778 നമ്പർ നിരാക്ഷേപ സാക്ഷ്യപത്രം, പരിസ്ഥിതികാനുമതി</p> <ol style="list-style-type: none"> 1. പത്രം(കാലാവധി 28/02/2024),പെട്രോളിയം മന്ത്രാലയത്തിന്റെ 13/09/2022 ലെ നം 81/ഹെസ്/പെ.ഹെസ്/2022/12172 നമ്പർ അനുമതി പൊല്യൂഷൻ കണ്ട്രോൾ ബോർഡ് സർട്ടിഫിക്കറ്റ് (കാലാവധി 31/05/2025)മൈനിംഗ്/ജിയോളജി വകുപ്പിൽ നിന്നുള്ള അനുമതി, എക്സ്പ്ലോസീവ് സർട്ടിഫിക്കറ്റ് (കാലാവധി 31/03/2026) സംസ്ഥാന പരിസ്ഥിതിവകുപ്പിന്റെ നിരാക്ഷേപ സാക്ഷ്യപത്രത്തിന്റേയും മറ്റ് സർട്ടിഫിക്കറ്റുകളുടേയും കാലാവധി തീരുന്ന മുറുക്ക് ലൈസൻസിന്റെ കാലാവധി അവസാനിക്കുന്നതാണ്. 		

ഓഫീസ് മുദ്ര



സെക്രട്ടറി
SECRETARY
 Nagaroor Grama Panchayat
 നഗരൂർ ഗ്രാമപഞ്ചായത്ത്

Rafel

ലൈസൻസി താഴെ പറയുന്ന വ്യവസ്ഥകൾ അനുസരിക്കേണ്ടതാകുന്നു.

- 1 കേരള പഞ്ചായത്ത് രാജ് ആക്ടും അതേ തുടർന്നുള്ള ചട്ടങ്ങളും ബൈലകളും അനുസരിച്ചു പ്രവർത്തിക്കേണ്ടതാകുന്നു.
- 2 തൊഴിൽ സ്ഥലവും അതിലുള്ള സാധനസാമഗ്രികളും പഞ്ചായത്തധികാരികൾക്കോ/സെക്രട്ടറി അധികാരപ്പെടുത്തുന്ന മറ്റ് ഉദ്യോഗസ്ഥർക്കോ പരിശോധിക്കുന്നതിന് ലൈസൻസി വേണ്ട സൈകര്യം നൽകേണ്ടതും അവർ ആവശ്യപ്പെട്ടാൽ ഈ ലൈസൻസ് കാണിക്കേണ്ടതുമാണ്.
- 3 ഏത് സ്ഥലത്തിന്റെ കാര്യത്തിൽ ലൈസൻസ് നൽകിയിരിക്കുന്നവോ ആ സ്ഥലത്ത് എല്ലാവരും കാണത്തക്ക വിധത്തിലുള്ള ഒരു ഭാഗത്ത് ലൈസൻസി തന്റെ പേരും, ലൈസൻസിന്റെ നമ്പരും ഉദ്ദേശവും കാണിക്കുന്ന ഒരു അടയാളപ്പലക വച്ചിരിക്കേണ്ടതാണ്.
- 4 പഞ്ചായത്തിൽ നിന്നും അനുവാദം ലഭിച്ചശേഷമല്ലാതെ തൊഴിൽ സ്ഥലം മാറ്റാൻ പാടില്ലാത്തതും തൊഴിൽ നിർത്തുന്ന പക്ഷം വിവരം മുൻകൂട്ടി പഞ്ചായത്തിൽ അറിയിക്കേണ്ടതുമാകുന്നു.
- 5 തൊഴിൽ സ്ഥലവും പരിസരങ്ങളും വൃത്തിയായും സാംക്രമികരോഗാണുക്കൾ ഉണ്ടാക്കാത്ത വിധത്തിലും പൊതുജനോപദ്രവമാക്കാത്ത വിധത്തിലും വ്യപാരത്തിനു വച്ചിട്ടുള്ള ഭക്ഷണപദാർത്ഥങ്ങൾ ഈച്ച, അണുക്കള്, പൊടി മുതലായവയുടെ ശല്യം ഉണ്ടാക്കാത്ത വിധത്തിലും സൂക്ഷിക്കേണ്ടതാണ്.
- 6 ഒരോ പ്രവർത്തിദിവസത്തിന്റെയും ട്രൂവിൽ സ്ഥലം വൃത്തിയാക്കേണ്ടതാണ്.
- 7 ആ സ്ഥലത്തിന്റെയോ പരിസരത്തിന്റെയോ, ഏതെങ്കിലും ഭാഗത്ത് വീഴുകയോ നിക്ഷേപിക്കുകയോ ചെയ്യുന്ന ചപ്പുചവറോ, മൃഗങ്ങളുടെ അവശിഷ്ടങ്ങളോ മറ്റ് പദാർത്ഥമോ ശേഖരിച്ച്, സെക്രട്ടറിക്ക് തൃപ്തികരമായ രീതിയിൽ നീക്കം ചെയ്യിക്കേണ്ടതാണ്.
- 8 ലൈസൻസി ഏതൊരു കെട്ടിടത്തിന്റെയും ചുവരുകളുടെ അകവശത്തിന്റെ ഏതൊരു ഭാഗവും മേൽപറഞ്ഞ പരിസരത്തിലുള്ള തറയും നടപ്പാതയും അവിടെ തെറിച്ചുവീഴാനിടയുള്ള ഏതെങ്കിലും (ദ്രാവകമോ, മാലിന്യമോ, ചപ്പുചവറോ, അസഹ്യവും, ഉപദ്രവകരവുമായ ഏതെങ്കിലും പദാർത്ഥമോ അവിടെ ലയിക്കുന്നത് തടയത്തക്കവിധം എപ്പോഴും നന്നായി കേടുപാട് തീർത്ത് നിലനിർത്തേണ്ടതാണ്.
- 9 ലൈസൻസി മേൽപറഞ്ഞ സ്ഥലത്തോ, പരിസരത്തോ അതോടു ചേർന്നോ ഉള്ള ഏതൊരു ഓവുചാലും, അഴുക്കുജലം കളയുന്നതിനുള്ള ഉപകരണവും എപ്പോഴും നന്നായി കേടുപാട് തീർത്ത് വയ്യിക്കേണ്ടതാണ്.
- 10 അധിതരം ആചരിക്കുന്ന കടകളുടെ ലൈസൻസ് റദ്ദുചെയ്യുന്നതാണ്.
- 11 ഏതെങ്കിലും തരത്തിലുള്ള തപ്ത് രോഗമോ കുഷ് രോഗമോ (വ്രണമോ പകർച്ച വ്യാധികളോ ഉള്ള യാതൊരാളും കച്ചവടം നടത്തുന്നതിന് ഉപയോഗിക്കുന്ന സ്ഥലത്തും പരിസരത്തും പ്രവർത്തിക്കുവാൻ പാടില്ലാത്തതാകുന്നു.
- 12 17/02/2019 ലെ സ.ഉ. (കൈ) നം.7/2019 പരിസ്ഥിതി ഉത്തരവ് പ്രകാരം ഒറ്റത്തവണ ഉപയോഗിക്കുന്ന നിരോധിത വസ്തുക്കൾ ഉൽപ്പാദിപ്പിക്കുകയോ ശേഖരിക്കുകയോ വിൽക്കുകയോ കൈകാര്യം ചെയ്യുകയോ വിതരണം ചെയ്യുകയോ ചെയ്യാൻ പാടില്ല.
- 13 സ്ഥാപനത്തിന്റെ ബോർഡിൽ സ്ഥലനാമം മലയാളത്തിലും ഇംഗ്ലീഷിലും രേഖപ്പെടുത്തേണ്ടതാണ്.
- 14 20 സീറ്റിൽ കൂടുതലുള്ള എല്ലാ ഹോട്ടലുകൾക്കും റെസ്റ്റോറന്റുകൾക്കും ടോയ്റ്റ് സൗകര്യം ഏർപ്പെടുത്തേണ്ടതാണ്.
- 15 നിരോധിത ഉൽപ്പന്നങ്ങളായ പാൻമസാല, ഗുഡ്ഖ തുടങ്ങിയവ സംഭരിച്ചുവയ്ക്കുവാനോ വിൽക്കുവാനോ പാടില്ല.
- 16 ബാലവേല അനുവദിക്കാൻ പാടില്ല.
- 17 മുകളിൽ കാണിച്ചിരിക്കുന്ന വ്യവസ്ഥകളുടെ ലംഘനം ഈ ലൈസൻസ് റദ്ദ് ചെയ്യപ്പെടുന്നതിന് കാരണമാകാവുന്നതാണ്.



Shujith
സെക്രട്ടറി

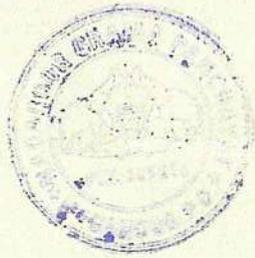
നഗരൂർ ഗ്രാമപഞ്ചായത്ത്

N.B:- ഈ ലൈസൻസ് അവസാനിക്കുന്ന തീയതിക്ക് 30 ദിവസം മുമ്പ് ലൈസൻസ് പുതുക്കുന്നതിനുള്ള ഫീസ് ട്രൂക്കുവരുത്തേണ്ടതാണ്.

Signature
Muzhamil Ibrahim

Signature

<p>1. ബഹു.ജില്ലാകളക്ടറുടെ 03/03/2023 ലെ ബി7-17779/18 നമ്പർ നിരാക്ഷേപ സാക്ഷ്യപത്രം</p> <p>2. പാരിസ്ഥിതികാനുമതി 1405/EC2/2019/SEIAA (5 years) (കാലാവധി 28/02/2024)</p> <p>3. പെട്രോളിയം മന്ത്രാലയത്തിന്റെ 13/09/2022 ലെ നം ഇ/എസ്ഇ/കെ.എൽ/22/331 (ഇ121778) നമ്പർ അനുമതി, കാലാവധി- 31/03/2026,</p> <p>4. പഞ്ചായത്ത് ഭരണസമിതിയുടെ 21/02/2023 ലെ 11(1) നമ്പർ തീരുമാനം. 5. ബഹു.ഹൈക്കോടതിയിലെ 30260/2010(എഫ്), 25830/2019, 2294/2022(ജെ) എഎന്നീ കേസുകളിലെ ബഹു. ഹൈക്കോടതി വിധിക്ക് വിധേയമായിരിക്കുന്നതാണ്.</p>	<p>6. മൈനിംഗ് /ജിയോളജി വകുപ്പിൽ നിന്നുള്ള അനുമതി,</p> <p>7. എക്സ്പ്ലോസീവ് സർട്ടിഫിക്കറ്റ് (കാലാവധി 31/03/2026),</p> <p>8. കേരള മലിനീകരണ നിയന്ത്രണ ബോർഡിന്റെ അനുമതി നമ്പർ കെ.എസ്.പി.സി.ബി./റ്റിവി/ഐസി/10005287/2022 തീയതി 15/06/2022, കാലാവധി 31/05/2025,</p> <p>9. മൈനിംഗ് ആൻഡ് ജിയോളജി വകുപ്പിന്റെ 25/10/2022 ലെ ഡി.എം.ജി./2879/2022-ൺ3 നമ്പർ അനുമതി. കാലാവധി until further orders,</p> <p>10. KSPCB/TV/ICO/10005087/2022 dated 15.06.2022 CDMG/2879/2022m3 dated 25.10.2022)</p>	<p>നിരാക്ഷേപ സാക്ഷ്യപത്രത്തിന്റേയും മറ്റ് സർഫിക്കറ്റുകളുടേയും കാലാവധി തീരുന്ന മുറയ്ക്ക് തുടർ അനുമതി സമർപ്പിക്കാത്ത കാലയളവിൽ ലൈസൻസിന്റെ കാലാവധി അവസാനിക്കുന്നതാണ്.</p>
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Shujail
SECRETARY
 Nagaroor Grama Panchayat

Rafel

Annexure 14:

**AVPPL Letter – Submission of EC Copy
to Nagaroor Panchayath**



Ports and
Logistics

Ref: AVPPL/SEIAA/2022-23/2117

Date: 16th September 2022

To,
The Panchayat Secretary,
Office of the Nagaroor Grama Panchayat,
Chemmarathamukku, Nagaroor,
Thiruvananthapuram,
Kerala - 695601

Subject: Environment Clearance (EC) for Granite Building Stone Quarry situated at Re-Sy. Block No. 37, Re-Sy. No. 554/1, 554/5 & 554/6 of Nagaroor village (Kadavilla), Chirayinkeezh Taluk, Thiruvananthapuram District of Kerala State - Reg.

Reference: EC No. 92/Q/2022 dated 16.08.2022

Dear Sir/Madam,

As per the EC obtained from State Environment Assessment Authority (SEIAA), Kerala vide reference above, *The proponent shall send a copy of the EC to concerned Grama Panchayat/District Panchayat/Municipality/Corporation/Urban Local Body and also to the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The Environmental Clearance shall also be uploaded on the website of the company.*

Therefore, we are herewith enclosing a copy of the EC for your reference and records. A copy of the EC is available with the SEIAA office and it is available on the website of the Authority at www.seiaakerala.in and on the website www.parivesh.nic.in. The copy of EC is also uploaded to our company website: <https://www.adaniports.com/Downloads>.

You are requested to kindly acknowledge the receipt of the same.

Thanking you.

Yours Sincerely
Sunil Kumar Ayyappan
AGM-Projects

Encl: As Stated Above

**Annexure 15:
Ambient Noise Monitoring Report**

**TEST REPORT**

ULR No: TC1219123000002261F

LRI No.: SEAL23100427A

Date: 10-10-2023

Page 1 of 2

CUSTOMER DETAILS

Customer Name & Address **M/s Adani Vizhinjam Port Pvt Ltd**
Nagaroor, Chirayinkeezhu,
Thiruvananthapuram District

Customer Reference Test Request date: 28-09-2023

DETAILS OF MONITORING

Product Category	Atmospheric Pollution	Sample Code	EN23091101
Sample Name	Ambient Noise	Monitoring Commenced on	28-09-2023
Test Method	IS 9989:1981	Monitoring Completed on	29-09-2023
Monitoring Location	Project Site	Monitored by	Lab Authorized Sampler
Latitude	8° 43'48.11" N	Longitude	76° 50'23.12" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

MONITORING RESULTS - Leq

TIME	RESULTS dB(A)	TIME	RESULTS dB(A)	TIME	RESULTS dB(A)
06:00	38.4	14:00	51.5	22:00	37.2
07:00	41.2	15:00	51.9	23:00	38.6
08:00	45.5	16:00	53.1	24:00	41.4
09:00	49.1	17:00	53.5	01:00	42.2
10:00	51.5	18:00	47.9	02:00	41.8
11:00	54.6	19:00	44.4	03:00	42.6
12:00	51.9	20:00	40.4	04:00	41.4
13:00	51.1	21:00	39.9	05:00	43.4

Nesny A.K.
Chemist
Checked by



Laju P.N.
Laboratory Head
Authorized Signatory

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

Standards Environmental & Analytical Laboratories

Accreditation & Approval: NABL accredited Testing Laboratory as per ISO/IEC 17025:2017
vide Certificate No. TC - 12191 & "A" Grade Laboratory approved by KSPCB.

'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist. - 683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com



TEST REPORT

ULR No: TC1219123000002261F

LRI No.: SEAAL23100427A

Date: 10-10-2023

Page 2 of 2

TEST RESULTS- CHEMICAL DISCIPLINE

Sl. No.	PARAMETERS	UNIT	RESULT	Limit as per Noise Pollution (Regulation and Control) Rules, 2000 (Industrial Area)
1	Ambient Sound Level (Leq) Day Time (06:00 to 22:00)	dB(A)	50.0	75 dB (A)
2	Ambient Sound Level (Leq) Night Time (22:00 to 06:00)	dB(A)	41.8	70 dB (A)

Remarks:

End of Report

Standards

Nesny A.K.
Chemist
Checked by



Laju P.N.
Laboratory Head
Authorized Signatory

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

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Accreditation & Approval: NABL accredited Testing Laboratory as per ISO/IEC 17025:2017
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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC1219123000002262F

LRI No.: SEAL23100428A

Date: 10-10-2023

Page 1 of 2

CUSTOMER DETAILS

Customer Name & Address **M/s Adani Vizhinjam Port Pvt Ltd**
Nagaroor, Chirayinkeezhu,
Thiruvananthapuram District

Customer Reference Test Request date: 28-09-2023

DETAILS OF MONITORING

Product Category	Atmospheric Pollution	Sample Code	EN23091102
Sample Name	Ambient Noise	Monitoring Commenced on	28-09-2023
Test Method	IS 9989:1981	Monitoring Completed on	29-09-2023
Monitoring Location	Near Operators Rest Room North Side (250 m away from Project Site)	Monitored by	Lab Authorized Sampler
Latitude	8° 43'48.63" N	Longitude	76° 50'12.46" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

MONITORING RESULTS - Leq

TIME	RESULTS dB(A)	TIME	RESULTS dB(A)	TIME	RESULTS dB(A)
06:00	40.0	14:00	53.6	22:00	38.7
07:00	42.8	15:00	54.0	23:00	37.0
08:00	47.4	16:00	55.2	24:00	39.6
09:00	51.1	17:00	55.6	01:00	40.4
10:00	53.6	18:00	49.9	02:00	40.0
11:00	56.9	19:00	46.1	03:00	40.8
12:00	54.0	20:00	42.0	04:00	39.6
13:00	53.1	21:00	41.5	05:00	41.5

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

Standards Environmental & Analytical Laboratories

Accreditation & Approval: NABL accredited Testing Laboratory as per ISO/IEC 17025:2017
vide Certificate No. TC - 12191 & "A" Grade Laboratory approved by KSPCB.

'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist. - 683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com



TEST REPORT

ULR No: TC1219123000002262F

LRI No.: SEAL23100428A

Date: 10-10-2023

Page 2 of 2

TEST RESULTS- CHEMICAL DISCIPLINE

Sl. No.	PARAMETERS	UNIT	RESULT	Limit as per Noise Pollution (Regulation and Control) Rules, 2000 (Industrial Area)
1	Ambient Sound Level (Leq) Day Time (06:00 to 22:00)	dB(A)	52.1	75 dB (A)
2	Ambient Sound Level (Leq) Night Time (22:00 to 06:00)	dB(A)	40.0	70 dB (A)

Remarks:

End of Report

Standards

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC1219123000002263F

LRI No.: SEAL23100429A

Date: 10-10-2023

Page 1 of 2

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District
Customer Reference	Test Request date: 28-09-2023

DETAILS OF MONITORING

Product Category	Atmospheric Pollution	Sample Code	EN23091103
Sample Name	Ambient Noise	Monitoring Commenced on	28-09-2023
Test Method	IS 9989:1981	Monitoring Completed on	29-09-2023
Monitoring Location	Vanchiyoor UP School West Side (1 Km away from Project Site)	Monitored by	Lab Authorized Sampler
Latitude	8° 43'16.56" N	Longitude	76° 50'10.91" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

MONITORING RESULTS - Leq

TIME	RESULTS dB(A)	TIME	RESULTS dB(A)	TIME	RESULTS dB(A)
06:00	35.4	14:00	47.5	22:00	34.3
07:00	38.0	15:00	47.8	23:00	36.3
08:00	42.0	16:00	48.9	24:00	38.9
09:00	45.3	17:00	49.3	01:00	39.6
10:00	47.5	18:00	44.2	02:00	39.3
11:00	50.4	19:00	40.9	03:00	40.0
12:00	47.8	20:00	37.2	04:00	38.9
13:00	47.1	21:00	36.8	05:00	40.8

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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Standards Environmental & Analytical Laboratories

Accreditation & Approval: NABL accredited Testing Laboratory as per ISO/IEC 17025:2017
vide Certificate No. TC - 12191 & "A" Grade Laboratory approved by KSPCB.

'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com



TEST REPORT

ULR No: TC1219123000002263F

LRI No.: SEAL23100429A

Date: 10-10-2023

Page 2 of 2

TEST RESULTS- CHEMICAL DISCIPLINE

Sl. No.	PARAMETERS	UNIT	RESULT	Limit as per Noise Pollution (Regulation and Control) Rules, 2000 (Safe zone Area)
1	Ambient Sound Level (Leq) Day Time (06:00 to 22:00)	dB(A)	57.6	50 dB (A)
2	Ambient Sound Level (Leq) Night Time (22:00 to 06:00)	dB(A)	42.1	40 dB (A)

Remarks:

End of Report

Standards

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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Standards Environmental & Analytical Laboratories

Accreditation & Approval: NABL accredited Testing Laboratory as per ISO/IEC 17025:2017
vide Certificate No. TC - 12191 & "A" Grade Laboratory approved by KSPCB.

'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC1219123000002264F

LRI No.: SEAAL23100430A

Date: 10-10-2023

Page 1 of 2

CUSTOMER DETAILS

Customer Name & Address **M/s Adani Vizhinjam Port Pvt Ltd**
Nagaroor, Chirayinkeezhu,
Thiruvananthapuram District

Customer Reference Test Request date: 28-09-2023

DETAILS OF MONITORING

Product Category	Atmospheric Pollution	Sample Code	EN23091104
Sample Name	Ambient Noise	Monitoring Commenced on	28-09-2023
Test Method	IS 9989:1981	Monitoring Completed on	29-09-2023
Monitoring Location	St. Joseph of Cluny Public School - South side (850 m away from Project Site)	Monitored by	Lab Authorized Sampler
Latitude	8° 43'37.63" N	Longitude	76° 50'49.33" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

MONITORING RESULTS - Leq

TIME	RESULTS dB(A)	TIME	RESULTS dB(A)	TIME	RESULTS dB(A)
06:00	36.1	14:00	48.4	22:00	35.0
07:00	38.7	15:00	48.7	23:00	36.8
08:00	42.8	16:00	49.8	24:00	39.4
09:00	46.1	17:00	50.2	01:00	40.2
10:00	48.4	18:00	45.0	02:00	39.8
11:00	51.3	19:00	41.7	03:00	40.6
12:00	48.7	20:00	37.9	04:00	39.4
13:00	48.0	21:00	37.5	05:00	41.3

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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Standards Environmental & Analytical Laboratories

Accreditation & Approval: NABL accredited Testing Laboratory as per ISO/IEC 17025:2017
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'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com



TEST REPORT

ULR No: TC1219123000002264F

LRI No.: SEAL23100430A

Date: 10-10-2023

Page 2 of 2

TEST RESULTS- CHEMICAL DISCIPLINE

Sl. No.	PARAMETERS	UNIT	RESULT	Limit as per Noise Pollution (Regulation and Control) Rules, 2000 ((Safe zone Area)
1	Ambient Sound Level (Leq) Day Time (06:00 to 22:00)	dB(A)	54.5	50 dB (A)
2	Ambient Sound Level (Leq) Night Time (22:00 to 06:00)	dB(A)	41.8	45 dB (A)

Remarks:

End of Report

Standards

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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Standards Environmental & Analytical Laboratories

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'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC1219123000002265F

LRI No.: SEAL23100431A

Date: 10-10-2023

Page 1 of 2

CUSTOMER DETAILS

Customer Name & Address **M/s Adani Vizhinjam Port Pvt Ltd**
Nagaroor, Chirayinkeezhu,
Thiruvananthapuram District

Customer Reference Test Request date: 28-09-2023

DETAILS OF MONITORING

Product Category	Atmospheric Pollution	Sample Code	EN23091105
Sample Name	Ambient Noise	Monitoring Commenced on	28-09-2023
Test Method	IS 9989:1981	Monitoring Completed on	29-09-2023
Monitoring Location	Viswanadhapuram Shiva Temple East Side (650 m away from Project Site)	Monitored by	Lab Authorized Sampler
Latitude	8° 44'9.02" N	Longitude	76° 50'18.82" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

MONITORING RESULTS - Leq

TIME	RESULTS dB(A)	TIME	RESULTS dB(A)	TIME	RESULTS dB(A)
06:00	37.1	14:00	49.7	22:00	35.9
07:00	39.7	15:00	50.0	23:00	36.8
08:00	43.9	16:00	51.2	24:00	39.4
09:00	47.4	17:00	51.6	01:00	40.2
10:00	49.7	18:00	46.2	02:00	39.8
11:00	52.7	19:00	42.8	03:00	40.6
12:00	50.0	20:00	39.0	04:00	39.4
13:00	49.3	21:00	38.5	05:00	41.3

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

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'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com



TEST REPORT

ULR No: TC1219123000002265F

LRI No.: SEAL23100431A

Date: 10-10-2023

Page 2 of 2

TEST RESULTS- CHEMICAL DISCIPLINE

Sl. No.	PARAMETERS	UNIT	RESULT	Limit as per Noise Pollution (Regulation and Control) Rules, 2000 ((Safe zone Area)
1	Ambient Sound Level (Leq) Day Time (06:00 to 22:00)	dB(A)	51.9	50 dB (A)
2	Ambient Sound Level (Leq) Night Time (22:00 to 06:00)	dB(A)	41.4	40 dB (A)

Remarks:

End of Report

Standards

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**Annexure 16:
Notice of Appointment of Statutory
Persons**

FIRST SCHEDULE
Form I
(See Regulation 3,6,7,8)
Notice of Appointment of Agent

From

Rajesh Kumar Jha,
CEO & MD
3rd Floor, Aspinwall House,
Kuravankonam, Thiruvananthapuram,
Kerala - 695003

To

The Director General of Mines Safety,
P.O. DHANBAD. Eastern Railway,
JHARKHAND STATE - 826001

The Dy. Director General of Mines Safety,
Southern Zone Bangalore

The Director of Mines Safety
Southern Zone, Bangalore

Sir,

I have to furnish the following particulars in respect of (I) **Kadavila 2&3 Stone Quarry** located at **Block No. 37, Re-Sy No. 554/1, 554/5, 554/6** of **Nagaroor (v), Chirayinkeezhu (Tk), Thiruvananthapuram (Dt) – 695 101 Kerala State** of **M/s. Adani Vizhinjam Port Pvt Ltd.,**

1. In case old CHANGE OF MINE:

- | | | |
|---------------------|---|-----|
| a. Old Name of Mine | : | NIL |
| b. Date of Change | : | NIL |

2. Situation of the Mine

- | | | |
|---------------------|---|---------------------|
| a. Extent | : | 2.4706 Ha |
| a. Village | : | Nagaroor(v), |
| b. Police Station | : | Nagaroor |
| c. Division (Taluk) | : | Chirayankeezhu(TK), |
| d. State | : | Kerala |

3. Name and Postal Address of (ii)

(a) Owner

RAJESH KUMAR JHA
Mine owner,
CEO & MD
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003.
KERALA SATE
Mobile No: +91 77520 11111
Mail Id: rajesh.jha@adani.com

(b) Appointment of Agent

JITESH GUPTA
Mine Agent,
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003,
KERALA SATE.
Mobile No: +91 8089787728
Mail Id: jitesh.gupta@adani.com

DATE OF APPOINTMENT : 14.07.2023

Actual Date of Opening/Reopening
Abandonment/Dis—Continuance of
the Mine : 14.07.2023

Yours faithfully,

Signature:



Designation: Owner/Agent/Manager

Date:

14.07.2023
Thiruvananthapuram.

From,

Rajesh Kumar Jha,
CEO & MD
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor Aspinwall House,
Kuravankonam, Thiruvananthapuram,
Kerala - 695003

To,
The Director General of Mines Safety,
P.O Dhanbad – 826001, Eastern Railway,
Jharkhand State.

The Dy. Director General of Mines Safety,
Southern Zone, Bangalore

The Director of Mines Safety
Southern Zone, Bangalore.

Dear Mr. JITESH GUPTA

Sub: Appointment Letter.

I am herewith nominating you as Mine Agent with Reference to Regulation 8 A under MMR 1961 to our **Kadavila-2&3 Stone Quarry** of **M/s. Adani Vizhinjam Port Pvt Ltd., located at Block No. 37, Re-Sy No. 554/1, 554/5, 554/6** of Nagaroor (v), Chirayinkeezhu (Tk), Thiruvananthapuram (Dt) – 695 101 Kerala State. **Blue Metal (Mineral)** and you are advised to take charge as Mine Agent on or before 14.07.2023

You are hereby informed that the terms and conditions of your service as per Reg 8A under MMR 1961 and return the copy of the Appointment Order with duly signed by you.

Kindly acknowledge the receipt.

Thanking You,
Yours Sincerely,



Rajesh Kumar Jha
CEO Cum Mine Owner

Received with thanks,



JITESH GUPTA

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

14.07.2023
Thiruvananthapuram

From,
Mr. JITESH GUPTA
3rd Floor Aspinwall House,
Kuravankonam, Thiruvananthapuram,
Kerala – 695003

To,
CEO
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam, Thiruvananthapuram,
Kerala - 695003

Dear Sir,

Sub: Acceptance Letter

Ref: Appointment Letter Dt 14.07.2023

I am herewith furnishing my acceptance Letter with reference to your Appointment letter Dt 14.07.2023 as a Mine Agent.

Hence, I kindly request you to accept my acceptance letter and permit me to join the duty as Mine Agent from 14.07.2023

Thanking You
Yours Sincerely,



JITESH GUPTA



AVPPL/DGMS/2022-23/2580

20.09.2023
Thiruvananthapuram.

To

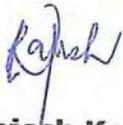
The Director General of Mine Safety,
P.O.DHANBAD - 826001. Eastern Railway,
JHARKAND STATE.The Dy. Director General of Mines Safety,
Southern Zone, BangaloreThe Director of Mines Safety
Southern Zone, Bangalore.

Dear Sir,

Sub: Appointment of Mines Manager, Assistant Mines Manager, Mines Foreman and Mechanical Engineer

I am herewith enclosing the **Notice of Appointment of Mines Manager, Assistant Mines Manager, Mines Foreman & Mechanical Engineer** in First Schedule of Form - I in respect of Kadavila 2&3 Stone quarry of M/s. **Adani Vizhinjam Port Pvt Ltd.**, located at Block No. 37 Re Sy No. 554/1, 554/5 & 554/6 **Nagaroor (v), Chirayinkeezhu (Tk), Thiruvananthapuram (Dt) - 695 101 Kerala State**

Kindly acknowledge the receipt.

Thanking You,
Yours Sincerely,**Rajesh Kumar Jha**
CEO Cum Mine OwnerAdani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

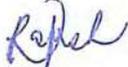
Registered Office:

Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

Sl.No	Particulars	Annexure No
1	Notice of Appointment of Mines Manager Assistant Mines Manager, Mines Foreman & Mechanical Engineer	1
2	Appointment Letter – Mines Manager (P Kumar)	2
3	Acceptance Letter – Mines Manager (P Kumar)	3
4	Statutory Certificate – Mines Manager (P Kumar)	4
5	Appointment Letter – Assistant Mines Manager (Jawahar Srinath)	5
6	Acceptance Letter – Assistant Mines Manager (Jawahar Srinath)	6
7	Statutory Certificate – Assistant Mines Manager (Jawahar Srinath)	7
8	Appointment Letter – Mines Foreman (Selvakumareshan)	8
9	Acceptance Letter – Mines Foreman (Selvakumareshan)	9
10	Statutory Certificate – Mines Foreman (Selvakumareshan)	10
11	Appointment Letter – Mechanical Engineer (Ebinsam)	11
12	Acceptance Letter – Mechanical Engineer (Ebinsam)	12
13	Degree Certificate – Mechanical Engineer (Ebinsam)	13

Hence, I kindly request you give permission for Opening of the Mine and Appointment of Agent under Regulation 3,6,7,8 in Form I of First Schedule under MMR 1961.

Thanking You,
Yours Sincerely,



Rajesh Kumar Jha
Mine Owner.

Encl: Form I and its Related Documents.

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

Registered Office:

Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

FIRST SCHEDULE
Form I
(See Regulation 3,6,7,8)

Notice of Appointment of Mines Manager, Assistant Mines Manager, Mine Foreman &
Mechanical Engineer

From

Rajesh Kumar Jha,
CEO & MD
3rd Floor, Aspinwall House,
Kuravankonam, Thiruvananthapuram,
Kerala - 695003

To

The Director General of Mines Safety,
P.O. DHANBAD. Eastern Railway,
JHARKHAND STATE - 826001

The Dy. Director General of Mines Safety,
Southern Zone Bangalore

The Director of Mines Safety
Southern Zone, Bangalore

Sir,

I have to furnish the following particulars in respect of (I) Kadavila 2&3 Stone Quarry at Nagaroor (v), Chirayinkeezhu (Tk), Thiruvananthapuram (Dt) – 695 101 Kerala State of M/s. Adani Vizhinjam Port Pvt Ltd.,

1. In case old CHANGE OF MINE:

- a. Old Name of Mine : NIL
b. Date of Change : NIL

2. Situation of the Mine

- a. Extent : 2.4706 Ha
a. Village : Nagaroor(v),
b. Police Station : Nagaroor
c. Division (Taluk) : Chirayankeezhu(TK),
d. State : Kerala



3. Name and Postal Address of (ii)

(a) Owner

RAJESH KUMAR JHA
Mine owner,
CEO & MD
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003.
KERALA SATE
Mobile No: +91 77520 11111
Mail Id: rajesh.jha@adani.com

(b) Appointment of Agent

JITESH GUPTA
Mine Agent,
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003,
KERALA SATE.
Mobile No: +91 8089787728
Mail Id: jitesh.gupta@adani.com

(c) Appointment of Mines Manager

Certificate No. 1395
Dated: 03.05.2000

P KUMAR
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003
KERALA STATE.
Mobile No: +91 94833 50581
Mail Id: kumarp1426@gmail.com

Date of APPOINTMENT

Date: 01.07.2023

(d) Appointment of Assistant
Mines Manager
Certificate No. SMU-E 2901

JAWAHAR SRINATH S
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003
KERALA STATE.
Mobile No: +91 94833 50581
Mail Id: jawaharsrinath333@gmail.com

Date of APPOINTMENT

Date: 14.07.2023



(e) Appointment of
Mines Foreman
Certificate No. FR/5197

SELVAKUMARESHAN N. G.
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003
KERALA STATE.
Mobile No: +91 97916 48323
Mail Id: selvagpe@gmail.com

Date of APPOINTMENT

Date: 14.07.2023

(f) Appointment of Mechanical
Engineer
Certificate No 961216114034/RG

S R EBIN SAM
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003
KERALA STATE
Mobile No: 96563 97102
Mail Id: ebinsam98@gmail.com

Date of APPOINTMENT

Date: 14.07.2023

Actual Date of Opening/Reopening
Abandonment/Dis—Continuance of
the Mine

: 14.07.2023

Yours faithfully,

Signature:



Designation: Owner/Agent/Manager

Date:

D13.07.2023
Thiruvananthapuram

To
Mr. PALANIVELU KUMAR
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Mr. PALANIVELU KUMAR

Sub: Appointment Letter

Ref: Appointment for the position of Mines Manager

This is to inform you that as per discussion on 13.07.2023, the Management has decided you to appoint as Mines Manager for our Kadavila-2&3 Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriankeezhu (TK), Thiruvananthapuram District, Kerala and you are advised to join the Duty on or before 14.07.2023

Further, you are hereby informed that the terms and conditions of your service will be as per our Organization norms.

For M/s Adani Vizhinjam Port Pvt Ltd.,

RAJESH KUMAR JHA
CEO cum Mine Owner

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

Registered Office:

Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

14.07.2023
Thiruvananthapuram

From,
Mr. PALANIVELU KUMAR
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

To,
CEO
M/s. Adani Vizhinjam port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Sir,

Sub: Acceptance Letter

Ref: Appointment Letter Dt 13.07.2023

I am herewith furnishing my acceptance Letter with reference to your Appointment letter Dt 13.07.2023 as a Mines Manager for Kadavila-2&3 Building Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriyankeezhu (TK), Thiruvananthapuram District, Kerala

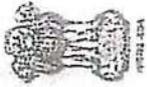
Hence, I kindly request you to accept my acceptance letter and permit me to join the duty as Mines Manager on 14.07.2023

Thanking You
Yours Sincerely,



PALANIVELU KUMAR





खान अधिनियम 1952
THE MINES ACT 1952

प्रथम श्रेणी प्रबंधक सक्षमता प्रमाण-पत्र धातुउत्पादक खान के प्रबंध हेतु
MANAGER'S FIRST CLASS CERTIFICATE OF COMPETENCY TO MANAGE A METALLIFEROUS MINE

(धातुउत्पादक खान विनियम, 1961 के अन्तर्गत)
(Under the Metalliferous Mines Regulations 1961)

(केवल विद्युत खनित युक्त खानों तक ही सीमित)
(Restricted to mines having opencast workings only)

पार्लामीवेलु कुमार

खनिकी जन्म तिथि 22 ~ 05 ~ 1963 है, एवं दिनांक 01 अक्टूबर, 1999 को आयोजित लिखित परीक्षा में उत्तीर्ण होने पर उपरोक्त केवल विद्युत खनित युक्त धातुउत्पादक खान के प्रबंध हेतु प्रथम श्रेणी प्रबंधक सक्षमता प्रमाण-पत्र प्रदान किया जाता है।
यह प्रमाण-पत्र 03 ~ 05 ~ 2000 से प्रभावी समया जाएगा।

P. Parivirefu Kumare

born on 22nd May, 1963 and having passed
the prescribed examination held on October, 1999 is hereby granted MANAGER'S FIRST CLASS
CERTIFICATE OF COMPETENCY to manage a metalliferous mine having opencast workings only. This Certificate
is effective from 03 ~ 05 ~ 2000



सदस्य
खनन परीक्षा बोर्ड
Members of the Board of
Mining Examinations

[Signature]
03/05/02
Dr
3.6.02
[Signature]

Signed and Sealed
03 JUN 2012

[Signature]
03/06/12
अध्यक्ष
खनन परीक्षा बोर्ड
Chairman of the Board of
Mining Examinations

[Handwritten signature]

13.07.2023
Thiruvananthapuram

To
Mr. Jawahar Srinath S
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Mr. JAWAHAR SRINATH S

Sub: Appointment Letter

Ref: Appointment for the position of Assistant Mines Manager

This is to inform you that as per discussion on 13.07.2023, the Management has decided to transfer you as an Assistant Mines Manager for our Kadavila-2&3 Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriyankeezhu (TK), Thiruvananthapuram District, Kerala and you are advised to join the Duty on or before 14.07.2023

Further, you are hereby informed that the terms and conditions of your service will be as per the annexure to this appointment letter.

For M/s Adani Vizhinjam Port Pvt Ltd.,



RAJESH KUMAR JHA
CEO cum Mine Owner

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

Registered Office:

Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

14.07.2023
Thiruvananthapuram

From,
Mr. Jawahar Srinath S
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

To,
CEO
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Sir,

Sub: Acceptance Letter

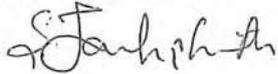
Ref: Appointment Letter Dt. 13.07.2023

I am herewith furnishing my acceptance Letter with reference to your Appointment letter Dt 13.07.2023 as an Assistant Mines Manager for Kadavila-2&3 Building Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriyankeezhu (TK), Thiruvananthapuram District, Kerala

Hence, I kindly request you to accept my acceptance letter and permit me to join the duty as Assistant Mine Manager from 14.07.2023

Thanking You

Yours Sincerely,



JAWAHAR SRINATH S



Cert No. SMU-E 2901



भारत सरकार/Government of India
खान अधिनियम, 1952/Mines Act, 1952
खनन परीक्षा बोर्ड/Board of Mining Examinations

द्वितीय श्रेणी प्रबंधक सक्षमता प्रमाण-पत्र
SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY

(धात्विकीय खान विनियम, 1961 के अन्तर्गत)
(Under the Metalliferous Mines Regulations, 1961)

श्री जवाहर श्रीनाथ एस. सुपुत्र शनमुगम आर
जिनकी जन्म तिथि 10.10.1997 है, को विहित अर्हताएं एवं अनुभव प्राप्त करने का सन्तोषजनक प्रमाण प्रस्तुत करने पर एतद्वारा धात्विकीय खानों के प्रबंध हेतु द्वितीय श्रेणी प्रबंधक सक्षमता प्रमाण-पत्र प्रदान किया जाता है। यह प्रमाण-पत्र 20 नवम्बर 2019 से प्रभावी है।

Shri JAWAHAR SRINATH S son of SHANMUGAM R
born on 10 OCTOBER 1997 having given satisfactory evidence of possessing the prescribed qualifications and experience is hereby granted SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY to manage the metalliferous mines. This certificate is effective from. 20.11.2019



[Signature]
सचिव

खनन परीक्षा बोर्ड

Secretary
Board of Mining
Examinations

[Signature]

अध्यक्ष
खनन परीक्षा बोर्ड

Chairman
Board of Mining
Examinations

Self attested by

S. Sankhita

Signed and Sealed

Date 21/05/2020

[Signature]

13.07.2023
Thiruvananthapuram

To
Mr. Selvakumareshan. N. G.
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Mr. SELVAKUMARESHAN. N. G.

Sub: Appointment Letter

Ref: Appointment for the position of Mines Foreman

This is to inform you that as per discussion on 13.07.2023, the Management has decided to transfer you as a Mines Foreman for our Kadavila-2&3 Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriyankeezhu (TK), Thiruvananthapuram District, Kerala and you are advised to join the Duty on or before 14.07.2023

Further, you are hereby informed that the terms and conditions of your service will be as per the annexure to this appointment letter.

For M/s Adani Vizhinjam Port Pvt Ltd.,



RAJESH KUMAR JHA
CEO cum Mine Owner

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

Registered Office:

Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

14.07.2023
Thiruvananthapuram

From,
Mr. Selvakumareshan. N. G.
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

To,
CEO
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Sir,

Sub: Acceptance Letter

Ref: Appointment Letter Dt. 13.07.2023

I am herewith furnishing my acceptance Letter with reference to your Appointment letter Dt 13.07.2023 as an Mines Foreman for Kadavila-2&3 Building Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriyankeezhu (TK), Thiruvananthapuram District, Kerala

Hence, I kindly request you to accept my acceptance letter and permit me to join the duty as Mines Foreman from 14.07.2023

Thanking You

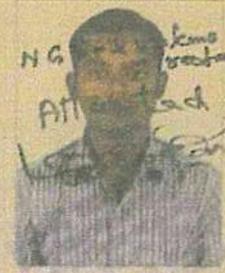
Yours Sincerely,



SELVAKUMARESHAN. N. G.



Cert No. FR /5197



भारत सरकार/Government of India
 खान अधिनियम, 1952/Mines Act, 1952
 खनन परीक्षा बोर्ड/Board of Mining Examinations
 खान फोरमैन सक्षमता प्रमाण-पत्र
 (केवल ओपेनकास्ट खानों तक सीमित)
 (Restricted to mines having opencast workings only)
MINE FOREMAN'S CERTIFICATE OF COMPETENCY
 (धात्विकीय खान विनियम, 1961 के अन्तर्गत)
 (Under the Metalliferous Mines Regulations, 1961)

श्री सेलवाकुमारेसन एन जी

सुपुत्र

गोविन्दराजन

जिनकी जन्म तिथि 07.05.1990

है, को विहित अर्हताएं एवं अनुभव

प्राप्त करने का सन्तोषजनक प्रमाण प्रस्तुत करने एवं

जनवरी 2019

में आयोजित विहित परीक्षा में उत्तीर्ण

होने पर एतद्वारा केवल ओपेनकास्ट धात्विकीय खान के लिए फोरमैन प्रमाण-पत्र प्रदान किया जाता है। यह प्रमाण-पत्र दिनांक 03 जून 2019 से प्रभावी है।

Shri SELVAKUMARESHAN N G

son of

GOVINDARAJAN

born on 07 MAY 1990

having given satisfactory evidence of

possessing the prescribed qualifications and experience and having passed the examination held in

JANUARY 2019

is hereby granted MINE FOREMAN'S CERTIFICATE OF COMPETENCY

for metalliferous mine having opencast workings only. This certificate is effective from

03.06.2019

सचिव

खनन परीक्षा बोर्ड

Secretary

Board of Mining

Examinations

अध्यक्ष

खनन परीक्षा बोर्ड

Chairman

Board of Mining

Examinations

Signed and Sealed

Date

28/02/2020

20.07.2023
Thiruvananthapuram

To
Mr. S R EBIN SAM
Kaliyikkal, Parasuvaikal PO
Trivandrum
Kerala 695 508

Dear Mr. S R EBIN SAM

Sub: Appointment Letter

Ref: Your resume for the position of Mechanical Engineer.

With reference to your application dated 03.07.2023 and subsequent interview dated 10.07.2023 the Management has decided to appoint you as Mechanical Engineer for our Building Stone Quarry located at Block No. 37 Re Sy No. 554/1, 554/5 & 554/6 **Nagaroor (v), Chirayinkeezhu (Tk), Thiruvananthapuram (Dt) – 695 101 Kerala State** and you are advised to join the Duty on or before 01.08.2023

Further, you are hereby informed that the terms and conditions of your service will be as per the annexure to this appointment letter.

For M/s Adani Vizhinjam Port Pvt Ltd.,



RAJESH KUMAR JHA
CEO cum Mine Owner

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

Registered Office:

Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

01.08.2023
Thiruvananthapuram

From,
Mr. S R EBIN SAM
Kaliyikkal, Parasuvaikal PO
Trivandrum
Kerala 695 508

To,
CEO
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Sir,

Sub: Acceptance Letter

Ref: Appointment Letter Dt 20.07.2023

I am herewith furnishing my acceptance Letter with reference to your Appointment letter Dt 20.07.2023 as a Mechanical Engineer.

Hence, I kindly request you to accept my acceptance letter and permit me to join the duty as Mechanical Engineer from 01.08.2023

Thanking You
Yours Sincerely,



S R EBIN SAM



Anna University



Reg.No. 961216114034/RG

The Syndicate of the Anna University hereby makes known that **EBINSAM S R** has been admitted to the **DEGREE OF BACHELOR OF ENGINEERING** in **MECHANICAL ENGINEERING** under the Faculty of Mechanical Engineering, having completed the prescribed programme of study and having been certified by the duly appointed examiners to be qualified to receive the same, and has been placed in **FIRST CLASS** at the Examination held in **APRIL 2020**.

Given under the Seal of the University



Self-Attested

[Handwritten signature]

[Handwritten signature]
Chennai 600 025
India
March 2021

[Handwritten signature]
Controller of Examinations

[Handwritten signature]
Registrar

[Handwritten signature]
Vice-Chancellor

LIN: 2-5750-3159-4
MINE CODE: 51251051

AVPPL/DGMS/2023-24/2645

14.10.2023
Thiruvananthapuram.

To

The Director General of Mine Safety,
P.O.DHANBAD - 826001. Eastern Railway,
JHARKAND STATE.

The Dy. Director General of Mines Safety,
Southern Zone, Bangalore

The Director of Mines Safety
Southern Zone, Bangalore.

Dear Sir,

Sub: Appointment of Mining Mate Cum Blaster

I am herewith enclosing the **Notice of Appointment of Mining Mate Cum Blaster** in First Schedule of Form - I in respect of **Kadavila 2&3 Stone quarry of M/s. Adani Vizhinjam Port Pvt Ltd., located at Block No. 37 Re Sy No. 554/1, 554/5 & 554/6 Nagaroor (v), Chirayinkeezhu (Tk), Thiruvananthapuram (Dt) – 695 101 Kerala State**

Kindly acknowledge the receipt.

Thanking You,
Yours Sincerely,

Rajesh Kumar Jha
CEO Cum Mine Owner

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com
CIN: U61200GJ2015PTC083954

Registered Office:

Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

Sl.No	Particulars	Annex ure No
1	Notice of Appointment of Mining Mate Cum Blaster in Form - 1	1
2	Appointment Letter – Mining Mate Cum Blaster	2
3	Acceptance Letter – Mining Mate Cum Blaster	3
4	Statutory Certificate – Mining Mate Cum Blaster	4

Hence, I kindly request you give permission for Appointment of Mining Mate under Regulation 3,6,7,8 in Form I of First Schedule under MMR 1961.

Thanking You,
Yours Sincerely,



Rajesh Kumar Jha
Mine Owner.

Encl: Form I and its Related Documents.

FIRST SCHEDULE
Form I
(See Regulation 3,6,7,8)
Notice of Appointment of Mining Mate Cum Blaster

From

Rajesh Kumar Jha,
CEO & MD
3rd Floor, Aspinwall House,
Kuravankonam, Thiruvananthapuram,
Kerala - 695003

To

The Director General of Mines Safety,
P.O. DHANBAD. Eastern Railway,
JHARKHAND STATE - 826001

The Dy. Director General of Mines Safety,
Southern Zone Bangalore

The Director of Mines Safety
Southern Zone, Bangalore

Sir,

I have to furnish the following particulars in respect of (I) **Kadavila 2&3 Stone Quarry** located at **Block No. 37, Re-Sy No. 554/1, 554/4, 554/5 of Nagaroor (v), Chirayinkeezhu (Tk), Thiruvananthapuram (Dt) – 695 101 Kerala State of M/s. Adani Vizhinjam Port Pvt Ltd.,**

1. In case old CHANGE OF MINE:

- | | | |
|---------------------|---|-----|
| a. Old Name of Mine | : | NIL |
| b. Date of Change | : | NIL |

2. Situation of the Mine

- | | | |
|---------------------|---|---------------------|
| a. Extent | : | 2.4706 Ha |
| a. Village | : | Nagaroor(v), |
| b. Police Station | : | Nagaroor |
| c. Division (Taluk) | : | Chirayankeezhu(TK), |
| d. State | : | Kerala |



3. Name and Postal Address of (ii)

(a) Owner

RAJESH KUMAR JHA
Mine owner,
CEO & MD
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003.
KERALA STATE
Mobile No: +91 77520 11111
Mail Id: rajesh.jha@adani.com

(b) Appointment of Agent

JITESH GUPTA
Mine Agent,
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003,
KERALA STATE.
Mobile No: +91 8089787728
Mail Id: jitesh.gupta@adani.com

(c) Appointment of Mines Manager

Certificate No. 1395
Dated: 03.05.2000

P KUMAR
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003
KERALA STATE.
Mobile No: +91 94833 50581
Mail Id: kumarp1426@gmail.com

(d) Appointment of
Mining Mate Cum Blaster
Certificate No. MR/SZ/0747

S. MADASAMY
M/s Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam,
Thiruvananthapuram – 695003
KERALA STATE.
Mobile No: +91 96598 20552
Mail Id: madasamy661971@gmail.com

Date of APPOINTMENT

Date: 13.10.2023

Actual Date of Opening/Reopening
Abandonment/Dis-Continuance of
the Mine : 14.07.2023

Yours faithfully,

Signature: 

Designation: Owner/Agent/Manager

Date:

13.10.2023
Thiruvananthapuram

To
Mr. PALANIVELU KUMAR
M/s. Adani Vizhinjam Port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Mr. S MADASAMY

Sub: Appointment Letter

Ref: Appointment for the position of Mining Mate Cum Blaster

This is to inform you that as per discussion on 12.10.2023, the Management has decided you to appoint as Mining Mate Cum Blaster for our Kadavila-2&3 Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriyankeezhu (TK), Thiruvananthapuram District, Kerala and you are advised to join the Duty on or before 13.10.2023

Further, you are hereby informed that the terms and conditions of your service will be as per our Organization norms.

For M/s Adani Vizhinjam Port Pvt Ltd.,

RAJESH KUMAR JHA
CEO cum Mine Owner

Adani Vizhinjam Port Pvt Ltd
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
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www.adani.com
CIN: U61200GJ2015PTC083954

Registered Office:
Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

13.10.2023
Thiruvananthapuram

From,
Mr. S. MADASAMY
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

To,
CEO
M/s. Adani Vizhinjam port Pvt Ltd.,
3rd Floor, Aspinwall House,
Kuravankonam
Thiruvananthapuram,
Kerala-695003

Dear Sir,

Sub: Acceptance Letter

Ref: Appointment Letter Dt 12.10.2023

I am herewith furnishing my acceptance Letter with reference to your Appointment letter Dt 12.10.2023 as a Mines Mate Cum Blaster for Kadavila-2&3 Building Stone Quarry located at Block No. 37, Re-Survey Nos. 554/1, 554/5, 554/6 of Nagaroor (V), Cheriyankeezhu (TK), Thiruvananthapuram District, Kerala

Hence, I kindly request you to accept my acceptance letter and permit me to join the duty as Mining Mate Cum Blaster on 13.10.2023

Thanking You
Yours Sincerely,



S MADASAMY



Cert No. MR/57/0747



भारत सरकार/Government of India
खान अभियोग, 1952/Mines Act, 1952
खान परीक्षा बोर्ड/Board of Mining Examinations
खान पेट सक्षमता प्रमाण पत्र
MINING MATE'S CERTIFICATE OF COMPETENCY
(केवल ओपेनकास्ट खानों तक सीमित)
(Restricted to mines having opencast workings only)
(धातुवर्गीय खान विनियम, 1961 के अन्तर्गत)
(Under the Metalliferous Mines Regulations, 1961)

श्री _____ पुत्र _____ है, जो अपनी
जिनकी जन्म तिथि _____
आयु, स्वस्थता, सदाचार, साक्षरता और धातुवर्गीय खानों में काम करने के विहित अनुभव का सन्तोषजनक प्रमाण
प्रस्तुत करने एवं दिनांक _____ को _____ पर आयोजित
विहित परीक्षा में उत्तीर्ण होने पर एतद्वारा केवल ओपेनकास्ट खानों तक सीमित पेट सक्षमता प्रमाण-पत्र
प्रदान किया जाता है।

Shri S. MADASAMY son of M. SIVARAM KRISHNAN
born on 06TH JUNE, 1971 (SEVENTY ONE) having given satisfactory evidence of his age,
medical fitness, good character, literacy and prescribed experience of working in metalliferous
mines and having passed the prescribed examination held at GVTC, TRICHY
centre on 27.12.2016 is hereby granted MINING MATE'S CERTIFICATE OF
COMPETENCY restricted to mines having opencast workings only.

बाएं हाथ _____ निशान
Left hand thumb impression

अंचल सचिव
खान परीक्षा बोर्ड
Zonal Secretary
Board of Mining
Examinations

अंचल सचिव
खान परीक्षा बोर्ड
Zonal Secretary
Board of Mining Examination
Southern Zone, Bengaluru

Self Attested

S. Madamy

Rahul Gaba

अध्यक्ष
खान परीक्षा बोर्ड
Chairman
Board of Mining
Examinations

Signed and Sealed
Date 23/02/2017

Rahul

**Annexure 17:
Ground Water and Surface Water
Quality Report**

**TEST REPORT**

ULR No: TC1219123000002269F

LRI No.: SEaal23100435A

Date: 10-10-2023

Page 1 of 3

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request Date: 28-09-2023

SAMPLE DETAILS

Product Category	Water	Sample Code	WT23090739
Sample Name	Surface Water	Sample Received on	29-09-2023
Sample Description by Customer	Pond Water	Temperature @ Receipt	4°C
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	30-09-2023
Sample Quantity & Packing	2 L & 125 ml in a Plastic Bottle	Test Completed on	07-10-2023
Information Provided by Customer	---	Sampled by	Lab Authorized Sampler

DETAILS OF SAMPLING

Sample Source	Out Side Project Site	Date of Sampling	28-09-2023
Sampling Procedure	SEaal/QAD/SOP/7.3/01	Sample Temperature	26.3°C
Latitude	8° 43'49.31" N	Longitude	76° 50'12.02" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

Nesny A.K.
Chemist
Checked by



Remya B.
TM-Biological
Authorized Signatory

Laiju P.N.
Laboratory Head
Authorized Signatory

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'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist. - 683 110

Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com



Standards

TEST REPORT

ULR No: TC1219123000002269F

LRI No.: SEaal23100435A

Date: 10-10-2023

Page 2 of 3

TEST RESULTS - CHEMICAL DISCIPLINE

Sl. No.	TEST PARAMETER	TEST METHOD	UNITS	RESULT	Requirement as per Acceptable Limit of IS 10500:2012
1	Colour	IS 3025 (Part 4):1983	Hazen	1	5.00 (Max)
2	Turbidity	IS 3025 (Part 10):1984	NTU	<0.1	1.00 (Max)
3	pH	IS 3025 (Part 11):1983	---	6.81	6.50 - 8.50
4	Conductivity	IS 3025 (Part 14):1984	µS/cm	80.0	---
5	Total Dissolved Solids	IS 3025 (Part 16):1984	mg/L	50.7	500 (Max)
6	Total Suspended Solids	IS 3025 (Part 17): 1984	mg/L	<1.00	---
7	Total Hardness as CaCO ₃	IS 3025 (Part 21):2009	mg/L	20.0	200 (Max)
8	Calcium as Ca	IS 3025 (Part 40):1991	mg/L	5.60	75.0 (Max)
9	Magnesium as Mg	IS 3025 (Part 46):1994	mg/L	1.46	30.0 (Max)
10	Chloride as Cl	IS 3025 (Part 32):1988	mg/L	7.05	250 (Max)
11	Total Alkalinity as CaCO ₃	IS 3025 (Part 23):1986	mg/L	9.90	200 (Max)
12	Iron as Fe	IS 3025 (Part 53):2003	mg/L	0.14	1.00 (Max)
13	Sulphate as SO ₄	IS 3025 (Part 24):1986	mg/L	7.67	200 (Max)
14	Fluoride as F	APHA 23 rd Edition 4500-F- B D: 2017	mg/L	<0.10	1.00 (Max)
15	Nitrate as NO ₃	APHA 23 rd Edition 4500-NO3 B 2017	mg/L	<1.00	45.0 (Max)
16	Dissolved Oxygen	IS 3025 (Part 38): 1989	mg/L	7.00	---
17	Chemical Oxygen Demand	IS 3025 (Part 58): 2006	mg/L	4.00	---
18	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 (Part 44): 1993	mg/L	<2.00	---

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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TEST REPORT

ULR No: TC1219123000002269F

LRI No.: SEaal23100435A

Date: 10-10-2023

Page 3 of 3

TEST RESULTS - BIOLOGICAL DISCIPLINE

Sl.No.	PARAMETERS	TEST METHOD	UNIT	RESULT	Requirement as per Acceptable Limit of IS 10500 : 2012
1	Total Coliform Bacteria	IS 15185 : 2016	----	Present/100 ml	Absent/100 ml
2	E coli	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml

Remarks:

End of Report

Standards

Nesny A.K.
Chemist

Checked by



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TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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**TEST REPORT**

ULR No: TC1219123000002269F

LRI No.: SEaal23100435A

Date: 10-10-2023

Page 1 of 3

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request Date: 28-09-2023

SAMPLE DETAILS

Product Category	Water	Sample Code	WT23090739
Sample Name	Surface Water	Sample Received on	29-09-2023
Sample Description by Customer	Pond Water	Temperature @ Receipt	4°C
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	30-09-2023
Sample Quantity & Packing	2 L & 125 ml in a Plastic Bottle	Test Completed on	07-10-2023
Information Provided by Customer	---	Sampled by	Lab Authorized Sampler

DETAILS OF SAMPLING

Sample Source	Out Side Project Site	Date of Sampling	28-09-2023
Sampling Procedure	SEaal/QAD/SOP/7.3/01	Sample Temperature	26.3°C
Latitude	8° 43'49.31" N	Longitude	76° 50'12.02" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

Nesny A.K.
Chemist

Checked by



Remya B.
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Laiju P.N.
Laboratory Head

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TEST REPORT

ULR No: TC1219123000002269F

LRI No.: SEAAL23100435A

Date: 10-10-2023

Page 2 of 3

TEST RESULTS - CHEMICAL DISCIPLINE

Sl. No.	TEST PARAMETER	TEST METHOD	UNITS	RESULT	Requirement as per Acceptable Limit of IS 10500:2012
1	Colour	IS 3025 (Part 4):1983	Hazen	1	5.00 (Max)
2	Turbidity	IS 3025 (Part 10):1984	NTU	<0.1	1.00 (Max)
3	pH	IS 3025 (Part 11):1983	---	6.81	6.50 - 8.50
4	Conductivity	IS 3025 (Part 14):1984	µS/cm	80.0	---
5	Total Dissolved Solids	IS 3025 (Part 16):1984	mg/L	50.7	500 (Max)
6	Total Suspended Solids	IS 3025 (Part 17): 1984	mg/L	<1.00	---
7	Total Hardness as CaCO ₃	IS 3025 (Part 21):2009	mg/L	20.0	200 (Max)
8	Calcium as Ca	IS 3025 (Part 40):1991	mg/L	5.60	75.0 (Max)
9	Magnesium as Mg	IS 3025 (Part 46):1994	mg/L	1.46	30.0 (Max)
10	Chloride as Cl	IS 3025 (Part 32):1988	mg/L	7.05	250 (Max)
11	Total Alkalinity as CaCO ₃	IS 3025 (Part 23):1986	mg/L	9.90	200 (Max)
12	Iron as Fe	IS 3025 (Part 53):2003	mg/L	0.14	1.00 (Max)
13	Sulphate as SO ₄	IS 3025 (Part 24):1986	mg/L	7.67	200 (Max)
14	Fluoride as F	APHA 23 rd Edition 4500-F- B D: 2017	mg/L	<0.10	1.00 (Max)
15	Nitrate as NO ₃	APHA 23 rd Edition 4500-NO3 B 2017	mg/L	<1.00	45.0 (Max)
16	Dissolved Oxygen	IS 3025 (Part 38): 1989	mg/L	7.00	---
17	Chemical Oxygen Demand	IS 3025 (Part 58): 2006	mg/L	4.00	---
18	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 (Part 44): 1993	mg/L	<2.00	---

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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TEST REPORT

ULR No: TC1219123000002269F

LRI No.: SEAAAL23100435A

Date: 10-10-2023

Page 3 of 3

TEST RESULTS - BIOLOGICAL DISCIPLINE

Sl.No.	PARAMETERS	TEST METHOD	UNIT	RESULT	Requirement as per Acceptable Limit of IS 10500 : 2012
1	Total Coliform Bacteria	IS 15185 : 2016	----	Present/100 ml	Absent/100 ml
2	E coli	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml

Remarks:

End of Report

Standards

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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**TEST REPORT**

ULR No: TC1219123000002271F

LRI No.: SEAAL23100437A

Date: 10-10-2023

Page 1 of 3

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request Date: 28-09-2023

SAMPLE DETAILS

Product Category	Water	Sample Code	WT23090741
Sample Name	Ground Water	Sample Received on	29-09-2023
Sample Description by Customer	Open Well Water	Temperature @ Receipt	4°C
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	30-09-2023
Sample Quantity & Packing	2 L & 125 ml in a Plastic Bottle	Test Completed on	07-10-2023
Information Provided by Customer	---	Sampled by	Lab Authorized Sampler

DETAILS OF SAMPLING

Sample Source	Near Operators Rest Room North Side	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/QAD/SOP/7.3/01	Sample Temperature	26.5°C
Latitude	8° 43'47.98" N	Longitude	76° 50'12.73" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

Nesny A.K.
Chemist
Checked by



Remya B.
TM-Biological
Authorized Signatory

Laiju P.N.
Laboratory Head
Authorized Signatory

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TEST REPORT

ULR No: TC1219123000002271F

LRI No.: SEaal23100437A

Date: 10-10-2023

Page 2 of 3

TEST RESULTS - CHEMICAL DISCIPLINE

Sl. No.	TEST PARAMETER	TEST METHOD	UNITS	RESULT	Requirement as per Acceptable Limit of IS 10500:2012
1	Colour	IS 3025 (Part 4):1983	Hazen	1	5.00 (Max)
2	Turbidity	IS 3025 (Part 10):1984	NTU	2.5	1.00 (Max)
3	pH	IS 3025 (Part 11):1983	---	7.03	6.50 - 8.50
4	Conductivity	IS 3025 (Part 14):1984	µS/cm	59.1	---
5	Total Dissolved Solids	IS 3025 (Part 16):1984	mg/L	37.1	500 (Max)
6	Total Suspended Solids	IS 3025 (Part 17): 1984	mg/L	<1.00	---
7	Total Hardness as CaCO ₃	IS 3025 (Part 21):2009	mg/L	10.0	200 (Max)
8	Calcium as Ca	IS 3025 (Part 40):1991	mg/L	3.20	75.0 (Max)
9	Magnesium as Mg	IS 3025 (Part 46):1994	mg/L	<1.00	30.0 (Max)
10	Chloride as Cl	IS 3025 (Part 32):1988	mg/L	9.06	250 (Max)
11	Total Alkalinity as CaCO ₃	IS 3025 (Part 23):1986	mg/L	3.96	200 (Max)
12	Iron as Fe	IS 3025 (Part 53):2003	mg/L	1.08	1.00 (Max)
13	Sulphate as SO ₄	IS 3025 (Part 24):1986	mg/L	5.70	200 (Max)
14	Fluoride as F	APHA 23 rd Edition 4500-F- B D: 2017	mg/L	<0.10	1.00 (Max)
15	Nitrate as NO ₃	APHA 23 rd Edition 4500-NO3 B 2017	mg/L	<1.00	45.0 (Max)
16	Dissolved Oxygen	IS 3025 (Part 38): 1989	mg/L	7.00	---
17	Chemical Oxygen Demand	IS 3025 (Part 58): 2006	mg/L	<4.00	---
18	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 (Part 44): 1993	mg/L	<2.00	---

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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Standards

TEST REPORT

ULR No: TC1219123000002271F

LRI No.: SEaal23100437A

Date: 10-10-2023

Page 3 of 3

TEST RESULTS - BIOLOGICAL DISCIPLINE

Sl.No.	PARAMETERS	TEST METHOD	UNIT	RESULT	Requirement as per Acceptable Limit of IS 10500 : 2012
1	Total Coliform Bacteria	IS 15185 : 2016	----	Present/100 ml	Absent/100 ml
2	E coli	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml

Remarks:

End of Report

Standards

Nesny A.K.
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**TEST REPORT**

ULR No: TC1219123000002272F

LRI No.: SEAAL23100438A

Date: 10-10-2023

Page 1 of 3

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request Date: 28-09-2023

SAMPLE DETAILS

Product Category	Water	Sample Code	WT23090742
Sample Name	Ground Water	Sample Received on	29-09-2023
Sample Description by Customer	Open Well Water	Temperature @ Receipt	4°C
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	30-09-2023
Sample Quantity & Packing	2 L & 125 ml in a Plastic Bottle	Test Completed on	07-10-2023
Information Provided by Customer	---	Sampled by	Lab Authorized Sampler

DETAILS OF SAMPLING

Sample Source	St. Joseph of Cluny Public School - South side	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/QAD/SOP/7.3/01	Sample Temperature	26.5°C
Latitude	8° 43'36.42" N	Longitude	76° 50'49.36" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

Nesny A.K.
Chemist

Checked by



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**TEST REPORT**

ULR No: TC1219123000002272F

LRI No.: SEaal23100438A

Date: 10-10-2023

Page 2 of 3

TEST RESULTS - CHEMICAL DISCIPLINE

Sl. No.	TEST PARAMETER	TEST METHOD	UNITS	RESULT	Requirement as per Acceptable Limit of IS 10500:2012
1	Colour	IS 3025 (Part 4):1983	Hazen	1	5.00 (Max)
2	Turbidity	IS 3025 (Part 10):1984	NTU	0.1	1.00 (Max)
3	pH	IS 3025 (Part 11):1983	---	7.35	6.50 – 8.50
4	Conductivity	IS 3025 (Part 14):1984	µS/cm	79.8	---
5	Total Dissolved Solids	IS 3025 (Part 16):1984	mg/L	50.6	500 (Max)
6	Total Suspended Solids	IS 3025 (Part 17): 1984	mg/L	<1.00	---
7	Total Hardness as CaCO ₃	IS 3025 (Part 21):2009	mg/L	20.0	200 (Max)
8	Calcium as Ca	IS 3025 (Part 40):1991	mg/L	6.40	75.0 (Max)
9	Magnesium as Mg	IS 3025 (Part 46):1994	mg/L	<1.00	30.0 (Max)
10	Chloride as Cl	IS 3025 (Part 32):1988	mg/L	11.1	250 (Max)
11	Total Alkalinity as CaCO ₃	IS 3025 (Part 23):1986	mg/L	15.8	200 (Max)
12	Iron as Fe	IS 3025 (Part 53):2003	mg/L	0.27	1.00 (Max)
13	Sulphate as SO ₄	IS 3025 (Part 24):1986	mg/L	<1.00	200 (Max)
14	Fluoride as F	APHA 23 rd Edition 4500-F- B D: 2017	mg/L	<0.10	1.00 (Max)
15	Nitrate as NO ₃	APHA 23 rd Edition 4500-NO3 B 2017	mg/L	<1.00	45.0 (Max)
16	Dissolved Oxygen	IS 3025 (Part 38): 1989	mg/L	6.90	---
17	Chemical Oxygen Demand	IS 3025 (Part 58): 2006	mg/L	<4.00	---
18	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 (Part 44): 1993	mg/L	<2.00	---

Nesny A.K.
Chemist

Checked by



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Laiju P.N.
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ULR No: TC1219123000002272F

LRI No.: SEaal23100438A

Date: 10-10-2023

Page 3 of 3

TEST RESULTS - BIOLOGICAL DISCIPLINE

Sl.No.	PARAMETERS	TEST METHOD	UNIT	RESULT	Requirement as per Acceptable Limit of IS 10500 : 2012
1	Total Coliform Bacteria	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml
2	E coli	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml

Remarks:

End of Report

Standards

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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vide Certificate No. TC - 12191 & "A" Grade Laboratory approved by KSPCB.

'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist. - 683 110

Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC1219123000002274F

LRI No.: SEaal23100440A

Date: 10-10-2023

Page 1 of 3

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request Date: 28-09-2023

SAMPLE DETAILS

Product Category	Water	Sample Code	WT23090744
Sample Name	Ground Water	Sample Received on	29-09-2023
Sample Description by Customer	Open Well Water	Temperature @ Receipt	4°C
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	30-09-2023
Sample Quantity & Packing	2 L & 125 ml in a Plastic Bottle	Test Completed on	07-10-2023
Information Provided by Customer	---	Sampled by	Lab Authorized Sampler

DETAILS OF SAMPLING

Sample Source	Workers Mess	Date of Sampling	28-09-2023
Sampling Procedure	SEaal/QAD/SOP/7.3/01	Sample Temperature	26.5°C
Latitude	8° 43'29.226" N	Longitude	76° 50'21.84" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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**TEST REPORT**

ULR No: TC1219123000002274F

LRI No.: SEAAL23100440A

Date: 10-10-2023

Page 2 of 3

TEST RESULTS - CHEMICAL DISCIPLINE

Sl. No.	TEST PARAMETER	TEST METHOD	UNITS	RESULT	Requirement as per Acceptable Limit of IS 10500:2012
1	Colour	IS 3025 (Part 4):1983	Hazen	1	5.00 (Max)
2	Turbidity	IS 3025 (Part 10):1984	NTU	<0.1	1.00 (Max)
3	pH	IS 3025 (Part 11):1983	---	7.53	6.50 - 8.50
4	Conductivity	IS 3025 (Part 14):1984	µS/cm	103	---
5	Total Dissolved Solids	IS 3025 (Part 16):1984	mg/L	65.9	500 (Max)
6	Total Suspended Solids	IS 3025 (Part 17): 1984	mg/L	<1.00	---
7	Total Hardness as CaCO ₃	IS 3025 (Part 21):2009	mg/L	20.0	200 (Max)
8	Calcium as Ca	IS 3025 (Part 40):1991	mg/L	5.60	75.0 (Max)
9	Magnesium as Mg	IS 3025 (Part 46):1994	mg/L	1.46	30.0 (Max)
10	Chloride as Cl	IS 3025 (Part 32):1988	mg/L	22.1	250 (Max)
11	Total Alkalinity as CaCO ₃	IS 3025 (Part 23):1986	mg/L	9.90	200 (Max)
12	Iron as Fe	IS 3025 (Part 53):2003	mg/L	0.11	1.00 (Max)
13	Sulphate as SO ₄	IS 3025 (Part 24):1986	mg/L	<1.00	200 (Max)
14	Fluoride as F	APHA 23 rd Edition 4500-F- B D: 2017	mg/L	<0.10	1.00 (Max)
15	Nitrate as NO ₃	APHA 23 rd Edition 4500-NO3 B 2017	mg/L	<1.00	45.0 (Max)
16	Dissolved Oxygen	IS 3025 (Part 38): 1989	mg/L	6.90	---
17	Chemical Oxygen Demand	IS 3025 (Part 58): 2006	mg/L	<4.00	---
18	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 (Part 44): 1993	mg/L	<2.00	---

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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Standards Environmental & Analytical Laboratories

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: sealab@gmail.com



TEST REPORT

ULR No: TC1219123000002274F

LRI No.: SEaal23100440A

Date: 10-10-2023

Page 3 of 3

TEST RESULTS – BIOLOGICAL DISCIPLINE

Sl.No.	PARAMETERS	TEST METHOD	UNIT	RESULT	Requirement as per Acceptable Limit of IS 10500 : 2012
1	Total Coliform Bacteria	IS 15185 : 2016	----	Present/100 ml	Absent/100 ml
2	E coli	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml

Remarks:

End of Report

Standards

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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**TEST REPORT**

ULR No: TC1219123000002273F

LRI No.: SEAAL23100439A

Date: 10-10-2023

Page 1 of 3

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request Date: 28-09-2023

SAMPLE DETAILS

Product Category	Water	Sample Code	WT23090743
Sample Name	Ground Water	Sample Received on	29-09-2023
Sample Description by Customer	Open Well Water	Temperature @ Receipt	4°C
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	30-09-2023
Sample Quantity & Packing	2 L & 125 ml in a Plastic Bottle	Test Completed on	07-10-2023
Information Provided by Customer	---	Sampled by	Lab Authorized Sampler

DETAILS OF SAMPLING

Sample Source	Vanchiyoor UP School - West Side	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/QAD/SOP/7.3/01	Sample Temperature	26.5°C
Latitude	8° 43'36.42" N	Longitude	76° 50'49.36" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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Standards

TEST REPORT

ULR No: TC1219123000002273F

LRI No.: SEAL23100439A

Date: 10-10-2023

Page 2 of 3

TEST RESULTS - CHEMICAL DISCIPLINE

Sl. No.	TEST PARAMETER	TEST METHOD	UNITS	RESULT	Requirement as per Acceptable Limit of IS 10500:2012
1	Colour	IS 3025 (Part 4):1983	Hazen	1	5.00 (Max)
2	Turbidity	IS 3025 (Part 10):1984	NTU	0.2	1.00 (Max)
3	pH	IS 3025 (Part 11):1983	---	4.99	6.50 - 8.50
4	Conductivity	IS 3025 (Part 14):1984	µS/cm	117	---
5	Total Dissolved Solids	IS 3025 (Part 16):1984	mg/L	74.6	500 (Max)
6	Total Suspended Solids	IS 3025 (Part 17): 1984	mg/L	<1.00	---
7	Total Hardness as CaCO ₃	IS 3025 (Part 21):2009	mg/L	8.00	200 (Max)
8	Calcium as Ca	IS 3025 (Part 40):1991	mg/L	2.40	75.0 (Max)
9	Magnesium as Mg	IS 3025 (Part 46):1994	mg/L	<1.00	30.0 (Max)
10	Chloride as Cl	IS 3025 (Part 32):1988	mg/L	30.2	250 (Max)
11	Total Alkalinity as CaCO ₃	IS 3025 (Part 23):1986	mg/L	<1.00	200 (Max)
12	Iron as Fe	IS 3025 (Part 53):2003	mg/L	0.30	1.00 (Max)
13	Sulphate as SO ₄	IS 3025 (Part 24):1986	mg/L	<1.00	200 (Max)
14	Fluoride as F	APHA 23 rd Edition 4500-F- B D: 2017	mg/L	<0.10	1.00 (Max)
15	Nitrate as NO ₃	APHA 23 rd Edition 4500-NO3 B 2017	mg/L	<1.00	45.0 (Max)
16	Dissolved Oxygen	IS 3025 (Part 38): 1989	mg/L	6.80	---
17	Chemical Oxygen Demand	IS 3025 (Part 58): 2006	mg/L	<4.00	---
18	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 (Part 44): 1993	mg/L	<2.00	---

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: sealab@gmail.com



TEST REPORT

ULR No: TC1219123000002273F

LRI No.: SEaal23100439A

Date: 10-10-2023

Page 3 of 3

TEST RESULTS - BIOLOGICAL DISCIPLINE

Sl.No.	PARAMETERS	TEST METHOD	UNIT	RESULT	Requirement as per Acceptable Limit of IS 10500 : 2012
1	Total Coliform Bacteria	IS 15185 : 2016	----	Present/100 ml	Absent/100 ml
2	E coli	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml

Remarks:

End of Report

Standards

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com



TEST REPORT

ULR No: TC1219123000002275F

LRI No.: SEaal23100441A

Date: 10-10-2023

Page 1 of 3

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request Date: 28-09-2023

SAMPLE DETAILS

Product Category	Water	Sample Code	WT23090745
Sample Name	Surface Water	Sample Received on	29-09-2023
Sample Description by Customer	Check Dam	Temperature @ Receipt	4°C
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	30-09-2023
Sample Quantity & Packing	2 L & 125 ml in a Plastic Bottle	Test Completed on	07-10-2023
Information Provided by Customer	---	Sampled by	Lab Authorized Sampler

DETAILS OF SAMPLING

Sample Source	Inside Project Site	Date of Sampling	28-09-2023
Sampling Procedure	SEaal/QAD/SOP/7.3/01	Sample Temperature	26.3°C
Latitude	8° 43'47.96" N	Longitude	76° 50'16.33" E

SAMPLING SITE DETAILS

Survey No.	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

Nesny A.K.
Chemist
Checked by



Remya B.
TM-Biological
Authorized Signatory

Laiju P.N.
Laboratory Head
Authorized Signatory

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Standards

TEST REPORT

ULR No: TC1219123000002275F

LRI No.: SEAL23100441A

Date: 10-10-2023

Page 2 of 3

TEST RESULTS - CHEMICAL DISCIPLINE

Sl. No.	TEST PARAMETER	TEST METHOD	UNITS	RESULT	Requirement as per Acceptable Limit of IS 10500:2012
1	Colour	IS 3025 (Part 4):1983	Hazen	1	5.00 (Max)
2	Turbidity	IS 3025 (Part 10):1984	NTU	0.2	1.00 (Max)
3	pH	IS 3025 (Part 11):1983	---	7.65	6.50 - 8.50
4	Conductivity	IS 3025 (Part 14):1984	µS/cm	527	---
5	Total Dissolved Solids	IS 3025 (Part 16):1984	mg/L	341	500 (Max)
6	Total Suspended Solids	IS 3025 (Part 17): 1984	mg/L	2.10	---
7	Total Hardness as CaCO ₃	IS 3025 (Part 21):2009	mg/L	156	200 (Max)
8	Calcium as Ca	IS 3025 (Part 40):1991	mg/L	52.0	75.0 (Max)
9	Magnesium as Mg	IS 3025 (Part 46):1994	mg/L	6.33	30.0 (Max)
10	Chloride as Cl	IS 3025 (Part 32):1988	mg/L	8.05	250 (Max)
11	Total Alkalinity as CaCO ₃	IS 3025 (Part 23):1986	mg/L	37.6	200 (Max)
12	Iron as Fe	IS 3025 (Part 53):2003	mg/L	0.37	1.00 (Max)
13	Sulphate as SO ₄	IS 3025 (Part 24):1986	mg/L	134	200 (Max)
14	Fluoride as F	APHA 23 rd Edition 4500-F- B D: 2017	mg/L	<0.10	1.00 (Max)
15	Nitrate as NO ₃	APHA 23 rd Edition 4500-NO3 B 2017	mg/L	<1.00	45.0 (Max)
16	Dissolved Oxygen	IS 3025 (Part 38): 1989	mg/L	6.50	---
17	Chemical Oxygen Demand	IS 3025 (Part 58): 2006	mg/L	<4.00	---
18	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 (Part 44): 1993	mg/L	<2.00	---

Nesny A.K.
Chemist
Checked by



Remya B.
TM-Biological
Authorized Signatory

Laiju P.N.
Laboratory Head
Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: sealab@gmail.com



Standards

TEST REPORT

ULR No: TC1219123000002275F

LRI No.: SEaal23100441A

Date: 10-10-2023

Page 3 of 3

TEST RESULTS - BIOLOGICAL DISCIPLINE

Sl.No.	PARAMETERS	TEST METHOD	UNIT	RESULT	Requirement as per Acceptable Limit of IS 10500 : 2012
1	Total Coliform Bacteria	IS 15185 : 2016	----	Present/100 ml	Absent/100 ml
2	E coli	IS 15185 : 2016	----	Absent/100 ml	Absent/100 ml

Remarks:

End of Report

Standards

Nesny A.K.
Chemist

Checked by



Remya B.
TM-Biological

Authorized Signatory

Laiju P.N.
Laboratory Head

Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

3251

**Annexure 18:
Ambient Air Quality Monitoring Report**

**TEST REPORT**

ULR No: TC121912300002256F

LRI No.: SEAAL23100422A

Date: 10-10-2023

Page 1 of 1

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS

Product Category	Atmospheric Pollution	Sample Code	EN23091096
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING

Sampling Location	Project Site	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'48.11" N	Longitude	76° 50'23.12" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS

Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE

SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	69.4	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	37.8	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit

Remarks:

End of Report

Nesny A.K.
Chemist
Checked by



Laju P.N.
Laboratory Head
Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC121912300002257F

LRI No.: SEAAL23100423A

Date: 10-10-2023

Page 1 of 2

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS

Product Category	Atmospheric Pollution	Sample Code	EN23091097
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING

Sampling Location	Near Operators Rest Room North Side (250 m away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'48.63" N	Longitude	76° 50'12.46" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS

Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE

SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	64.5	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	35.3	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit

Remarks:

End of Report

Nesny A.K.
Chemist

Checked by



Laju P.N.
Laboratory Head
Authorized Signatory

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ULR No:TC121912300002258F

LRI No.:SEAAL23100424A

Date: 10-10-2023

Page 1 of 1

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS

Product Category	Atmospheric Pollution	Sample Code	EN23091098
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING

Sampling Location	Vanchiyoor UP School West Side (1 Km away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'42.7" N	Longitude	76° 50'16.1" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS

Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE

SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	60.7	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	26.9	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit

Remarks:

End of Report

Checked by:

Laju P N
Laboratory Head
Authorized Signatory

**TEST REPORT**

ULR No.: TC121912300002259F

LRI No.: SEAAL23100425A

Date: 10-10-2023

Page 1 of 1

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS

Product Category	Atmospheric Pollution	Sample Code	EN23091099
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING

Sampling Location	St. Joseph of Cluny Public School - South side (850 m away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'37.63" N	Longitude	76° 50'49.33" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS

Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE

SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	72.5	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	37.5	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit

Remarks:

End of Report

Nesny A.K.
Chemist
Checked by



Laju P.N.
Laboratory Head
Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC121912300002260F

LRI No.: SEAAL23100426A

Date: 10-10-2023

Page 1 of 1

CUSTOMER DETAILS

Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS

Product Category	Atmospheric Pollution	Sample Code	EN23091100
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING

Sampling Location	Viswanadhapuram Shiva Temple East Side (650 m away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 44'9.02" N	Longitude	76° 50'18.82" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS

Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE

SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	58.4	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	27.3	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit

Remarks:

End of Report

Nesny A.K.
Chemist
Checked by



Laju P.N.
Laboratory Head
Authorized Signatory

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'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.- 683 110.
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**Annexure 19:
Letter and email Regarding the
submission of First HYCR**

Ref: AVPPL/MoEF/2023-24/2440

Date: 24th May 2023

To,
Ministry of Environment Forest and Climate Change (MoEF&CC),
Regional Office (Southern Zone), Kendriya Sadan,
IVth Floor, E&F Wings, 17th Main Road, IInd Block,
Koramangala, Bangalore-560034
rosz.bng-mefcc@gov.in

Subject: Half Yearly Compliance Report (HYCR) to Conditions of Environmental Clearance (EC) for the Period October 2022 to March 2023 with respect to our Building Stone Quarry Project in Re-Sy. Block No. 37, Re-Sy. No. 554/1, 554/5 & 554/6 of Nagaroor village (Kadavilla), Chirayinkeezh Taluk, Thiruvananthapuram District of Kerala State – Reg.

Reference: EC No. 92/Q/2022 dated 16.08.2022

Dear Sir/Madam,

This is with reference to the Environmental Clearance (EC) for Adani Vizhinjam Port Pvt. Ltd. (AVPPL) Building Stone Quarry Project in Re-Sy. Block No. 37, Re-Sy. No. 554/1, 554/5 & 554/6 of Nagaroor village (Kadavilla), Chirayinkeezh Taluk, Thiruvananthapuram District of Kerala State; by vide Reference above.

As per the EC, *The Half Yearly Compliance Report (HYCRs) with its contents, covering letter, compliance report and environmental monitoring data have to be uploaded in the PARIVESH portal and the website of the Project Proponent. The HYCR with the name of the project, EC No and date & the period of submission should be sent to the Regional Office of MoEF & CC & to SEIAA by email only at email ID rosz.bng-mefcc@gov.in & seacseiaakerala@gmail.com, respectively. Hardcopy of HYCRs shall not be acceptable.*

Since the orders for EC was granted on 16.08.2022, AVPPL have not initiated any work at the site. Further, as per the EC, *The EC shall be valid from the date of execution of permit/lease from the Department of Mining and Geology. The copy of the lease order should be provided to the SEIAA before commencing the mining activity.* AVPPL are yet to obtain Mining Lease from Department of Mining & Geology (DMG). The HYCR will be submitted after obtaining lease order from DMG and commencement of mining operations. This is for your information and records. You are requested to kindly acknowledge receipt of the same. Thanking You.

Yours Sincerely,



Rajesh Jha

MD & CEO – Authorized Signatory



Copy to: State Environment Impact Assessment Authority (SEIAA), K.S.R.T.C Bus Terminal Complex, 4th Floor, Thampanoor, Thiruvananthapuram, Kerala

Annexure 20:
**Letter and email Regarding the
submission of Compliance to Certain
Points**

Ref: AVPPL/MOEF/2022-23/2230

Date: 28th November 2022

To,
Ministry of Environment Forest and Climate Change (MoEF&CC),
Regional Office (Southern Zone),
Kendriya Sadan, IVth Floor, E&F Wings, 17th Main Road, IInd Block,
Koramangala, Bangalore-560034
rosz.bng-mefcc@gov.in

Subject: Submission of Half Yearly Compliance Report (HYCR) to Conditions of Environmental Clearance (EC) for the Period April 2022 to September 2022 with respect to our Building Stone Quarry Project in Re-Sy. Block No. 37, Re-Sy. No. 554/1, 554/5 & 554/6 of Nagaroor village (Kadavilla), Chirayinkeezh Taluk, Thiruvananthapuram District of Kerala State – Reg.

Reference: 1. EC No. 92/Q/2022 dated 16.08.2022
2. Our Letter AVPPL/SEIAA/2022-23/2090 dated 31.08.2022
3. Our Letter AVPPL/SEIAA/2022-23/2117 dated 16.09.2022

Dear Sir/Madam,

This is with reference to the Environmental Clearance (EC) for Adani Vizhinjam Port Pvt. Ltd. (AVPPL) Building Stone Quarry Project in Re-Sy. Block No. 37, Re-Sy. No. 554/1, 554/5 & 554/6 of Nagaroor village (Kadavilla), Chirayinkeezh Taluk, Thiruvananthapuram District of Kerala State; by vide Reference 1.

As per the EC, *The Half Yearly Compliance Report (HYCRs) with its contents, covering letter, compliance report and environmental monitoring data have to be uploaded in the PARIVESH portal and the website of the Project Proponent. The HYCR with the name of the project, EC No and date & the period of submission should be sent to the Regional Office of MoEF & CC & to SEIAA by email only at email ID rosz.bng-mefcc@gov.in & seacseiaakerala@gmail.com, respectively. Hardcopy of HYCRs shall not be acceptable.*

Since the orders for EC was granted on 16.08.2022, AVPPL have not initiated any work at the site. Further, as per the EC, *The EC shall be valid from the date of execution of permit/lease from the Department of Mining and Geology. The copy of the lease order should be provided to the SEIAA before commencing the mining activity.* AVPPL have applied for panchayat license and are yet to obtain the same; after which the Mining Lease will be applied for.

The first Half Yearly Compliance Report (HYCR) will be submitted after obtaining valid lease/permit from the Mining & Geology Department and commencement of mining operations. In the meantime, AVPPL have complied with certain General Conditions that are applicable; as detailed in the table below:

S. No.	Condition	Compliance Status
General Conditions		
1	The proponent should provide notarized affidavit (indicating the number and date of Environmental Clearance proceedings) that all the conditions stipulated in the EC shall be scrupulously followed.	Complied AVPPL had submitted an Affidavit to SEIAA (indicating the number and date of Environmental Clearance proceedings) stating that all the conditions stipulated in the EC shall be scrupulously followed vide reference 2; our letter AVPPL/SEIAA/2022-23/2090 dated 31.08.2022 (Enclosed as Annexure 1).
3	The project proponent should advertise in newspapers that the project has been accorded Environmental Clearance and copies of clearance letters are available in the Office of State Environment Impact Assessment Authority (SEIAA) and on the website of the Authority at www.seiaakerala.in. The advertisement should be in at least two local newspapers widely circulated in the region, one of which shall be in the vernacular language. The advertisement should be made within 10 days from the date of receipt of the Environmental Clearance letter and a copy of the same signed in all pages should be forwarded to the office of this Authority as confirmation.	Complied EC for the project was issued on 16.08.2022. Details of the EC were advertised in two local newspapers (The Hindu – English and Mathrubhumi – Malayalam) published on 18.08.2022. Copies of the Newspapers and the signed EC were submitted to SEIAA vide reference 2; our letter AVPPL/SEIAA/2022-23/2090 dated 31.08.2022 (Enclosed as Annexure 1).
4.	The proponent shall send a copy of the EC to concerned Grama Panchayat/ District Panchayat/Municipality/Corporation/Urban Local Body and also to the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The Environmental Clearance shall also be uploaded on the website of the company.	Complied AVPPL submitted a copy of the EC to the Nagaroor Gram Panchayat vide reference 3; our letter AVPPL/SEIAA/2022-23/2117 dated 16.09.2022 (Enclosed as Annexure 2). The copy of EC is also uploaded to the company website: https://www.adaniports.com/Downloads
42	The proponent has to provide insurance protection to the workers in the case of existing mining or provide the affidavit in case of fresh lease	Complied The contractors involved in mining at the quarry will be completely responsible for insurance of their workers and the same will

S. No.	Condition	Compliance Status
	before execution of mining lease.	be explicitly mentioned the Service Order issued to them. Affidavit for the same was submitted to SEIAA vide reference 2; our letter AVPPL/SEIAA/2022-23/2090 dated 31.08.2022 (Enclosed as Annexure 1).

You are requested to kindly acknowledge the receipt of the same.

Thanking you.



Yours Sincerely
Rajesh Jha
Chief Executive Officer

Encl: As Stated Above

3263

**Half Yearly Compliance Report (HYCR)
April 2023 to September 2023**

**Building Stone Quarry Project: Re - Sy. Block No. 37, Re - Sy No. 554/1, 554/5
& 554/6 of Nagaroor village (Kadavilla), Chirayinkeezh Taluk,
Thiruvananthapuram District, Kerala**

adani

Adani Vizhinjam Port Private Ltd. (AVPPL)

**TEST REPORT**

ULR No: TC1219123000002256F		
LRI No.: SEAAL23100422A	Date: 10-10-2023	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS			
Product Category	Atmospheric Pollution	Sample Code	EN23091096
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING			
Sampling Location	Project Site	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'48.11" N	Longitude	76° 50'23.12" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS			
Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE					
SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	69.4	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	37.8	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit

Remarks:

End of Report

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC1219123000002258F		
LRI No.: SEAAL23100424A	Date: 10-10-2023	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS			
Product Category	Atmospheric Pollution	Sample Code	EN23091098
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING			
Sampling Location	Vanchiyoor UP School West Side (1 Km away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'42.7" N	Longitude	76° 50'16.1" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS			
Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE					
SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	60.7	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	26.9	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit
Remarks:

End of Report

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

Standards

ANNEXURE R-20**TEST REPORT**

ULR No: TC1219123000002259F		
LRI No.: SEAAL23100425A	Date: 10-10-2023	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS			
Product Category	Atmospheric Pollution	Sample Code	EN23091099
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING			
Sampling Location	St. Joseph of Cluny Public School - South side (850 m away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'37.63" N	Longitude	76° 50'49.33" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS			
Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE					
SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	72.5	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	37.5	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit

Remarks:

End of Report

Nesny A.K.

Nesny A.K.
Chemist
Checked by



Laiju P.N.

Laiju P.N.
Laboratory Head
Authorized Signatory

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC1219123000002260F		
LRI No.: SEAAL23100426A	Date: 10-10-2023	Page 1 of 1

CUSTOMER DETAILS	
Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS			
Product Category	Atmospheric Pollution	Sample Code	EN23091100
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING			
Sampling Location	Viswanadhapuram Shiva Temple East Side (650 m away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 44'9.02" N	Longitude	76° 50'18.82" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS			
Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE					
SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	58.4	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	27.3	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit
Remarks:

End of Report

Nesny A.K.

Nesny A.K.
Chemist
Checked by



Laiju P.N.

Laiju P.N.
Laboratory Head
Authorized Signatory

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'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

**TEST REPORT**

ULR No: TC121912300002257F		
LRI No.: SEAAL23100423A	Date: 10-10-2023	Page 1 of 2

CUSTOMER DETAILS	
Customer Name & Address	M/s Adani Vizhinjam Port Pvt Ltd Nagaroor, Chirayinkeezhu, Thiruvananthapuram District.
Customer Reference	Test Request date: 28-09-2023

SAMPLE DETAILS			
Product Category	Atmospheric Pollution	Sample Code	EN23091097
Sample Name	Ambient Air	Sample Received on	29-09-2023
Sample Conditions at Receipt	Fit for Analysis	Test Commenced on	03-10-2023
Sampled by	Lab Authorized Sampler	Test Completed on	07-10-2023

DETAILS OF SAMPLING			
Sampling Location	Near Operators Rest Room North Side (250 m away from Project Site)	Date of Sampling	28-09-2023
Sampling Procedure	SEAAL/ENL/GEN/SOP/02	Humidity	65 %
Latitude	8° 43'48.63" N	Longitude	76° 50'12.46" E

INFORMATION PROVIDED BY CUSTOMER - SAMPLING SITE DETAILS			
Re - Survey No	555/2, Block No.37		
Village	Nagaroor	Taluk	Chirayinkeezhu
District	Thiruvananthapuram	State	Kerala

TEST RESULTS-CHEMICAL DISCIPLINE					
SL NO	PARAMETERS	TEST METHOD	UNIT	RESULT	NAAQ STANDARD
1	Particulate matter, PM ₁₀	IS 5182 (Part 23): 2006	µg/m ³	64.5	100 (Max)
2	Particulate matter, PM _{2.5}	IS 5182 (Part 24): 2019	µg/m ³	35.3	60.0 (Max)
3	Sulphur dioxide as SO ₂	IS 5182 (Part 2): 2001	µg/m ³	BDL (LOD 4.00)	80.0 (Max)
4	Oxides of Nitrogen as NO ₂	IS 5182 (Part 6): 2006	µg/m ³	BDL (LOD 4.00)	80.0 (Max)

Note: BDL- Below Detection Limit
Remarks:

End of Report

Nesny A.K.
Chemist
Checked by



Laiju P.N.
Laboratory Head
Authorized Signatory

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

ANNEXURE R-23**6. Consequences of any violation in silence zone / area.-**

Whoever, in any place covered under the silence zone / area commits any of the following offence, he shall be liable for penalty under the provisions of the Act:-

- (i) whoever, plays any music or uses any sound amplifiers,
- (ii) whoever, beats a drum or tom-tom or blows a horn either musical or pressure, or trumpet or beats or sounds any instrument, or
- (iii) whoever, exhibits any mimetic, musical or other performances of a nature to attract crowds.
- (iv) whoever, bursts sound emitting fire crackers; or
- (v) whoever, uses a loud speaker or a public address system.

7. Complaints to be made to the authority.-

(1) A person may, if the noise level exceeds the ambient noise standards by 10 dB (A) or more given in the corresponding columns against any area / zone or, if there is a violation of any provision of these rules regarding restrictions imposed during night time, make a complaint to the authority.

(2) The authority shall act on the complaint and take action against the violator in accordance with the provisions of these rules and any other law in force.

8 Power to prohibit etc. continuance of music sound or noise.-

(1) If the authority is satisfied from the report of an officer incharge of a police station or other information received by him including from the complainant that it is necessary to do so in order to prevent annoyance, disturbance, discomfort or injury or risk of annoyance, disturbance, discomfort or injury to the public or to any person who dwell or occupy property on the vicinity, he may, by a written order issue such directions as he may consider necessary to any person for preventing, prohibiting, controlling or regulating:-

- (a) the incidence or continuance in or upon any premises of-
 - (i) any vocal or instrumental music,
 - (ii) sounds caused by playing, beating, clashing, blowing or use in any manner whatsoever of any instrument including loudspeakers, public address systems, horn, construction

**Scientific Study on Blast Induced Ground Vibration for
Kadavila-1 Stone Quarry, Nagaroor Village, Chirayinkeezh
Taluk, Thiruvananthapuram District, Kerala of
M/s. Adani Vizhinjam Port Private Limited**

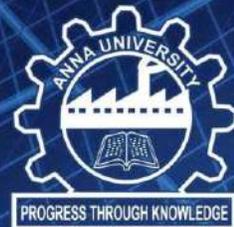


Submitted



Adani Vizhinjam Port Private Limited
(AVPPL)

To
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By
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Scientific Study on Blast Induced Ground Vibration
for Kadavila-1 Stone Quarry, Nagaroor Village,
Chirayinkeezh Taluk, Thiruvananthapuram District,
Kerala

adani

M/s. Adani Vizhinjam Port Private Limited

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Anna University Chennai

Scientific Study on
Blast Induced Ground Vibration for Kadavila-1 Stone Quarry,
Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram, Kerala
of M/s. Adani Vizhinjam Port Private Limited

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28/06/2024

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CERTIFICATION

Certified that this project report (No: AU/CEG/MN/1034/2020-2021) titled "Scientific Study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram, Kerala of M/s. Adani Vizhinjam Port Private Limited" is the bonafide work of Department of Mining Engineering, Anna University carried out under my supervision. I hereby affirm, to the best of knowledge and belief, based on the inspections, observations, field trials and upon the equations developed, that this Scientific Study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram, Kerala of M/s. Adani Vizhinjam Port Private Limited is completed and operable. The project was completed in accordance with the statutory requirements of act, regulations made thereunder and other provisions as recommended by the regulatory body (DGMS).



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Scientific Study on
Blast Induced Ground Vibration for Kadavila-1 Stone Quarry,
Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram, Kerala
of M/s. Adani Vizhinjam Port Private Limited

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Scientific Study on
Blast Induced Ground Vibration for Kadavila-1 Stone Quarry,
Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram
District, Kerala of M/s. Adani Vizhinjam Port Private Limited

EXECUTIVE SUMMARY

The scientific investigation is aimed at assessing the influence of blasting, principally the ground vibrations and noise levels in the Kadavila-1 Stone Quarry of M/s. Adani Vizhinjam Port Private Limited, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala on the residential and other buildings of the neighbouring villages.

OBJECTIVES

- Study the existing blasting, its design and its influence on the surroundings in respect of blast induced ground vibrations.
- Design of trial blasts which will
 - restrict blast induced ground vibrations to levels that are tolerable on the residential and other civil structures not belonging to the quarry owner.
 - restrict generation of fly-rock and their throw to eliminate adverse effect on the residents and agricultural lands of the Nagaroor (Kadavila) village.
- Carry out at least 10 controlled trial blasts and monitor blast induced ground vibrations at least in 25 points and study the distance to which flying fragments are produced.
- Submit the report including suggesting suitable controlled blasting technique(s) including maximum explosive charge per delay in the Kadavila-1 Stone Quarry that will limit the blast induced ground vibrations to permissible levels and also suggesting suitable methodology for carrying out regular drilling, controlled blasting operations in the quarry and the appropriate safety measures to be taken to guard against blast induced vibrations and fly-rock.



FIELD INVESTIGATIONS

The Kadavila-1 Stone Quarry is drilling 33 mm diameter holes with Jack hammer drilling machines and blasting with the cap-sensitive Emulsion explosive cartridges of 25 mm diameter. The mine management is presently blasting three to five rows of holes with NONELs having in-hole delay of 250 ms & surface delays of 17/25 ms to mitigate adverse impacts such as air blast, fly rock and ground vibration. The instantaneous electrical detonators are being used for initiating the blasting circuit prepared with NONEL based detonators.

In order to carry out the controlled blasting operations in the Kadavila-1 Stone Quarry approaching towards surrounding villages, the quarry management intended to get the matter scientifically investigated for adopting properly designed controlled blasting techniques to restrict the blast induced ground vibrations to less than the permissible levels the structures in question can tolerate without damage.

The author of this report have carried out ground vibration monitoring of **10 Nos. of controlled trial blasts** with FIVE numbers of seismographs by locating them at different locations in the surface and sensitive buildings located nearer to the Kadavila-1 Stone Quarry at various distances (in the villages as well as inside the quarry) from the blasting site (a total recordings of **47** and the instruments triggered only at 36 stations). These trial blasts were carried out during the period from 16.03.2021 to 17.03.2021.

RESULTS AND DISCUSSIONS

Ten trial blasts were carried out 16.03.2021 to 17.03.2021 and blast vibrations were monitored using five seismographs located at various distances. The minimum and maximum charge per delay varied from 1.07 to 2.17 kg. A maximum of 80 holes were drilled with jack hammer drilling equipment with a maximum number of holes per delay of six. In all the 10 trial blasts, ground vibrations were monitored at 47 locations around the blasting sites and neighbouring village. Out of the total 47 measurements made, vibrations were recorded by the instruments only at 36 stations. The vibrations recorded behind the blast free face were of highest magnitude. The magnitude of vibration recorded in the flank of direction of initiation was lower than those on the opposite side of the flank of blast initiation.

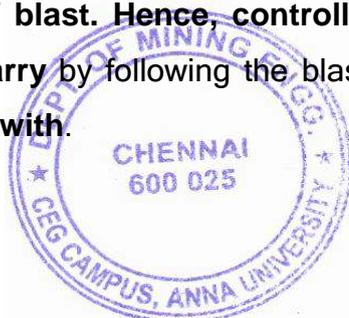
All the 10 blasts were carried out using NONEL shock tube detonators with an in-hole delay of 250 ms and surface delay of 25 ms. Fast attenuation of vibration was recorded at shorter distances whereas at far-off distances the attenuation was slow and was influenced by low frequency blast wave characteristics.

The recorded dominant frequencies of vibrations were in the range of 7.5 to 256 Hz. The Fast Fourier Transform (FFT) analyses of vibration data revealed that the concentration of vibration energy was in the range of 29.30 to 170.6 Hz. However, keeping in view the minimum frequency recorded during the trial blasts and the maximum peak particle velocity (PPV), structures of any type, can tolerate without damage or fall within the frequency range of 8 to 25 Hz. However, to avoid confusion for the people in the field, the maximum explosive charge per delay is calculated for this quarry to restrict the peak particle velocity to 5.0 mm/s only (irrespective of the type of structure), which is more conservative and safer as shown in the Table 2.1. Further it will secure the safety of Domestic houses & structures/Residential buildings located in the Nagaroor Village, Chirayinkeezhu Taluk, Thiruvananthapuram District, Kerala whose safety is also very important.

The analyses of vibration data recorded from detonation of blasts with higher amount of explosives generated higher level of vibrations at near-by-distances in comparison to the blasts which were detonated at the same bench face with lesser amount of explosives although the blast design and explosives parameters were kept identical. The explosives detonated in a delay in both the blasts were similar in weight.

The propagation equation for prediction of blast vibration have been established and are given as Equations 3. The permissible explosive weight per delay may be computed from the Equation to contain vibration within safe limits for distances of houses/structures concerned. For convenience, the permissible explosive weight per delay has been computed and is given in Table 3.22.

Based on the scientific study, it is concluded that **the blast induced ground vibrations and noise levels generated by the controlled blasting carried out in Kadavila-1 Stone Quarry was within permissible level and therefore is not affecting the residential buildings and other structures. Further, it has been observed that no flying fragments or projectiles travelled beyond 10 m from the site of blast. Hence, controlled blasting can be carried out at Kadavila-1 Stone Quarry by following the blasting parameters as recommended in the Table given herewith.**




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SUMMARY OF SUGGESTED CONTROLLED BLAST DESIGN FOR M/S. KADAVILA-1 STONE QUARRY

Sl. No.	Parameter		Value
1.	Blast hole diameter		33 mm
2.	Burden		1.2 m
3.	Spacing		1.5 m
4.	Height of the bench		6.00 m
5.	Stemming length		Minimum 0.70 m
6.	Drilling patterns to be followed		Rectangular / Staggered
7.	Specific charge	For creating Initial (Box) Cut	0.16 to 0.17 kg/m ³
		For production blasting	0.15 to 0.16 kg/m ³
8.	Loading Density	Cap-sensitive Emulsion (or) Slurry Cartridges	0.26 kg/m
9.	Average explosive Quantity/hole	Cap-sensitive Emulsion (or) Slurry Cartridges	0.50 kg
10.	Maximum explosive charge per drillhole during production blasting	Cap-sensitive Emulsion (or) Slurry Cartridges	125 g
11.	Detonators recommended		NONEL based detonators of 17/25 ms surface delay with an in-hole delay of 250 ms
12.	Type of explosive recommended		Emulsion (or) slurry cartridge type (ø=25 mm)
13.	Initiation system recommended		Inverse initiation
14.	Method of connecting detonator		Series
15.	Maximum charge per delay		As stated in Table 3.22 based on the distance of the blasting site from the structure and the type of structure to be protected



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CHAPTER 1

INTRODUCTION

1.0 GENERAL

In modern mining era, the blasting technique is one of the most adopted techniques for rock breakage and fragmentation due to its economical and efficient aspects. However, the use of explosives for the blasting operation is limited by statutory regulations as it may have a severe impact on the surrounding environment such as vibration, noise and dust. Especially, a ground vibration induced by blasting has to be paid much attention in the mining operation as it may give an obvious impact on the surrounding facilities and buildings.

Many researches established safe level for blasting criteria, the ground vibration level is characterized by using three parameters; duration, amplitude (peak particle velocity: PPV) and frequency. Current studies on the blast-induced ground vibration is focused on two parameters amplitude (PPV) and frequency suggested by Directorate General of Mines Safety (DGMS) when the concerned subject is structure. Hence, the control of PPV and dominant frequency are very important in order to design an appropriate blasting standard and minimize its environmental impacts.

1.1 BLAST INDUCED GROUND VIBRATIONS - BACKGROUND

Globally, blasting is the principal method of rock breaking in mining and construction industry because of its distinct advantages like economy, efficiency, convenience, ability to achieve large production, high productivity and ability to break the hardest of the rocks.

When an explosive or a blasting agent is initiated, the chemical energy of it is converted into mechanical energy, which is used for breaking the rock. Even in a properly designed blast, only a portion of the total energy of the explosive is used for fragmenting and displacing the rock and the rest utilized in producing undesirable environmental effects like ground vibrations, fly rock, air overpressure (noise) and over-break making them an integral part of blasting. These undesirable effects cause damage to the civil, mining, defence structures and other properties in the vicinity.

With increasing mining and construction activities in areas close to human settlements, ground vibration has become a critical environmental issue as it can cause human annoyance and structural damage.

The adverse environmental effects produced by blasting cannot be totally eliminated, but effectively controlled by proper design of appropriate controlled blasting techniques. Further, optimum design of blast, based on scientific investigations relating to the explosives used, rock properties and other geological aspects, which are site specific, can also address the issues.

Some of the explosive energy (left over after rock breaking), of blasting, is transmitted to the surrounding rocks as elastic waves. As these waves travel, they displace particles in their path causing the particles to oscillate before returning to their original positions. These oscillations constitute ground vibrations. Special three dimensional seismographs are used to measure these vibrations in terms of displacement, velocity, acceleration and frequency.

The ground vibrations generated from the blast are compressive in nature and spread away from the blasting site in all directions like ripples spreading outwards when a stone is dropped in still water in a pond or tank. When these waves reach a free face, they get reflected back and get converted into tensile waves and cause breaking of rock (as rock is weak in tension). When no free face is available, they travel to a longer distance and finally get attenuated. These waves, which are not doing any useful work of breaking the rock, generate ground vibrations and cause damage to the surface structures like dams, places of worship, structures of archaeological importance, quarry slopes, residential buildings, etc. and also underground excavations. The ground vibrations have three mutually perpendicular components namely radial (**R**), transverse (**T**) and vertical (**V**).

1.2 Factors Influencing Blast Induced Ground Vibrations

From the literature, it can be seen that peak particle velocity (PPV) and the frequency of the vibrations are the most important parameters over which the stability of the structures depend. Peak particle velocity is defined as the *greatest velocity with which the ground vibrates during the vibration history and the same is*

measured in millimetres per second. Frequency is the number of cycles of the to- and- fro movement of ground particles per second. The units for measurement of frequency are Hz. The frequency of vibrations depends on the geology of the area, the rock type, etc.

When the frequency of the vibrations is equal to the natural frequency of the structures, maximum damage occurs to the structure. The range of natural frequency of surface civil structures is given in **Table 1.0**

Table 1.0 Natural frequency of surface civil structures (as per Central Mining and Fuel Research Institute (CMFRI), Council for Scientific and Industrial Research, Govt. of India Laboratory (Report 1991))

Type of Structure	Natural Frequency, Hz
Single storey brick structures	12-14
Double storey brick structures	8 - 10
Concrete Structures	9 - 16

In addition, blast induced ground vibrations are dependent on many more factors like type of rock and its properties, geological parameters, maximum charge per delay, strength of the explosive, distance of the structure from the blasting site, time delay between holes and rows, choking at the toe of the bench, priming sequence, sequence of blast hole detonation, spacing between holes and burden, angle of drill holes, stemming depth and type, charge length and diameter, confinement, blast geometry, total charge, etc. Amongst them, type of rock and its properties, the charge per delay and the distance of the blasting site from the structures are the most important ones. To keep the ground vibrations within desired levels, a clear understanding of the causes or factors, which influence generation, and propagation of ground vibration is essential.

1.3 Permissible Limits of Blast Induced Ground Vibrations –Peak Particle Velocity (PPV) for Surface Structures

The permissible levels of vibrations of various surface civil structures and other details specified by Directorate General of Mines Safety (DGMS), Dhanbad and others are given in **Tables 1.2 to 1.8**

Table 1.2 Directorate General of Mines Safety (DGMS) suggested peak particle velocities (PPV) various types of civil structures can tolerate without damage {DGMS (Tech) (S&T) Circular No.7 of 1997} (Ministry of Labour, Govt. of India)

Type of structure		Max. Permissible PPV, mm/s		
		Dominant excitation frequency, Hz		
		<8	8-25	> 25
(A)	Buildings / structures not belonging to the owner			
(i)	Domestic houses/structures (kutchha brick & cement)	5	10	15
(ii)	Industrial buildings (RCC & framed structures)	10	20	25
(iii)	Objects of historical importance & sensitive structures	2	5	10
(B)	Buildings belonging to the owner with limited span of life			
(i)	Domestic houses/structures(kutchha brick & cement)	10	15	25
(ii)	Industrial buildings (RCC & framed structures)	15	25	50

Findings of some of the researchers in their investigations regarding the damages to residential structures due to blast induced ground vibrations are given in **Table 1.7**

Table 1.3 Safe Peak Particle Velocities (PPV) Surface Structures can withstand Without Damage as per Indian Standards (IS: 6922 – 1973)

Sl. No.	Type of strata	Maximum permissible PPV, mm/s	
		Where no monitoring is done	Where monitoring is done using suitable instruments
1.	Soils, weathered or soft rocks	50	70
2.	Hard rocks	70	100
Note: (1) <i>the values suggested above are lower than those which may be intolerable to human beings.</i>			
(2) <i>the suggested values are appropriate for masonry and will be conservative for concrete of M_{15} ($\sigma_c = 15$ MPa) quality</i>			

Table 1.4 USA standard (as per Siskind, et al, 1980)

Type of structure	Peak particle velocity, mm/s	
	Frequency (<40 Hz)	Frequency (>40 Hz)
Modern homes, dry wall interior	18.75	50
Older homes, plaster on wood lath construction	12.5	50

Table 1.5 Australian standard 2008 (AS 2187.2)

Type of structure	Maximum values
Historical building and monuments and building of special value	0.2 mm displacement for frequencies less than 15 Hz.
Houses and low rise residential buildings, commercial buildings not included below.	19 mm/s resultant ppv for frequency greater than 15 Hz
Commercial buildings and industrial buildings or structural of reinforced concrete or steel construction	0.2 mm maximum displacement corresponds to 12.5 mm/s ppv at 10 Hz and 6.25 mm/s at 5 Hz

Table 1.6 German standard (as per German DIN 4150, 1986)

Type of structure	Peak particle velocity at foundation, mm/s		
	<10 Hz	10-50 Hz	50-100 Hz
Offices and industrial premises	20	20-40	40-50
Domestic houses and similar constructions	5	5-15	15-20
Buildings that do not come under the above because of their sensitivity to vibrations	3	3-8	8-10

Table 1.7 Range of Common Residential Criteria and Effects suggested by other researchers

Type of structure and Damage	PPV mm/s	Reference
Plaster-on-lath construction near surface mines (long term, large scale, low frequencies vibrations)	12.7	Bureau of Mines (RI 5807)
Sheetrock constructed near surface mines	19.1	Bureau of Mines (RI 8507)
Residences near surface mines lying within a distance of 92 to 1,524 m	25.0	OSM regulatory limits
Widely accepted limit for residents near construction and quarry blasting	50.8	Bureau of Mines (RI 8507)
Minor damage to average house subjected to quarry blasting vibrations	137	Bureau of Mines (656)
About 90% probability of minor damage from construction or quarry blasting. Structural damage to some houses depending on vibration source and character of the vibration	229	---
For close-in construction blasting, minor damage to nearly all houses and structural damage to some at low frequencies, major damage to most houses	501	---

It was opined (based on results of field investigations) by National Institute of Rock Mechanics (NIRM), Kolar Gold Fields, Karnataka (Ministry of Science and Technology, Govt. of India) that the maximum tolerable Peak Particle Velocities (PPV) of various frequencies the buildings of different types can tolerate without damage suggested by Directorate General of Mines Safety are very conservative and requires upward revision and suggested higher values as given in **Table 1.8**.

Table 1.8 National Institute of Rock Mechanics (NIRM) (Ministry of Science and Technology, Govt. of India) Recommendations regarding the maximum Peak Particle Velocities (PPV) various civil structures can tolerate without damage (Anon, 2005)

Type of structure		Maximum permissible PPV, mm/s		
		Dominant frequency, Hz		
		<20	20-50	> 50
(A)	Buildings / structures not belonging to the owner			
(i)	Domestic houses/structures (kutchha brick & cement)	10	15	25
(ii)	Industrial buildings (RCC & framed structures)	20	25	35
(iii)	Objects of historical importance & sensitive structures	5	7	10
(B)	Buildings belonging to the owner with limited span of life			
(i)	Domestic houses/structures(kutchha brick & cement)	15	25	35
(ii)	Industrial buildings (RCC & framed structures)	55	35	50

Amongst the various norms (guidelines) discussed above, the DGMS norms are the most conservative and hence safest to protect different types of structures. Therefore, the same are adopted for the present study in deciding the maximum charge per delay for different distances of the structures from the blasting site in this report.

1.4 Ground Vibration Predictor Equations

For effective prediction and subsequent control of ground vibrations, rock constants which are site specific are determined for every site (by trial blasts) where blasting is to be carried out. These rock constants are used in the predictor equation (Equation 1) to calculate the maximum explosive charge per delay for a given

maximum PPV the structure in question can tolerate without damage and the distance between blasting site and the structure.

The tolerable PPV a structure can withstand (without damage) depends on the frequency of the vibrations, type of structure, material used for the construction of the structure and the type of rock (soft or hard) on which it is fixed.

For predicting ground vibrations, when both blasting and measurements are made on the surface, square root scaled distance formula (Equation 1) is used (as per the DGMS (Tech.) (S&T) circular No.7 of 1997) as it gives very reliable predictions of PPV to protect surface structures by limiting the vibrations to the tolerable levels when maximum charge per delay is restricted.

$$V = k(SD)^{-\beta} \dots\dots\dots (mm/s) \quad \dots \quad (1)$$

where,

- | | | |
|---------------|---|--|
| V | = | Peak particle velocity (PPV), mm/s |
| SD | = | Scaled distance, m/\sqrt{kg} |
| k and β | = | Rock constants, which are site specific. |

where, SD is calculated by equation (2)

$$SD = \frac{D}{\sqrt{W}} \quad (m/\sqrt{kg}) \quad \dots \quad (2)$$

where,

- | | | |
|---|---|--|
| D | = | Distance between the blasting site and the vibration monitoring station, m |
| W | = | Maximum explosive charge per delay, kg |

A linear regression analysis between PPV (on the y-axis) and scaled distance (on the x-axis) is to be carried out for the monitored data as per the DGMS guidelines; the best fit curve on log-log scale is to be drawn to determine the rock constants k and β for square root scaled distance formula. Linear regression analysis is a statistical tool to determine the line of best fit through a distribution of points in a graph.

1.5 Human Perception

Human beings are very sensitive and can detect even very low level of vibrations (as low as 0.5 mm/s) which cannot cause damage to the structures. Vibration levels

lesser than the ones that cause damage to the structures could cause rattling of doors or windows. Many a times, the slamming of a door or passing of a loaded lorry by the side of the house generates more vibration than a quarry blast. However, residents become alert and inquisitive by noise and rattling of objects in the immediate surroundings due to blasting in the neighbourhood and start looking for the damages to the structures like cracks in the walls in their residence. Finding a crack that existed even before blasting activity commenced in the neighbourhood, but not noticed, people start worrying and attributing the crack to blasting activity.

Dowding (1996) observed that the human sensitivity gets triggered by vibrations and air blasts and becomes inquisitive and suspicious about them from a blasting activity in the vicinity reaching the structure and resulting in some form of damage to it. The tolerance and reactions of humans to vibrations vary from person to person, the nature of the work he/she is doing, the environment in which they are present at the time of blast, etc. Blast induced ground vibrations may result in annoyance and interference with work proficiency.

1.6 SCOPE OF THE WORK

The management of Kadavila-1 Stone Quarry located at Nagaroor Village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of **M/s. Adani Vizhinjam Port Private Limited, Thiruvananthapuram** has requested the Department of Mining Engineering, Anna University, Chennai to carry out scientific investigation into the influence of ground vibrations due to blasting being carried out in the Kadavila-1 Stone Quarry, on the residential buildings and other civil structures of the nearest village, not belonging to the quarry owner.

Based on this, the field investigation has been carried out from 16.03.2021 to 17.03.2021. During the field investigation, ten number of trial blasts were carried out at various locations of the mine with varying designs and charging patterns. The blasts were monitored using five vibration monitoring seismographs which are capable of recording vibrations in all the three directions along with noise/air overpressure. Based on the analysis of the above trial blasts, the following report was prepared and submitted.

1.7 OBJECTIVES

The objectives of the study are as follows

- Site visit and collection of data.
- Study the existing blasting, its design and its influence on the surroundings in respect of blast induced ground vibrations
- Design of trial blasts which will
 - restrict blast induced ground vibrations to levels that are tolerable on the residential and other civil structures not belonging to the quarry owner.
 - restrict generation of fly-rock and their throw to eliminate adverse effect on the residents and agricultural lands of the Nagaroor (Kadavila) village.
- Carry out at least 10 controlled trial blasts and monitor blast induced ground vibrations at least in 25 points under the supervision of the author of this report and their team. Similarly, study the distance to which flying fragments are produced.
- Develop a scaled distance equation for the site and determine the site constants which are site specific.
- Fine tune the blast design, if required, which will restrict the blast induced ground vibrations to the levels tolerable to the said structures, and control the fly-rock to minimise their effect on the residents, and people working in the agricultural lands.
- Submit the report including suggesting suitable methodology for carrying out regular drilling, controlled blasting operations in the quarry and also appropriate safety measures to be taken to guard against blast induced vibrations and fly-rock.

1.8 BLAST VIBRATION MONITORING INSTRUMENTATION

Blast induced ground vibrations and air over pressure (noise) are monitored with three dimensional Seismographs. During the field investigations, the blast induced ground vibrations were monitored using two numbers of NOMIS and three numbers of INSTANTEL seismographs.

1.8.1 NOMIS Mini SuperGraph

NOMIS Mini SuperGraph instrument (shown in Figure 1.0) from NOMIS seismograph, Inc., Birmingham, Alabama, U.S.A. are used for monitoring ground vibrations and air overpressure. It is very light, portable and user-friendly instrument for ease of operation in the field. The instrument has tri-axial transducer to record the blast induced ground vibrations in all three directions viz. R, T, V and a microphone to measure and record the air over pressure levels. The instrument can be operated from mains and rechargeable battery.

The Vibration Monitoring System basically consists of

- Transducers for recording ground vibrations and a microphone for measuring air overpressure that convert physical motion or pressure to an electrical current, which is transmitted through a cable followed by an amplifying system. The vibration events are recorded on to the system.



Figure 1.0 NOMIS Seismograph

The software provided with the instrument works on windows operating system. The software provides for copying, viewing, analyzing and printing the data. The software is also capable of performing advanced analysis of waveforms, etc. for effective analysis of the ground vibrations. The instrument is to be properly fixed (Coupled) to the ground. Some of the salient features of NOMIS Seismograph are given in Table 1.9.

Table 1.9 Salient features of NOMIS Seismograph

S.No.	Parameter	Values
SEISMIC		
1.	Range	0-254 mm/s
2.	Accuracy	+/- 3%
3.	Frequency Response	2- 400 Hz (1 Hz optional)
SOUND		
1.	Range	92-148 dB
2.	Accuracy	+/- 0.1dBL at 30 Hz and 127 Hz
3.	Frequency Response	2- 400 Hz
WAVEFORM RECORDED DATA		
1.	Record Modes	Waveform and Manual
2.	Seismic trigger range	0.19- 254 mm/s, no trigger, manual Lower Levels Optional
3.	Sound trigger range	92- 148 dB, no trigger (other levels optional)
PHYSICAL SPECIFICATIONS		
1.	Weight	1.9 kg
2.	Battery	6 Volt, gel type rechargeable, 14 days duration
3.	Display-LCD	8 lines x 21 characters with backlight
4.	Pc Interface	RS-232 & additional 15 pin auxiliary connector

1.8.2 InstanTel DS-077 Minimate & Blastmate

Instruments of InstanTel, Canada (Figure 1.1) were also used for monitoring ground vibrations. The instrument can be operated with power from the rechargeable battery. It is very light, portable and user-friendly instrument for ease of operation in the field. The instrument has tri-axial transducer (seismograph) to record the blast induced ground vibration in all three directions viz. radial (R), transverse (T) & vertical (V) directions and a microphone to measure the air over pressure levels. Minimate is a PC compatible computer-based system with inbuilt memory. The seismograph can measure the PPV up to 127 mm/s, frequency in the range of 2 - 250 Hz and air over pressure in the range of 100 - 142 dB. For effective recording of the ground vibrations the instrument is properly coupled to the ground either by spiking or grouting or bolting.

1.8.3 Transducer Mounting

Monitoring of ground vibration is to be carried out after properly mounting (coupling) the transducer (Geophone) with the ground to receive and transmit the actual magnitude of the vibrations at that site. There are five methods of mounting the transducer on the ground as shown in Figure 1.2. In the first, the transducer is placed on a horizontal surface without any device to hold it (Figure 1.2 a).



Figure 1.1 INSTANTEL Vibration Monitoring Instruments

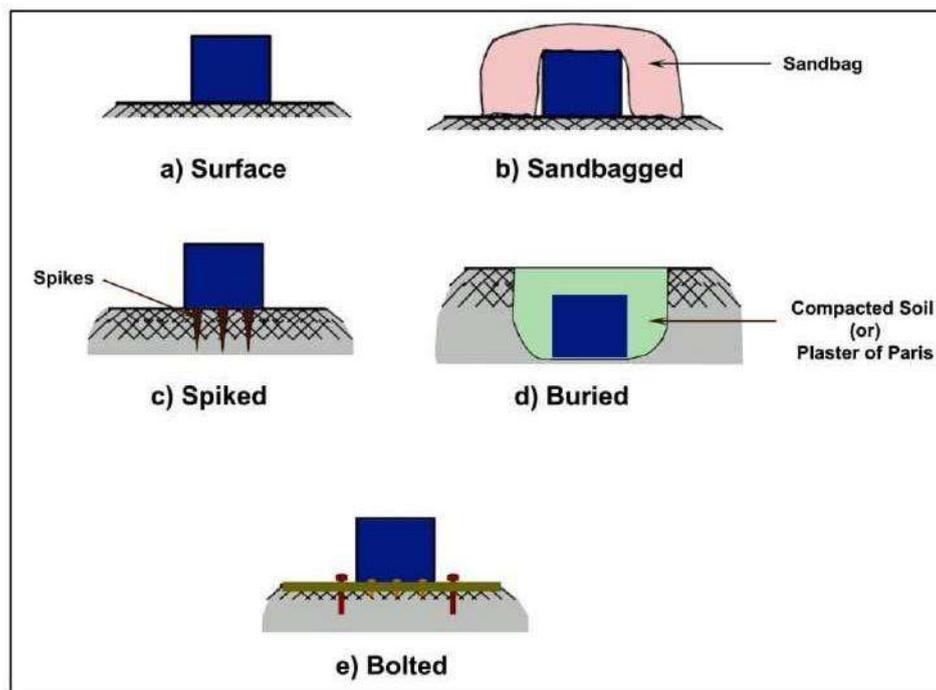


Figure 1.2. Five Common Methods of Transducer Mounting

The second one is also mounted in the same way but a loosely packed sandbag is placed over it so that all sides of the bag are directly in contact with ground (Figure 3b). In the third, the transducer is spiked into the ground (relatively loose) firmly, with the three spikes which are screwed to the transducer, by pressing into the ground

such that the base of the transducer is in direct contact with the ground (Figure 3c). In the fourth method, it is connected to the ground by completely burying it in soil or rock by making an excavation slightly bigger in size than that of the transducer and the soil compacted firmly around and over the transducer (Figure 3d). The same can be achieved by using „Plaster of paris” also. In the fifth method the transducer is bolted to the surface (floor or walls of a structure) to facilitate recording all the vibrations to which the surface is subjected to (Figure 3e).

1.9 CONTROLLED BLASTING

As stated earlier, when an explosive charge is blasted in a shot hole, in addition to doing the useful work of breaking rock and displacing it, it also produces adverse environmental effects like ground vibrations, over-break (back break), fly-rock, air-over pressure (noise) and air pollution with gases and dust. Some of these adverse effects cause damage to the structures in the vicinity and can cause injury to the people. Blasting by eliminating and / or controlling these adverse effects is termed as controlled blasting.

The blast induced ground vibrations get transmitted away from the blast in non-discriminating manner resulting in crushing and fracturing of the rock in the vicinity. This may pose a problem when blasting in the vicinity of the perimeter of a pit or a trench or civil, mining or defence structure. Hence, for the safety of the excavation and nearby structures, creation of new fractures and widening of the existing cracks due to the blasting are to be minimised, by generating less vibrations or preventing the vibrations from reaching the structure. The techniques to achieve this include

- Use of low strength explosives (explosives having less velocity of detonation).
- Reduced charge concentration by using less density explosives in small diameter drill holes.
- Reducing the quantity of explosive blasted at each moment of time by adopting delay blasting technique.
- Selecting optimum delay interval between two successive shots or groups of shots.
- Optimising the blast design parameters, viz. spacing, burden, length of the hole, charge factor, etc.

- Use of small diameter explosive charges (cartridges) in a large diameter holes (de-coupled charges).
- Use of air bags in the shot holes.
- Decking of explosives.
- Creating artificial cracks or discontinuity planes between the blasting site and the structures to be protected to limit the propagation of the radial cracks and transmission of shock waves.

1.9.1 Controlled Blasting Techniques

As on date, many blasting techniques are available to control the adverse effects of blasts. However, the selection of suitable technique primarily depends on the adverse parameter(s) of the blasting to be controlled. Some of the common techniques are (i) limiting the maximum charge per delay; (ii) line drilling; (iii) pre-splitting; (iv) cushion or smooth blasting; (v) air decking; (vi) muffling. Out of these, the first and sixth techniques, i.e. restricting the explosive quantity per delay and muffling with old tyres would be adopted for designing the controlled blasting technique in the Kadavila-1 Stone Quarry to protect the residential structures in the surrounding villages.

1.10 ADVERSE EFFECTS OF BLASTING

1.10.1 Abatement of Ground Vibrations by Controlled Blasting

The control measures for blast induced ground vibrations are:

- Design the blasts appropriate to the site and implement the designs scrupulously.
- Exercise good control over drill hole pattern by properly marking the shot holes on the floor of the bench prior to drilling, so that the designed spacing, burden and inclination are achieved.
- Provide maximum relief [by creating free face(s)] to ensure free movement of the rock with appropriate charge factor.
- If no additional free face is available, a properly designed initial cut pattern is to be implemented.
- Select and use appropriate explosives and accessories suitable for the ground conditions prevailing at the site.
- Select the appropriate charge factor (specific charge).

- Select the maximum charges per delay based on the distance of the structure to be protected from the blasting site.
- Select the appropriate delay interval between holes in the same row and rows of the holes.
- Deck the charges in a blast hole.

1.10.2 Fly Rock

When blasting is carried out, the rock gets fragmented and the fragmented material is moved away from the bench and gets piled up as fragmented mass to enable loading by an excavator. In addition to this desirable displacement of broken fragments, some stone pieces travel to certain distance away from the face resulting in scatter of the blasted muck pile and a few of them also project to a greater distance as shown in **Figure 1.3**. This undesirable projection of stones is termed as „fly rock’.

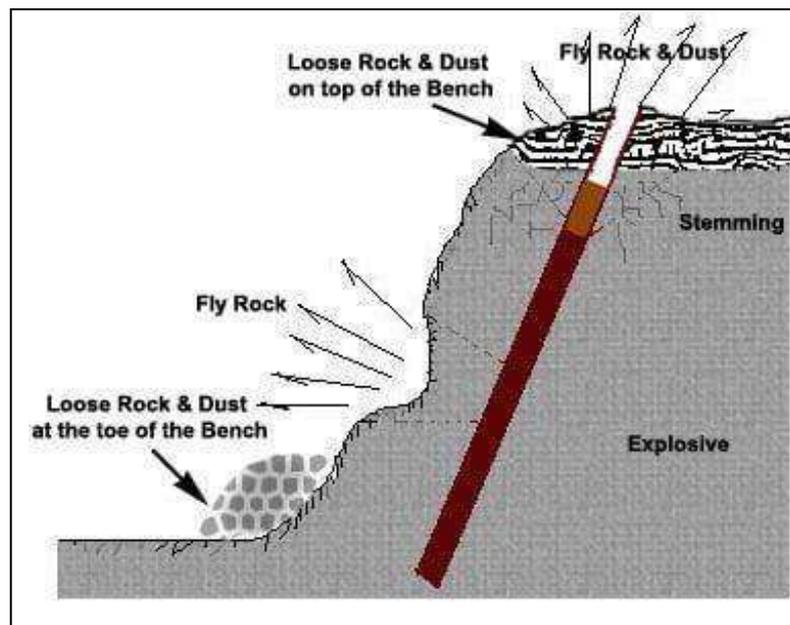


Figure 1.3 Fly-rock Generation

Fly rock is a serious environmental hazard and is often a cause of fatalities and /or serious injuries to the people, cattle, damage to the equipment, buildings and other property. Damage due to fly rock from blasting is one of the main causes of strained relations between the mine management and the people residing, working or passing by in the vicinity of blasting operations. This assumes prominence in mines having small leasehold area (when the danger zone falls beyond the leasehold area) and when the quarry is shallow with reference to the surroundings. These hazards

become serious as the blasting rounds become bigger with larger diameter boreholes, where fly rock of large sizes travel long distances. Fly rock is caused by improper blast design. The important parameters, which cause fly rock problem, are inadequate confinement of the explosive charge, high charge factor, decreased spacing and burden, overcharging, inaccurate drilling, inadequate stemming, faulty delay timing including not using delay detonators in multi-row blasting, improper initiation sequence, overlapping of delays, blast hole diameter, bench height, inclination of holes, charge distribution in holes, loose rock lumps lying on the top of bench or along slope, geological conditions like highly fractured and weathered rock and of course, human errors like - carelessness and improper supervision. In addition, secondary blasting is also a major source of fly rock and hence is to be avoided, wherever possible, or at least minimised by proper primary blast design (considering the above stated parameters) using delay detonators in conjunction with inverse initiation.

1.10.3 Control of fly-rock

Fly rock can be controlled by judicious selection of blast parameters mentioned above based on experience and calculations using certain empirical formulae developed from the site investigations. The fly rocks produced during the blasting can be controlled by adopting the following measures:

- Proper blast design and its implementation.
- Careful inspection of site before laying out blast holes and deciding the drilling pattern to be adopted based on the bench geometry.
- Drilling in accordance with the requisite blast design.
- Blast hole charging (using optimum charge factor).
- Maintaining the adequate stemming column.
- Use of proper stemming material (small pieces of stones with sharp edges are to be removed from the stemming material to eliminate the possibility of insulation of the detonator lead wires getting damaged or snapping of the lead wires and ultimately resulting in misfires).
- Imparting adequate training to the blasting crew.

In addition to the above, withdrawing all persons, cattle and traffic from the entire area falling **within a radius of 500 meters from the place of firing (hereinafter referred to as the danger zone)** as per **Reg. 188 (2)(b) of MMR 2019** and **DGMS Technical circular No. 2 of 2003**, and positioning of guards (sentries) at all probable entrances into the blasting zone is very essential to prevent inadvertent entry of persons, cattle and traffic.

1.10.4 Air Blast/Noise

When blasting is done, a loud noise is heard which is known as air blast. Air blast, however, is not simply the sound that is heard. Air blast is an increased pressure wave consisting of high frequency sound that is audible (from 20 Hz to 20 kHz) and low frequency sound or concussion (less than 20 Hz) that is sub-audible and cannot be heard. Although air blast seldom causes structural damage but sudden loud noise causes psychological fear in the nearby inhabitants and in some cases even breakage of window panes have been reported (Persson et al., 1994), if any building is present within a short distance from the blasting site. Air blast is influenced by type and amount of explosive, adequacy and type of material for stemming, direction of blast and meteorological conditions. The main cause of noise is the energy released in open air by the initiation system and inadequate stemming column, burden etc.

Air blasts are produced either by the direct action of the explosion products from the unconfined explosive (like, detonating cord) in air or by overcharging of explosive in a shot hole. The waves produced by the effect of blasting increases the air pressure from ambient pressure to peak and drops to negative (i.e., below ambient pressure) slowly. Its travel thereafter is governed by air temperature, wind direction & speed, and the presence of obstructions in the form of buildings, vegetation, and ground contour. Hence, blasting is to be avoided when the wind is blowing towards a critical area, which influences the air blast propagation. Similarly, blasting early in the morning and late in the evening is to be avoided, as there will be temperature inversions in the atmosphere during these periods of the day. Noise production is more with detonating cord and hence resorting to electric delay detonation reduces noise. However, United States Bureau of Mines (USBM) has correlated the damage due to air over-pressure. The recommended values are given below:

Table 1.10 United States Bureau of Mines (USBM) Values withstand Damage due to Air Over-pressure (Noise)

Over-pressure (dB)	Over-pressure (KPa)	Air Blast Effects
177	14	All windows break
170	6	Most windows break
150	0.63	Some windows break
140	0.20	Some large plate glass windows may break, desk and windows rattle
136	0.13	USBM interim limit for allowable air blast
126	0.05	Complaints likely

1.11 INITIATION SYSTEMS

There are a number of initiation techniques which can be used for supplying necessary energy to a column of explosive and thereby initiate the detonation process. The classification of initiation system is given in **Figure 1.4**

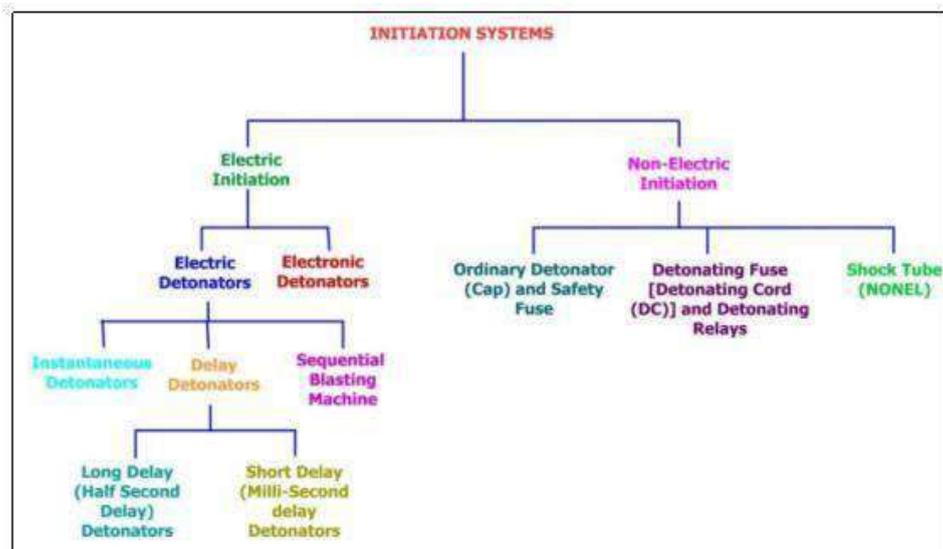


Figure 1.4 Blast initiation systems

Here, cap and safety fuse initiation is not recommended due to the difficulty in counting the number of shots during the firing of more number of holes in a single round creating unsafe situation.

Detonating fuse (DC) initiation system is also not recommended in this case because of its inability to provide inverse initiation (true bottom initiation). In addition, it produces more noise and increased possibility of misfires.

Shock tube initiation system can be used for better results and improved safety but it is more expensive.

Among the above, the **NONEL based initiation system** is having advantages of initiation systems like :

- As opposed to fuse initiation, the time of detonation is always under control.
- No damage is done to the stemming column.
- Delay blasting can be effectively carried out.
- True bottom initiation ensuring effective utilization of explosive energy thereby eliminating the stemming rejection and minimizing the flyrock travelling to large distances.
- No surface noises.
- Occurrence of misfires in the blasting can be minimised.
- Systems are cheaper and safe.

1.11.1 Shock Tube (NONEL)

The role of NONEL shock tube initiation system is the latest and advanced system in quarry blasting. The main component of a non-electric initiation system is shock tube that is a hollow plastic tube made with advanced materials designed to withstand field conditions. The inner walls of the tube are coated with high explosive of 14 to 20 mg/m length (**Figure 1.5**). With the help of non-electric millisecond delay detonators for down the hole initiation, two or three explosive decks in the same drill hole can be detonated by different delays. This reduces the maximum charge per delay thus controlling ground vibrations and can be very effectively used for carrying out controlled blasting operations. Use of NTD (Noiseless trunk line surface delay system) on the surface hook up, in place of detonating cord significantly reduces air blast/noise in view of the non-destructive nature of the tube. NTD or TLD (Trunk line delay) is a non-electric millisecond delay detonator for surface initiation of down line detonators. Combination of DTH and NTD give hole-by-hole initiation as well as sufficient 'burning front' thereby eliminating cut offs and misfires. Shock tube NONEL

system provides a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions.

1.11.2 Advantages of NONELs

- Noiseless, true bottom initiation, down-hole delays, simplified tie-in patterns, no limit on number of holes, reduction in air blasts/ground vibration, safe touse in extraneous electricity environments.

1.11.3 Disadvantages of NONELs

- Lack of firing circuit testing facility before firing (only visual examination is possible).
- Expensive compared to detonating cord and electric delay detonators.



Figure 1.5 Non- Electric Shock Tube Initiation Systems

CHAPTER 2.0 BLASTING PRACTICES IN THE QUARRY

2.0 DETAILS OF THE SITE

2.1 Company Profile

The Adani Group is one of India's leading business houses based at Ahmadabad – Gujarat, founded in 1988. Adani has grown to become a global integrated infrastructure player with businesses in key industry verticals – Resources, in coal mining and trading; Logistics, which is spread across ports, logistics, shipping and rail; Energy, with renewable, thermal, solar power generation and transmission businesses and Agro commodities and ancillary industries. The integrated model is well adapted to the infrastructure challenges of the emerging economies.

Adani Vizhinjam Port Private Limited (AVPPL) is a company belonging to Adani group, having their Registered office at Ahmedabad – Gujarat, and the local office at 2nd Floor, Vipanchika Tower, Thycaud, Thiruvananthapuram - 695014. The said company is in various infrastructural and construction activities, they have been awarded by the Government of Kerala for the development of Vizhijam port at Thiruvananthapuram, which is a National Developmental Project / Activity and is also a prestigious Sea Port for Kerala State. Hence, M/s. AVPPL is carrying out the stone quarrying operations in Sy. No. 555/2 of Nagaroor village (Kadavila), Chirayinkeezh Taluk, Thiruvananthapuram District over an area of 3.6630 Ha to facilitate the building stone material as the raw material for the development of the breakwater construction project.

2.2 Quarry Details

The present scientific study is in response to the request made by the management of M/s. Kadavila-1 Stone Quarry to investigate into the influence of blasting with emulsion explosives in their quarry relating to ground vibrations on the residential and other buildings of Kadavila village located around the quarry. The study is also aimed at investigating into the generation of the fly-rock, due to blasting and other mining activities of the quarry on the neighbourhood. Accordingly, the author of this report has carried out a preliminary survey followed by **10 number of controlled trial blasts** during **16.03.2021 to 17.03.2021** and prepared this report.

Figure 2.1 depict the Google map of the quarry area indicating the nearby surface structures and Figure 2.2 shows the surface plan of the leasehold area and locations of the nearest settlement and villages from the quarry lease area.

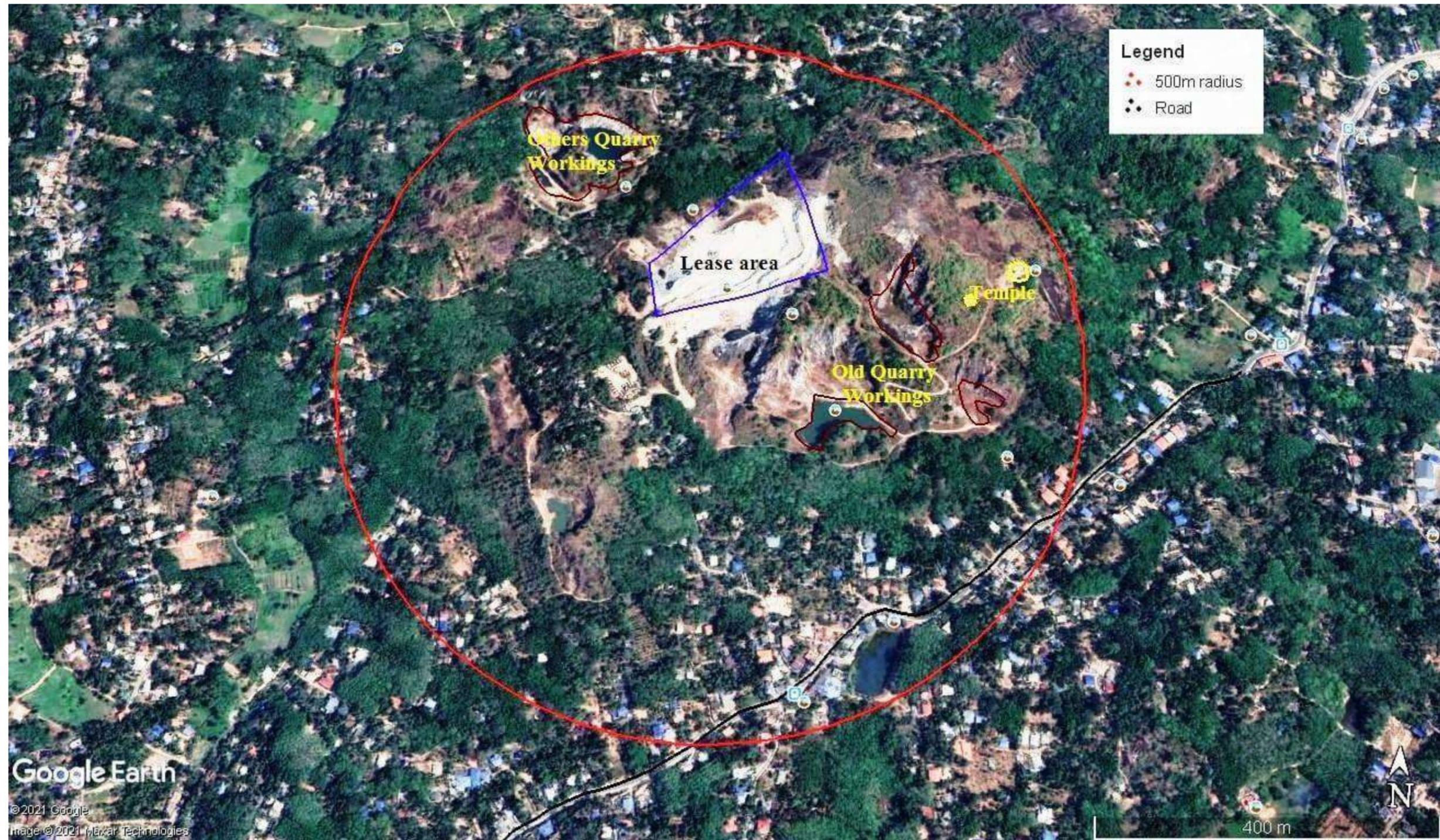


Figure 2.1 Shows the location of M/s. Kadavila-1 Stone Quarry in Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala and its surrounding settlement

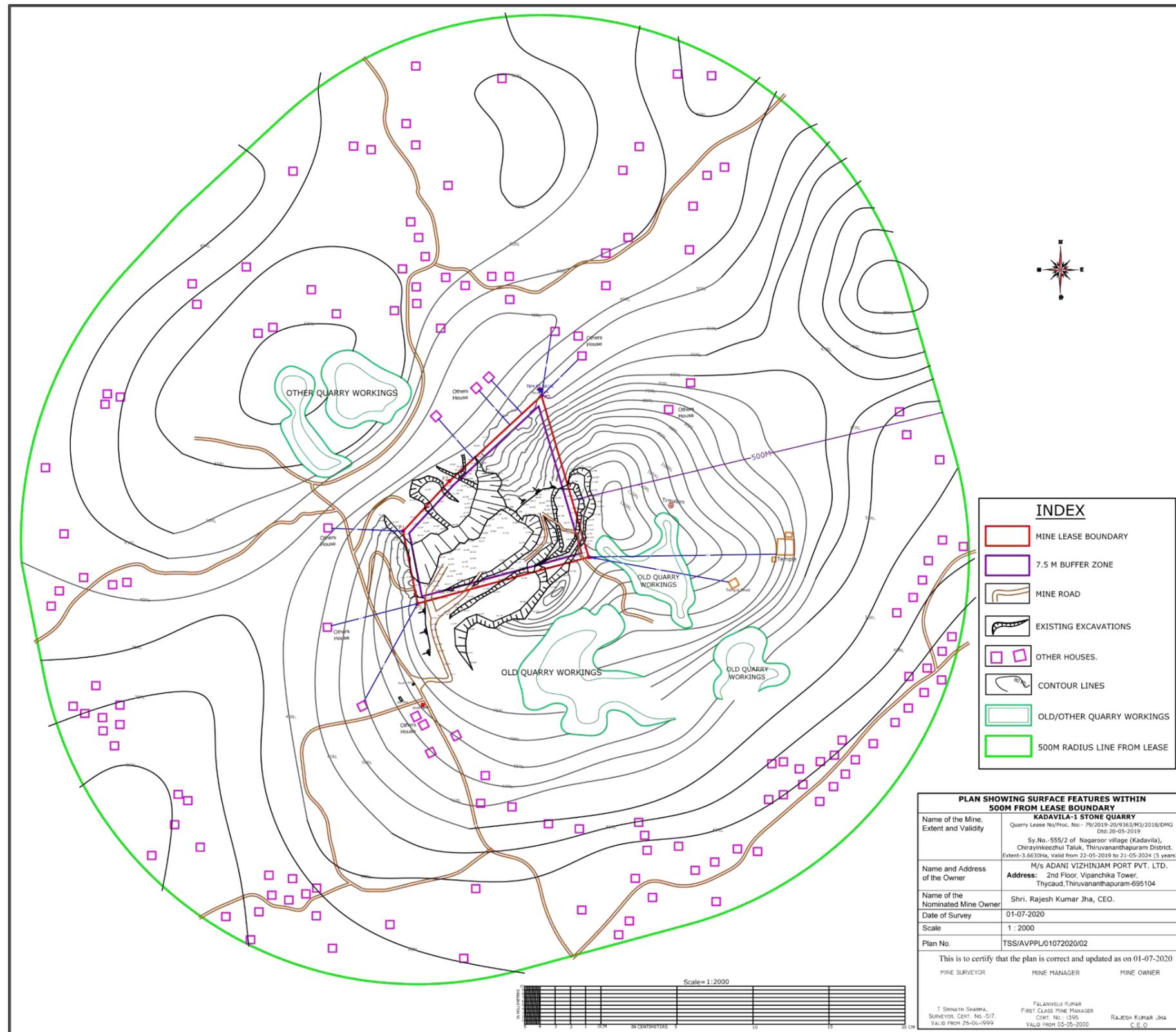


Figure 2.2 Shows the Surface Plan of M/s. Kadavila-1 Stone Quarry in Nagaroor village



The said quarry is located in Kadavila at a distance of 1.20 km towards southwest of Nagaroor village and lies towards north of Kadavila Bus stop at a distance of 0.50 km approximately. This lease area is approachable by all-weather road/s up to the up to Kadavila bus stop, thereafter a kutchra road towards north will lead to area.

The area is located between the geographical coordinates, **latitudes of 08°43' 42.88" N to 08°33' 51.74" N and longitudes of 76°50' 15.26" E to 76° 50' 23.24" E** and the total leasehold area of the mine is **3.6630 Ha (9.051 acres)** in Survey No. 555/2 (Government Land) of **Nagaroor village (Kadavila), Chirayinkeezh Taluk** of Thiruvananthapuram District, Kerala state. The Quarry is located at a distance of 35 km (by road) from Thiruvananthapuram which is the district head quarter and state's capital and at a distance of 13.0 km (by road) from Chirayinkeezh which is the Taluk head quarter, where all the infrastructural facilities are available. The nearest airport is at Thiruvananthapuram at a distance of 35.0 km and sea port at Kollam which is at a distance of 50.0 km. The nearest railhead on Broad gauge is Chirayinkeezh.

2.2.1 Geology of the area and properties of strata

Most of the quarry area is exposed by Charnockite (commercially known as Granite), only towards the north of the quarry area part is covered by topsoil with the thickness varying from 0.75 m to 1.00 m. The overburden is mainly topsoil, intercalated waste and mining rejects. Out of geological reserves of 5.196 million tonnes, only 1.778 million tonnes of reserves can be exploited / mineable, while the balance of 3.417 million tonnes of reserves is getting blocked which cannot be mined due to the boundary and practical constraints. The geological parameters of the ore body as follows:

Strike	: NW - SE with local variation of 15°- 20° on either side
Dip	: 70° - 80° dipping north
Strike length	: 250 m
Width of deposit	: 150-180m
Depth of deposit	: 50m

2.2.2 Method of Quarrying

Based on the mode and method so adopted and taking into the consideration of geological parameters, the quarry pit is designed such that the height of the bench is kept about 6.0 m maximum, and the width is also kept 6.0 m, maintaining 45° pit slope. The haul roads are properly laid and frequently wetted to suppress the dust being produced from the surface (Figure 2.3).



Figure 2.3 Benches and Haul road maintenance in the Quarry Face

Mining operation commenced from higher elevation to the lower elevation, benches developed and advanced in south and west direction laterally. Initially, the height of the highwall bench will be reduced, when it comes to the lower levels, benches will take the circular shapes and pit will be formed. The Mining operation is controlled and supervised by Statutory persons like Mine Manager, Assistant Mine Manager, Mine Foreman, Mining Mate Cum Blaster, who are certified by the Director General of Mines Safety, Dhanbad.

2.3 EXISTING BLASTING PRACTICES

The nature of the rock in the quarry has been found to be hard to medium hard in nature, possessing higher compressive strength and hence it requires drilling and

blasting operations to dislodge / loosen the material from the main rock mass to facilitate subsequent loading and transportation operations effectively.

The quarry is being worked systematically by constructing the benches with a maximum height of 6.0 m. Taking into consideration the parameters such as production requirement, required degree of fragmentation, type and capacity of excavator used, and environmental constraints, the **drill hole diameter of 33 mm** is being drilled using Jack hammer drilling machines. Based on the strength of the rock, the blasting pattern with a **burden** of 1.2 m and the **spacing** of 1.5 m are being maintained in the **row-by-row staggered patterns** (Fig. 2.4). The **hole depth** of 2.4 m for the above blastholes is maintained consistently for all the blasts. In the present case, vertical or inclined holes are used based on the bench conditions. If inclined hole drilling is adopted, the holes should be inclined at an angle of **15 to 20°** (more or less parallel to the inclined face of the bench) to the vertical and **inclined towards the free face** of the bench.

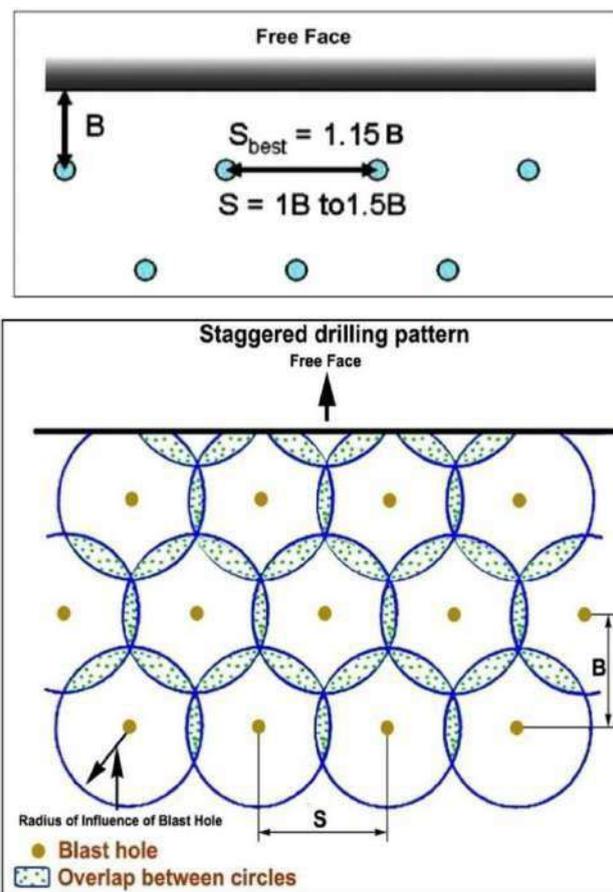


Figure 2.4 Staggered Pattern of Blast Holes

In the present site, a **minimum stemming length of 0.70 m** is used at the collar of the blast hole. The crushed angular rock of **2 to 4 mm (about 10% of blasthole diameter)** is used instead of fine drill cuttings to prevent premature venting of explosive gases. Keeping atleast two free faces during the current blasting practices in the Kadavila-1 stone quarry, a **charge factor of 0.15 to 0.16 kg/m³** is adopted for ensuring average charge quantity of 0.500 kg per hole. Accordingly, the cap- sensitive **Emulsion explosive** cartridges of **25 mm diameter** are used to charge the holes in **three to five** rows for ensuring effective fragmentation of rock and to minimise the fly-rock in the quarry. Maximum numbers of holes are being blasted at a time in a round are generally limited to 50 to 80 with Non-Electrical detonators (NONEL) with surface delay of 17/25 ms and an in-hole delay of 250 ms to mitigate adverse impacts such as air blast, fly rock and ground vibration. The instantaneous electrical detonators are being used for initiating the blasting circuit prepared with NONEL based detonators.

After completion of drilling, charging, stemming and hooking up by connecting the trunk-lines of NONEL shock tubes, the place would be ready for blasting (Figure 2.5 and 2.6). All blasting operations are carried out only during the day time (between sunrise and sunset) and under the personal supervision of the Assistant Mines Manager. However, it is ensured that cattle, stray dogs, human beings and traffic on the village road **within a distance of 500 m from the blasting site** (which is termed as blasting zone) are cleared away for the safety purposes. Similarly, the Mining Mate cum Blaster and his assistants are moved to a safe place and the **sentries with red flags and blowing whistles were kept in all the directions along the periphery of the blasting zone** on either side of the road within the blasting zone preventing any unauthorized entry of human beings or cattle or traffic into the blasting zone. After taking **the final clearance** from all sentries and the **final confirmation** from the Assistant Mines Manager, the exploder key is inserted into the exploder and the button is pressed for the firing.

After the completion of the blasting, the place is inspected for misfires, if any. **If no misfires are identified, all clear signal is given** and subsequently mucking (loading of the blasted rock) can be started.



Figure 2.5 Type of explosives used



Figure 2.6 Drilling and charging of blast holes



The summary of the blast design is given in **Table 2.1**

Table 2.1 Summary of the Blast Design being adopted in M/s. Kadavila-1 Stone Quarry

Sl. No.	Parameter		Value
1.	Blast hole diameter		33 mm
2.	Burden		1.2 m
3.	Spacing		1.5 m
4.	Height of the bench		6.00 m
5.	Stemming length		Minimum 0.70 m
6.	Drilling pattern being followed		Staggered
7.	Specific charge	For production blasting	0.15 to 0.16 kg/m ³
8.	Average explosive Quantity/hole	Emulsion cartridge	0.50 kg
9.	Maximum explosive charge per drillhole used during production blasting	Emulsion cartridge 125 g	0.625 to 0.688 kg
10.	Detonators used		NONEL based detonators of 17/25 ms surface delay with an in-hole delay of 250 ms
11.	Type of explosive used		Cap-sensitive type Emulsion cartridges (Ø=25 mm)
12.	Method of initiation system		IED/MSDD
13.	Method of connecting detonator		Series

Blasting shall be recognised as the most critical operation in mining and hence shall be carried out by maintaining highest standards of safety and reliability. Emphasis shall always be placed in creating a work-culture where it is to be emphasized that safety is the responsibility of all personnel working at the site. Hence, all these operations of drilling and blasting are being carried out under the direct supervision of qualified and experienced Assistant Mines Manager, Mining Mate cum Blaster in Kadavila-1 stone quarry.

CHAPTER 3.0

MONITORING AND ANALYSIS OF EXPERIMENTAL BLASTS

In response to the request made by the management of M/s. Kadavila-1 Stone Quarry to investigate into the influence of blasting with emulsion explosives in their quarry relating to ground vibrations on the residential and other buildings of Kadavila village located around the quarry, **10 number of controlled experimental blasts** were carried out during **16.03.2021 to 17.03.2021**. This scientific study is also aimed at investigating into the generation of the fly-rock and airblast (noise) due to blasting activities of the quarry on the neighbourhood.

Accordingly, five numbers of latest version of blast monitoring instruments (Two NOMIS and Three-Dimensional Seismographs of INSTANTEL make) have been used by the Anna University research team for monitoring blast induced ground vibrations in M/s. Kadavila-1 Stone Quarry.

After carrying out detailed site examination and discussion had with the management, **vibration levels** during the above **10 experimental blasts** were measured at the residential buildings, and other structures in the vicinity. The details of the blast parameters, peak particle velocities, their vectorial sum and the corresponding frequencies measured at the monitoring stations (**47 observations**) and other details of the blasts are given in **Table 3.1**. Regression curve has been drawn to develop the predictor equations for the site. From the predictor equation, site constants for M/s. Kadavila-1 Stone Quarry were determined. This enabled the blasting operations to be designed to maintain the permissible levels of peak particle velocity (blast induced ground vibrations) at any structure within the recommended level. The maximum explosive charge to be used per delay at each site to ensure no risk for the check dam, residential houses and other surrounding structures have been calculated using the **predictor equation with 95% confidence (Equation No. 3)** developed for various distance of the of structures from the blasting site.



Table 3.1 Details of the 10 Trial Blasts Carried out at Kadavila-1 Stone Quarry and the Blast Induced Ground Vibrations Recorded

Blast No.	Date	Location of Monitoring Site	Time	No of Holes	Average Depth of the holes	Average Burden & Spacing	Total charge./ Blast	Maximum Charge / delay	Volume of Rock Broken	Charge factor	Distance between the Blasting and the Monitoring Site	Vibration measurement recorded						Air Overpressure	
												Longitudinal		Transverse		Vertical			Vectorial Sum
												Peak Particle Velocity	Frequency	Peak Particle Velocity	Frequency	Peak Particle Velocity	Frequency		
No.	m	m	kg	kg	m ³	kg/m ³	m	mm/s	Hz	mm/s	Hz	mm/s	Hz	mm/s	dB(A)				
1	16.03.2021	S1 8°43'39.00" N 76°50'15.00"E	11.03 am	63	2.4	1.2,1.5	43.375	2.16875	265.356	0.1635	213	Not Triggered							
		S2 8°43'44.17"N 76°50'19.87"E	11.03 am	63	2.4	1.2,1.5	43.375	2.16875	265.356	0.1635	62	3.429	170.60	3.429	128.00	3.429	128.0	4.12	71.6
		S3 8°43'48.03"N 76°50'12.81"E	11.03 am	63	2.4	1.2,1.5	43.375	2.16875	265.356	0.1635	190	Not Triggered							
		S5 8°43'41.81"N 76°50'17.47"E	11.03 am	63	2.4	1.2,1.5	43.375	2.16875	265.356	0.1635	105	1.14	7.8	2.79	7.6	0.445	8.0	2.92	35.0
2	16.03.2021	S1 8°43'39.00" N 76°50'15.00"E	11.08 am	30	2.4	1.2,1.5	18.75	1.25	126.36	0.1483	297	Not Triggered							
		S2 8°43'44.17"N 76°50'19.87"E	11.08 am	30	2.4	1.2,1.5	18.75	1.25	126.36	0.1483	85	1.016	256.00	1.143	128.00	1.397	128.0	2.07	69.5
		S3 8°43'48.03"N 76°50'12.81"E	11.08 am	30	2.4	1.2,1.5	18.75	1.25	125.36	0.1483	253	Not Triggered							
		S5 8°43'41.81"N 76°50'17.47"E	11.08 am	30	2.4	1.2,1.5	18.75	1.25	126.36	0.1483	184	2.10	7.8	2.16	7.5	2.54	8.0	3.41	79.0

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



3	16.03.2021	S1 8°43'39.00" N 76°50'15.00"E	11.11 am	80	2.4	1.2,1.5	50	1.25	336.96	0.1483	267	Not Triggered							
		S2 8°43'44.17"N 76°50'19.87"E	11.11 am	80	2.4	1.2,1.5	50	1.25	336.96	0.1483	47	5.334	170.60	3.302	170.60	4.064	128.0	5.58	82.4
		S3 8°43'48.03"N 76°50'12.81"E	11.11 am	80	2.4	1.2,1.5	50	1.25	336.96	0.1483	264	Not Triggered							
		S5 8°43'41.81"N 76°50'17.47"E	11.11 am	80	2.4	1.2,1.5	50	1.25	336.96	0.1483	152	1.86	24	2.1	24	2.67	22	2.70	6.9
4	16.03.2021	S1 8°43'39.00" N 76°50'15.00"E	02.43 pm	30	2.4	1.2,1.5	18.75	1.33928	126.36	0.1484	136	0.381	0.0	0.245	0.0	0.254	0.0	0.832	4.5
		S2 8°43'44.17"N 76°50'19.87"E	02.43 pm	30	2.4	1.2,1.5	18.75	1.33928	126.36	0.1484	120	1.905	128.00	2.540	128.00	5.588	128.0	5.87	66.9
		S3 8°43'45.27"N 76°50'31.27"E	02.43 pm	30	2.4	1.2,1.5	18.75	1.33928	126.36	0.1484	465	0.572	8.1	0.889	7.8	0.508	8.0	0.968	6.9
		S4 8°43'41.81"N 76°50'17.47"E	02.43 pm	30	2.4	1.2,1.5	18.75	1.33928	126.36	0.1484	60	Not Triggered							
		S5 8°43'52.19"N 76°50'18.62"E	02.43 pm	30	2.4	1.2,1.5	18.75	1.33928	126.36	0.1484	282	1.52	7.7	2.48	7.5	0.953	8.0	2.81	57.3
5	16.03.2021	S1 8°43'39.00" N 76°50'15.00"E	02.45 pm	24	2.4	1.2,1.5	15	1.25	101.088	0.1484	296	0.889	204.80	0.254	68.30	1.143	29.30	1.47	18.9
		S2 8°43'44.17"N 76°50'19.87"E	02.45 pm	24	2.4	1.2,1.5	15	1.25	101.088	0.1484	102	4.064	73.10	4.572	128.00	7.366	102.4	7.52	63.1
		S3 8°43'45.27"N 76°50'31.27"E	02.45 pm	24	2.4	1.2,1.5	15	1.25	101.088	0.1484	359	0.254	8.0	0.381	7.8	0.191	8.0	0.397	12.9
		S4 8°43'41.81"N 76°50'17.47"E	02.45 pm	24	2.4	1.2,1.5	15	1.25	101.088	0.1484	185	Not Triggered							
		S5 8°43'52.19"N 76°50'18.62"E	02.45 pm	24	2.4	1.2,1.5	15	1.25	101.088	0.1484	151	0.191	7.7	0.381	7.5	0.191	7.8	0.429	36.1

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6	17.03.2021	S1 8°43'41.81"N 76°50'17.47"E	10.55 am	60	2.4	1.2,1.5	37.5	1.875	252.72	0.1484	80	8.509	170.60	5.842	128.00	3.175	73.10	9.8	30.4	
		S2 8°43'44.17"N 76°50'19.87"E	10.55 am	60	2.4	1.2,1.5	37.5	1.875	257.72	0.1484	95	1.524	170.60	2.032	256.00	3.302	170.6	3.41	92.6	
		S3 8°43'38.74"N 76°50'16.72"E	10.55 am	60	2.4	1.2,1.5	37.5	1.875	257.72	0.1484	174	1.97	7.7	1.84	7.8	1.27	8.0	2.11	6.9	
		S4 8°43'48.03"N 76°50'12.81"E	10.55 am	60	2.4	1.2,1.5	37.5	1.875	252.72	0.1484	170	0.635	8.2	0.508	7.7	0.572	7.8	0.778	52.4	
		S5 8°43'47.04"N 76°50'12.20"E	10.55 am	60	2.4	1.2,1.5	37.5	1.875	252.72	0.1484	165	0.572	7.8	0.635	7.6	0.318	8.0	0.683	73.4	
7	17.03.2021	S1 8°43'41.81"N 76°50'17.47"E	10.56 am	50	2.4	1.2,1.5	31.25	1.736	210.60	0.1484	75	7.747	170.60	10.16	170.60	5.969	128.0	11.09	70.9	
		S2 8°43'44.17"N 76°50'19.87"E	10.56 am	50	2.4	1.2,1.5	31.25	1.736	210.60	0.1484	125	1.651	51.20	1.778	170.60	2.032	128.0	2.51	68.2	
		S3 8°43'38.74"N 76°50'16.72"E	10.56 am	50	2.4	1.2,1.5	31.25	1.736	210.60	0.1484	157	1.46	7.7	2.10	7.8	1.14	8.0	2.24	6.9	
		S4 8°43'48.03"N 76°50'12.81"E	10.56 am	50	2.4	1.2,1.5	31.25	1.736	210.60	0.1484	160	0.953	8.2	0.953	7.7	0.699	7.8	1.17	47.2	
		S5 8°43'47.04"N 76°50'12.20"E	10.56 am	50	2.4	1.2,1.5	31.25	1.736	210.60	0.1484	154	1.71	7.8	1.14	7.6	0.572	8.0	1.89	56.3	
8	17.03.2021	S1 8°43'41.81"N 76°50'17.47"E	2.37 pm	30	2.4	1.2,1.5	18.75	1.339	126.36	0.1484	105	5.207	170.60	4.826	102.40	2.667	128.0	6.12	64.4	
		S2 8°43'44.17"N 76°50'19.87"E	2.37 pm	30	2.4	1.2,1.5	18.75	1.339	126.36	0.1484	68	1.651	56.80	1.270	128.00	2.032	51.20	2.3	78.0	
		S3 8°43'38.33"N 76°50'16.63"E	2.37 pm	30	2.4	1.2,1.5	18.75	1.339	126.36	0.1484	218	Not Triggered								
		S4 8°43'48.03"N 76°50'12.81"E	2.37 pm	30	2.4	1.2,1.5	18.75	1.339	126.36	0.1484	182	1.08	8.2	0.826	7.7	0.889	7.8	1.40	62.4	

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		S5 8°43'53.22"N 76°50'22.62"E	2.37 pm	30	2.4	1.2,1.5	18.75	1.339	126.36	0.1484	282	1.27	7.7	0.635	7.6	1.59	7.8	1.68	6.9	
9	17.03.2021	S1 8°43'41.81"N 76°50'17.47"E	2.39 pm	24	2.4	1.2,1.5	15	1.071	101.088	0.1484	186	3.302	170.60	2.794	256.0	1.413	170.6	3.47	67.8	
		S2 8°43'44.17"N 76°50'19.87"E	2.39 pm	24	2.4	1.2,1.5	15	1.071	101.088	0.1484	91	0.762	36.50	1.016	256.00	1.270	42.60	1.75	69.2	
		S3 8°43'38.33"N 76°50'16.63"E	2.39 pm	24	2.4	1.2,1.5	15	1.071	101.088	0.1484	293	Not Triggered								
		S4 8°43'48.03"N 76°50'12.81"E	2.39 pm	24	2.4	1.2,1.5	15	1.071	101.088	0.1484	205	0.317	8.2	0.317	7.7	0.317	7.8	0.524	63.7	
		S5 8°43'53.22"N 76°50'22.62"E	2.39 pm	24	2.4	1.2,1.5	15	1.071	101.088	0.1484	209	0.889	7.7	0.826	7.6	0.572	7.8	1.00	56.3	
10	17.03.2021	S1 8°43'41.81"N 76°50'17.47"E	2.46 pm	25	2.4	1.2,1.5	15.625	1.116	105.3	0.1484	146	2.54	170.60	2.54	256.0	1.397	170.6	3.4	56.2	
		S2 8°43'44.17"N 76°50'19.87"E	2.46 pm	25	2.4	1.2,1.5	15.625	1.116	105.3	0.1484	46	1.270	22.20	1.651	256.00	1.778	170.6	2.29	72.1	
		S3 8°43'38.33"N 76°50'16.63"E	2.46 pm	25	2.4	1.2,1.5	15.625	1.116	105.3	0.1484	259	Not Triggered								
		S4 8°43'48.03"N 76°50'12.81"E	2.46 pm	25	2.4	1.2,1.5	15.625	1.116	105.3	0.1484	245	0.191	8.2	0.191	7.7	0.127	7.8	0.206	59.1	
		S5 8°43'53.22"N 76°50'22.62"E	2.46 pm	25	2.4	1.2,1.5	15.625	1.116	105.3	0.1484	243	0.254	7.7	0.191	7.6	0.254	7.8	0.318	56.3	



3.1 Trial Blast Details

The details of the trial blasts along with the measured blast induced ground vibrations and blasting pattern are reported in the following paragraphs. From the adopted blasting pattern and charging practices during the aforesaid experimental blasts, maximum charge per delay and predictor equation were determined for the present site.

Blast No: 1: The first trial blast was conducted on 16th March, 2021 and the adopted blasting pattern and details are given in the Table 3.2 and 3.3. The Figure 3.1 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.2

Table 3.2 Co-ordinates of Blast & Instrument Locations

Sl. No	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B1)			8°43'45.19"	76°50'18.17"	---		
2	VMS_1 Location	11772	213	8°43'39.00"	76°50'15.00"	Not Triggered		Belonging to the owner
3	VMS_2 Location	20484	62	8°43'44.17"	76°50'19.88"	4.12 Within permissible limit	71.6	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	190	8°43'48.033"	76°50'12.81"	Not Triggered		Not belonging to the owner
6	VMS_5 Location	4687	105	8°43'41.81"	76°50'17.47"	2.92 Within permissible limit	35.0	Belonging to the owner, maximum value is 15 mm/s

Table 3.3 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	63	0.688	2.168	43.375

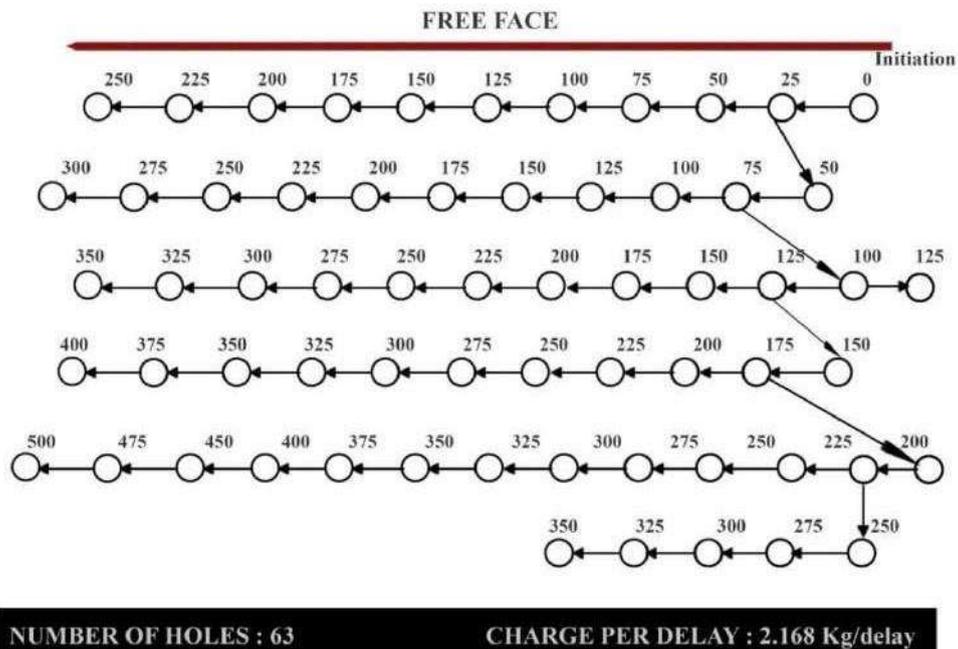


Figure 3.1 Schematic diagram of adopted blasting pattern for the blast 1

Post Blast Observations

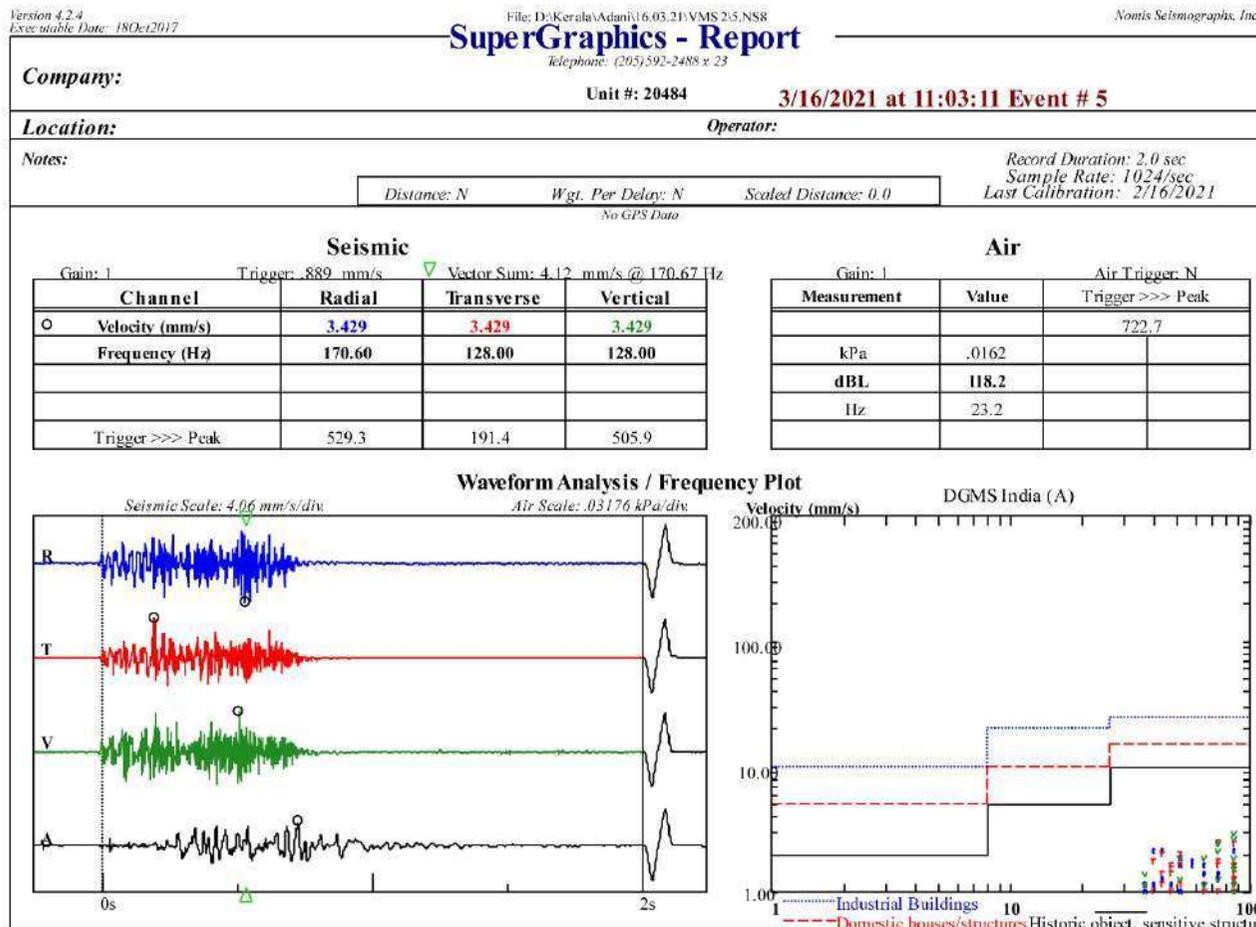
During the post blast observations, the following conditions were identified:

- No backbreak was observed.
- Muckpile was loose.
- The throw of the blast has been around 10-15 m which is considered to be normal.
- A drop of about 0.5 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 10 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored by the mine management was well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.2 & 3.3.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_2 Location : EVENT REPORT



VMS_5 Location : EVENT REPORT



Event Report

Date/Time MicL at 10:59:23 March 16, 2021
Trigger Source Geo: 0.492 mm/s
Range Geo: 127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687IW9Q.IZ0

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:50:28 (V8.12)

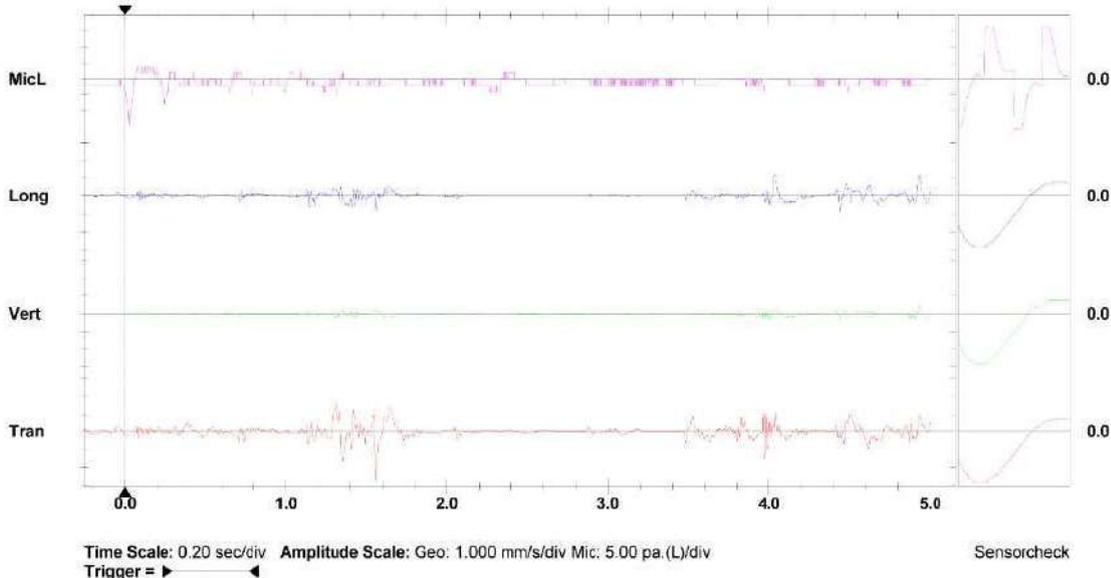
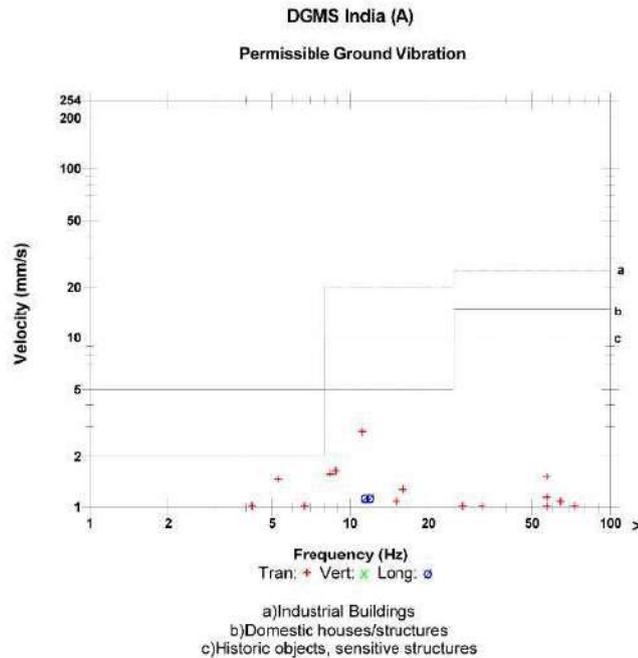
Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 116.9 dB(L) at 0.027 sec
ZC Freq 7.0 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 503 mv)

	Tran	Vert	Long	
PPV	2.79	0.445	1.14	mm/s
ZC Freq	11	20	11	Hz
Time (Rel. to Trig)	1.561	4.930	4.037	sec
Peak Acceleration	0.0530	0.0265	0.0199	g
Peak Displacement	0.0346	0.00307	0.0151	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.6	8.0	7.8	Hz
Overswing Ratio	3.6	3.3	3.5	

Peak Vector Sum 2.92 mm/s at 1.562 sec



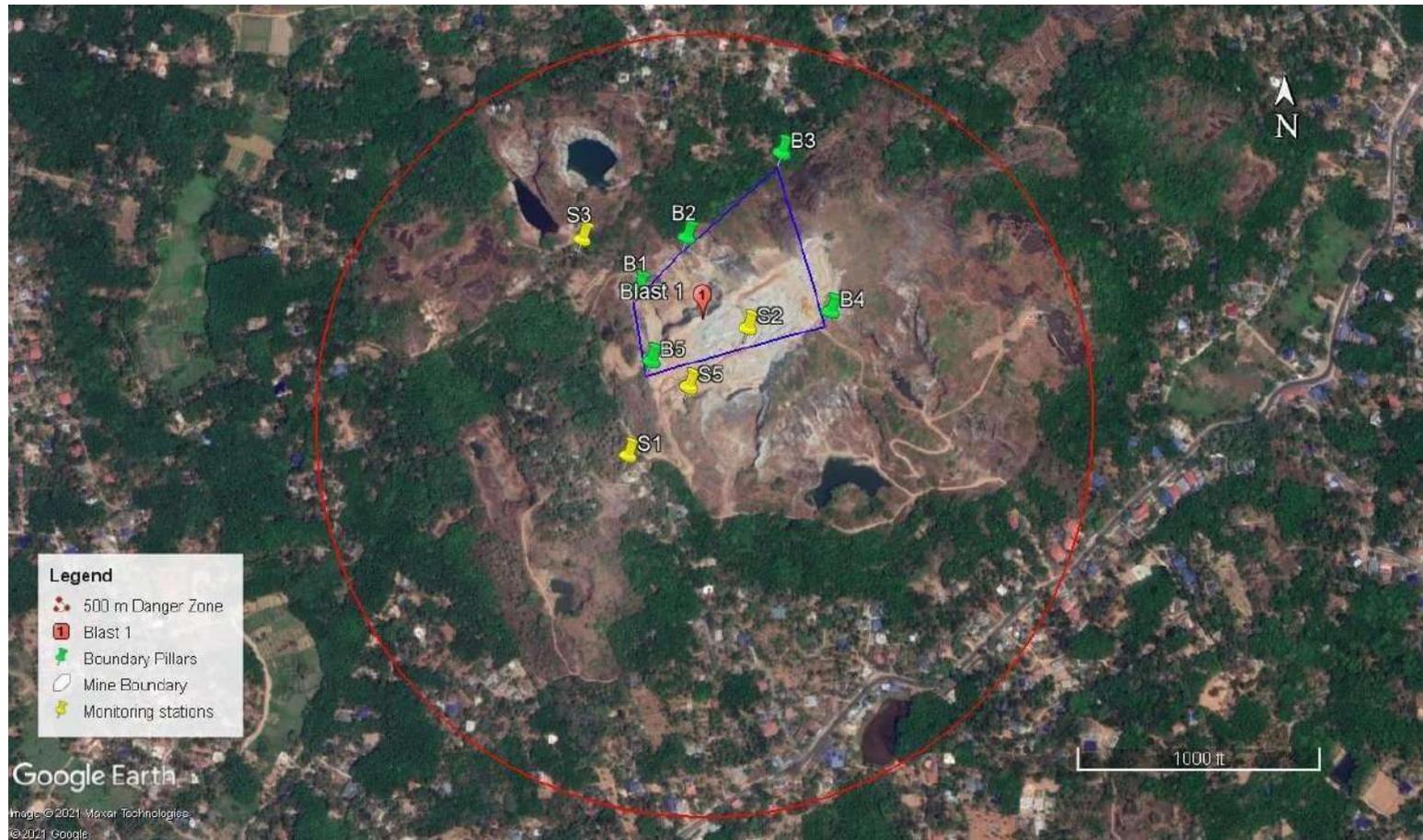


Figure 3.2 Imagery shows the location blast site 1 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



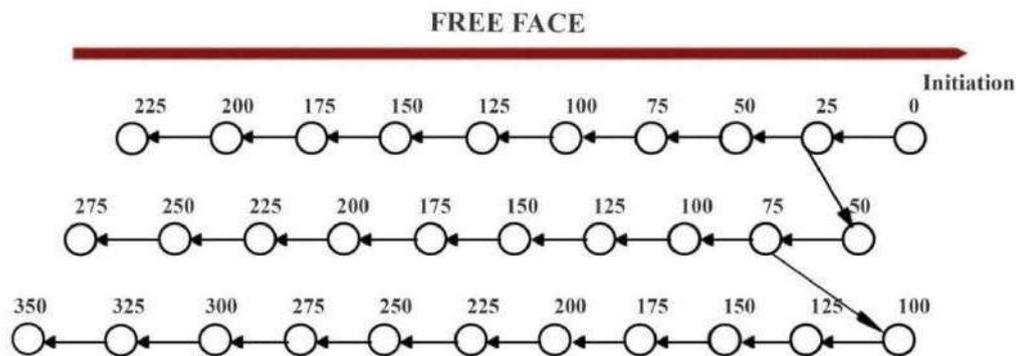
Blast No 2: The second blast was conducted on 16th March, 2021 and the adopted blasting pattern and details are given in the Table 3.4 and 3.5. The Figure 3.3 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.4

Table 3.4 Co-ordinates of Blast & Instrument Locations

Sl. No	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B2)			8°43'46.73"	76°50'20.89"	---		
2	VMS_1 Location	11772	297	8°43'39.00"	76°50'15.00"	Not Triggered		Belonging to the
3	VMS_2 Location	20484	85	8°43'44.17"	76°50'19.88"	2.07 Within permissible limit	69.5	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	253	8°43'48.033"	76°50'12.81"	Not Triggered		Not belonging to the owner
5	VMS_5 Location	4687	184	8°43'41.81"	76°50'17.47"	3.41 Within permissible limit	79.0	Belonging to the owner, maximum value is 15 mm/s

Table 3.5 Co-ordinates of Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	30	0.625	1.25	18.75



NUMBER OF HOLES : 30

CHARGE PER DELAY : 1.442 Kg/delay

Figure 3.3 Schematic diagram of adopted blasting pattern for the blast 2

Post Blast Observations

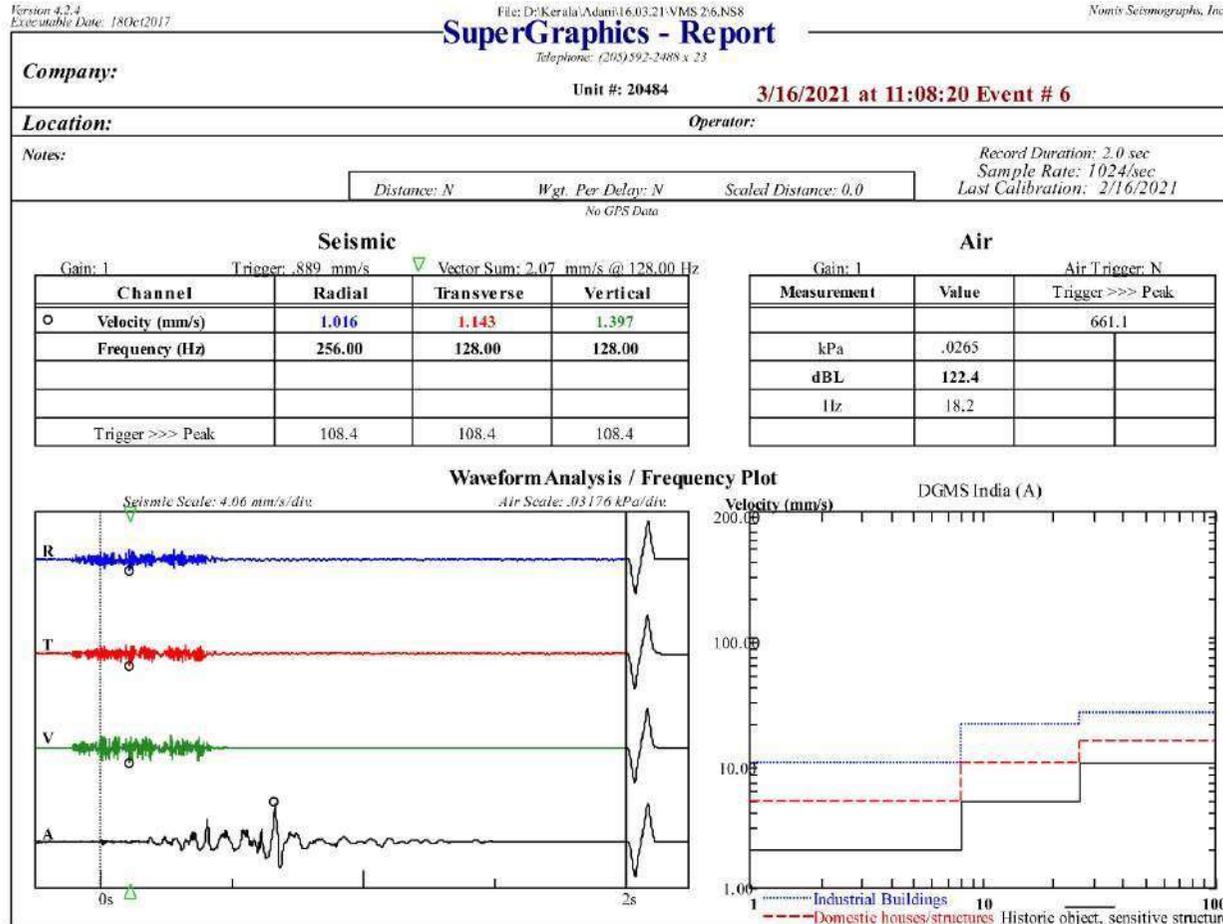
During the post blast observations, the following conditions were identified:

- No backbreak was observed.
- Muckpile was found to be loosen.
- The throw of the blast has been around 10-12 m which is considered to be normal.
- A drop of about 1m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 12 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring house was well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.4 & 3.5.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_2 Location : EVENT REPORT



VMS_5 Location : EVENT REPORT



Event Report

Date/Time Vert at 11:03:08 March 16, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687IW9Q.P80

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:50:28 (V8.12)

Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 114.0 dB(L) at 0.800 sec
ZC Freq 39 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	2.16	2.54	2.10	mm/s
ZC Freq	37	85	57	Hz
Time (Rel. to Trig)	0.190	0.441	0.448	sec
Peak Acceleration	0.0928	0.232	0.0994	g
Peak Displacement	0.00595	0.00493	0.00493	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.5	8.0	7.8	Hz
Overswing Ratio	3.6	3.3	3.5	

Peak Vector Sum 3.41 mm/s at 0.441 sec

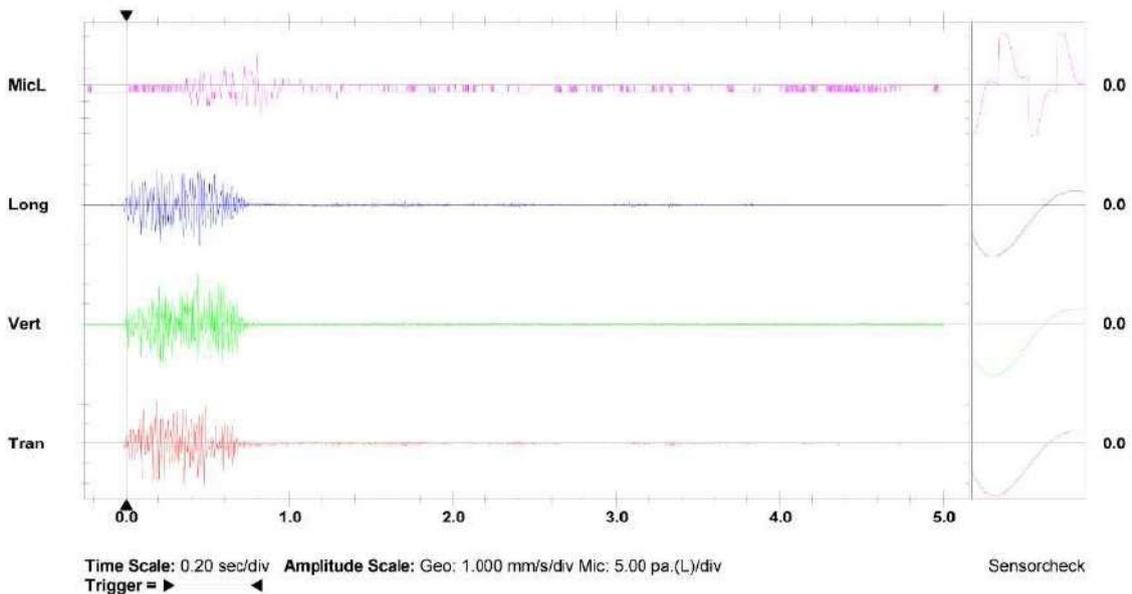
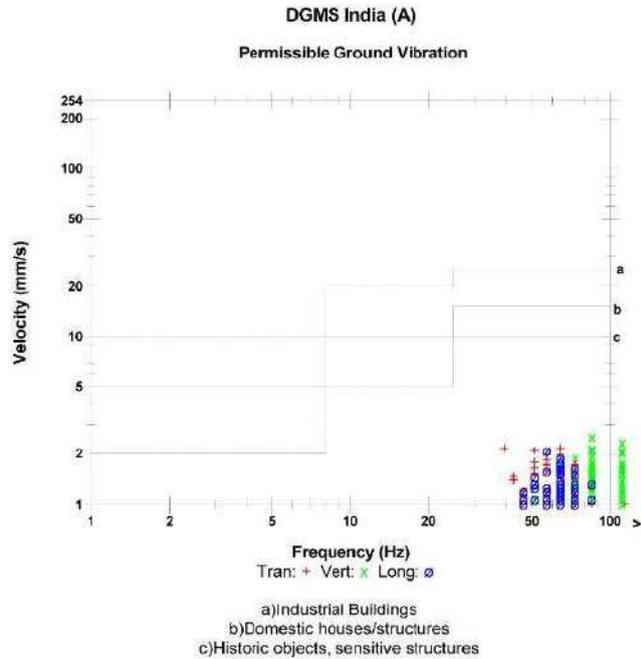




Figure 3.4 Imagery shows the location blast site 2 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



Blast No 3: The third blast was conducted on 16th March, 2021 and the adopted blasting pattern and details are given in the Table 3.6 and 3.7. The Figure 3.5 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.6

Table 3.6 Co-ordinates of Blast & Instrument Locations

Sl. No	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Nois dB(A)	Type of structure/ Permissible limit
1	Blast Location (B3)			8°43'45.46"	76°50'20.86"	---		
2	VMS_1 Location	11772	267	8°43'39.00"	76°50'15.00"	Not Triggered		Belonging to the owner
3	VMS_2 Location	20484	47	8°43'44.17"	76°50'19.88"	5.58 Within permissible limit	82.4	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	264	8°43'48.033 "	76°50'12.81"	Not Triggered		Not belonging to the owner
5	VMS_5 Location	4687	152	8°43'41.81"	76°50'17.47"	2.7 Within permissible limit	6.9	Belonging to the owner, maximum value is 15 mm/s

Table 3.7 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	80	0.625	2.174	50

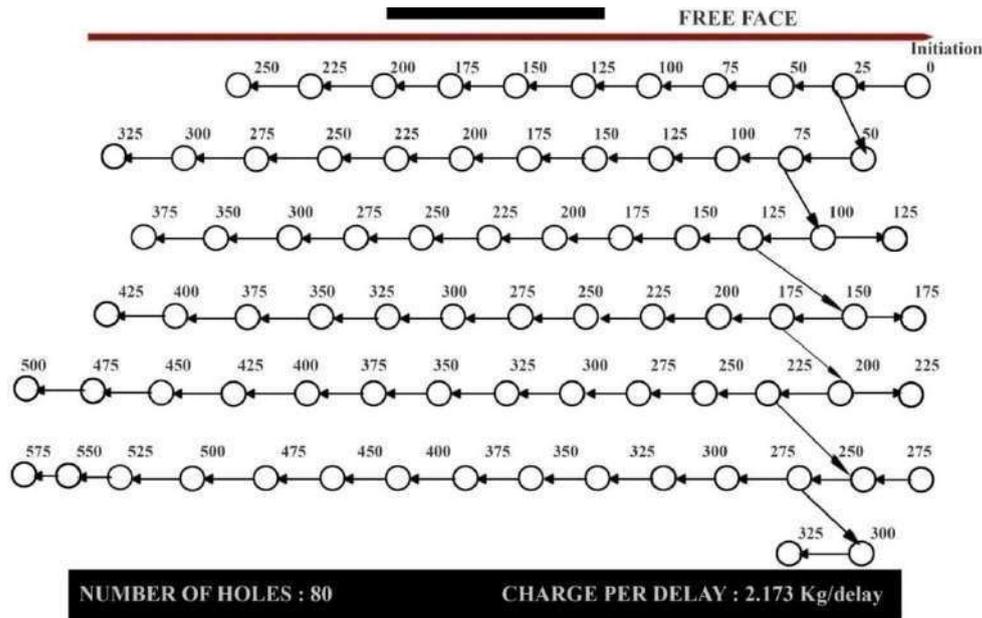


Figure 3.5 Schematic diagram of adopted blasting pattern for the blast 3

Post Blast Observations

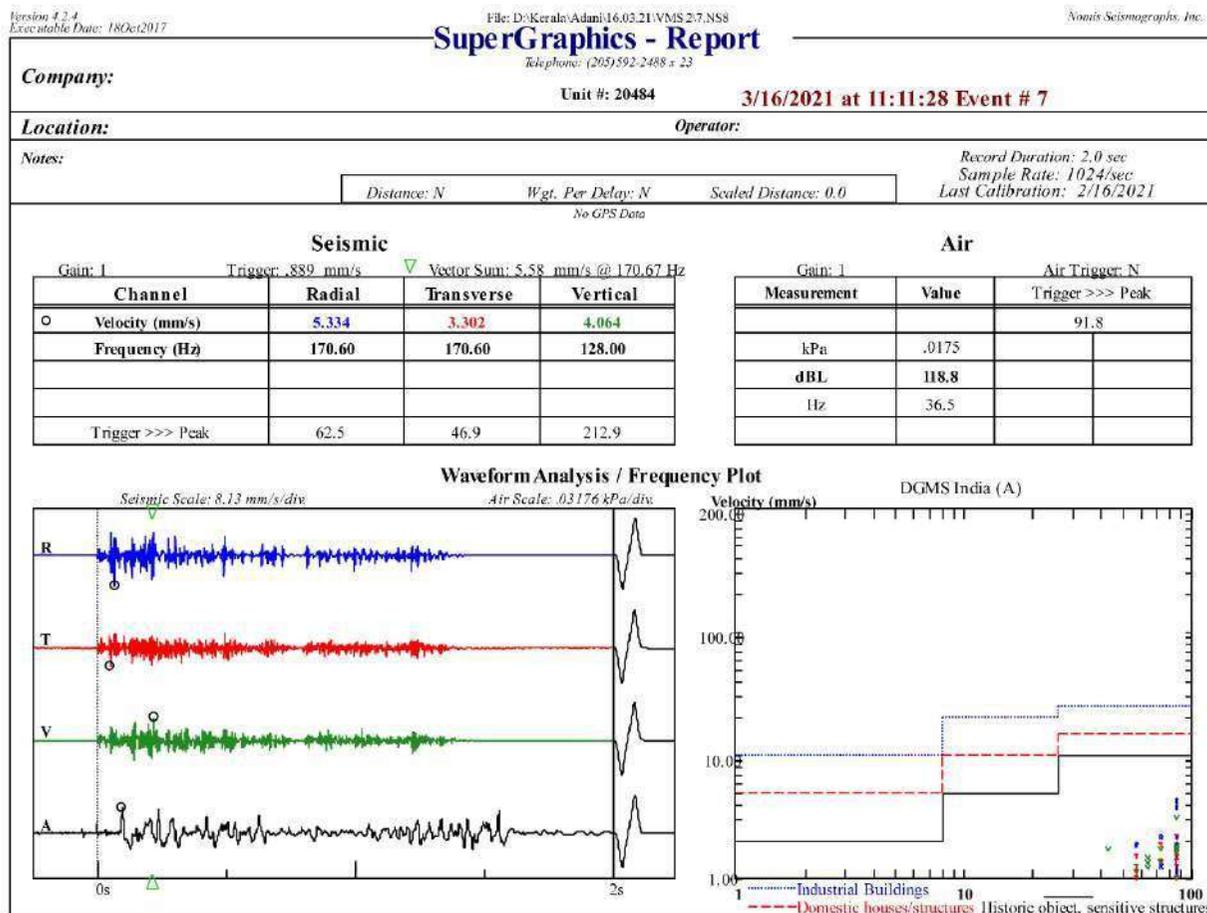
During the post blast observations, the following conditions were identified:

- No backbreak was observed.
- Muckpile was found to be adequately loosen.
- The throw of the blast has been around 12-15 m which is considered to be normal.
- A drop of about 1m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 10 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring house was well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.6 & 3.7.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_2 Location : EVENT REPORT





VMS_5 Location : EVENT REPORT



Event Report

Date/Time Tran at 11:11:30 March 16, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687IW9R.360

Notes
Location: KADAVILA STONE QUARRY;
Client: ADANI PORT PVT LTD
User Name: ANNA UNIVERSITY
Converted: February 26, 2011 04:50:28 (V8.12)

Extended Notes

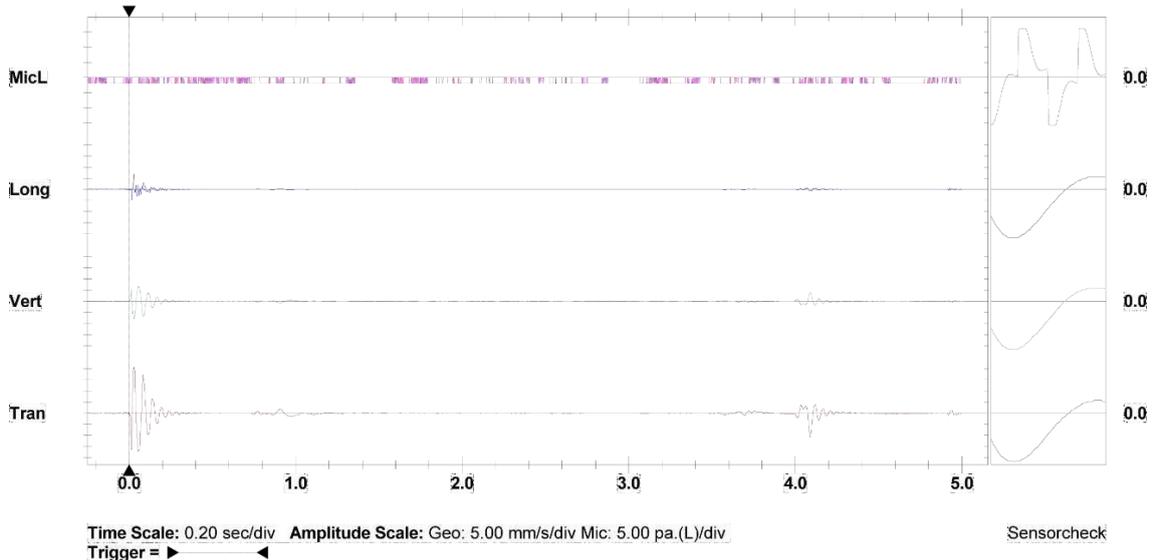
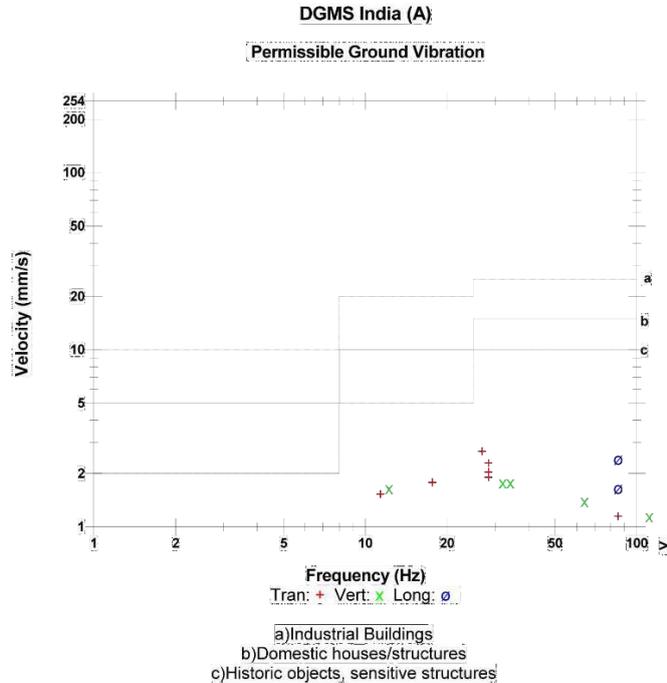
Post Event Notes

Microphone Linear Weighting
PSPL 100.0 dB(L) at 0.001 sec
ZC Freq N/A
Channel Test Passed (Freq = 20.0 Hz Amp = 506 mv)

	Tran	Vert	Long	
PPV	2.10	2.67	1.86	mm/s
ZC Freq	24	22	24	Hz
Time (Rel. to Trig)	0.032	0.030	0.029	sec
Peak Acceleration	0.464	0.305	0.212	g
Peak Displacement	0.184	0.0705	0.0206	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.5	7.8	7.7	Hz
Overswing Ratio	3.5	3.3	3.3	

Peak Vector Sum 2.7 mm/s at 0.032 sec

N/A: Not Applicable



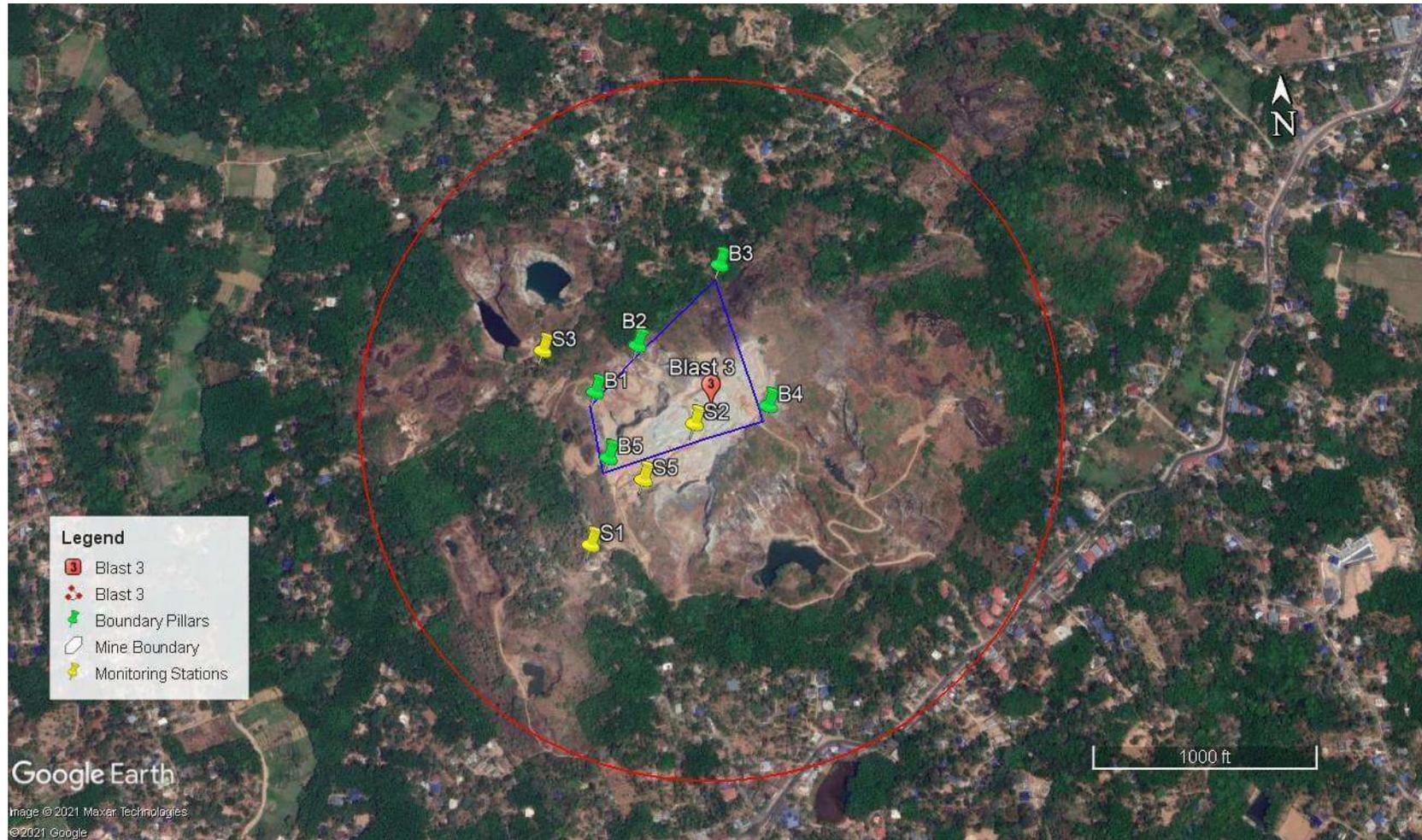


Figure 3.6 Imagery shows the location blast site 3 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



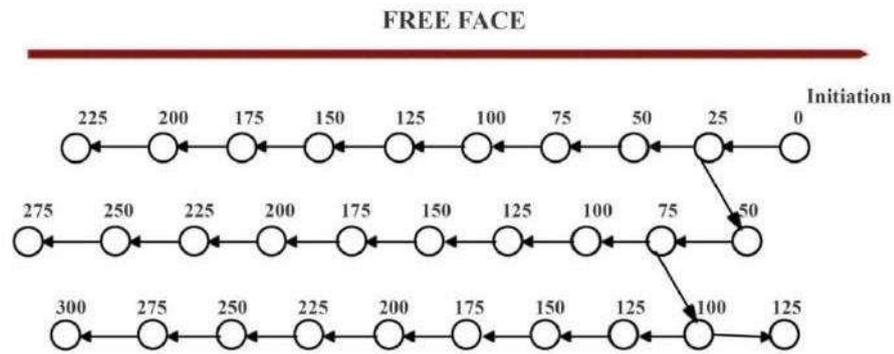
Blast No 4: The fourth blast was conducted on 16th March, 2021 and the adopted blasting pattern and details are given in the Table 3.8 and 3.9. The Figure 3.7 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.8

Table 3.8 Co-ordinates of Blast & Instrument Locations

Sl. No.	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B4)			8°43'43.29"	76°50'16.16"	---		
2	VMS_1 Location	11772	136	8°43'39.00"	76°50'15.00"	0.832 Within permissible limit	4.5	Not belonging to the owner, maximum value is 5 mm/s
3	VMS_2 Location	20484	120	8°43'44.17"	76°50'19.88"	5.87 Within permissible limit	66.9	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	465	8°43'45.28"	76°50'31.27"	0.968 Within permissible limit	6.9	Not belonging to the owner, maximum value is 5 mm/s
5	VMS_4 Location	4688	60	8°43'41.81"	76°50'17.47"	Not Triggered		Belonging to the owner
6	VMS_5 Location	4687	282	8°43'52.19"	76°50'18.62"	2.81 Within permissible limit	57.3	Not belonging to the owner, maximum value is 5 mm/s

Table 3.9 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	30	0.625	1.339	18.75



NUMBER OF HOLES : 30

CHARGE PER DELAY : 1.562 Kg/delay

Figure 3.7 Schematic diagram of adopted blasting pattern for the blast 4

Post Blast Observations

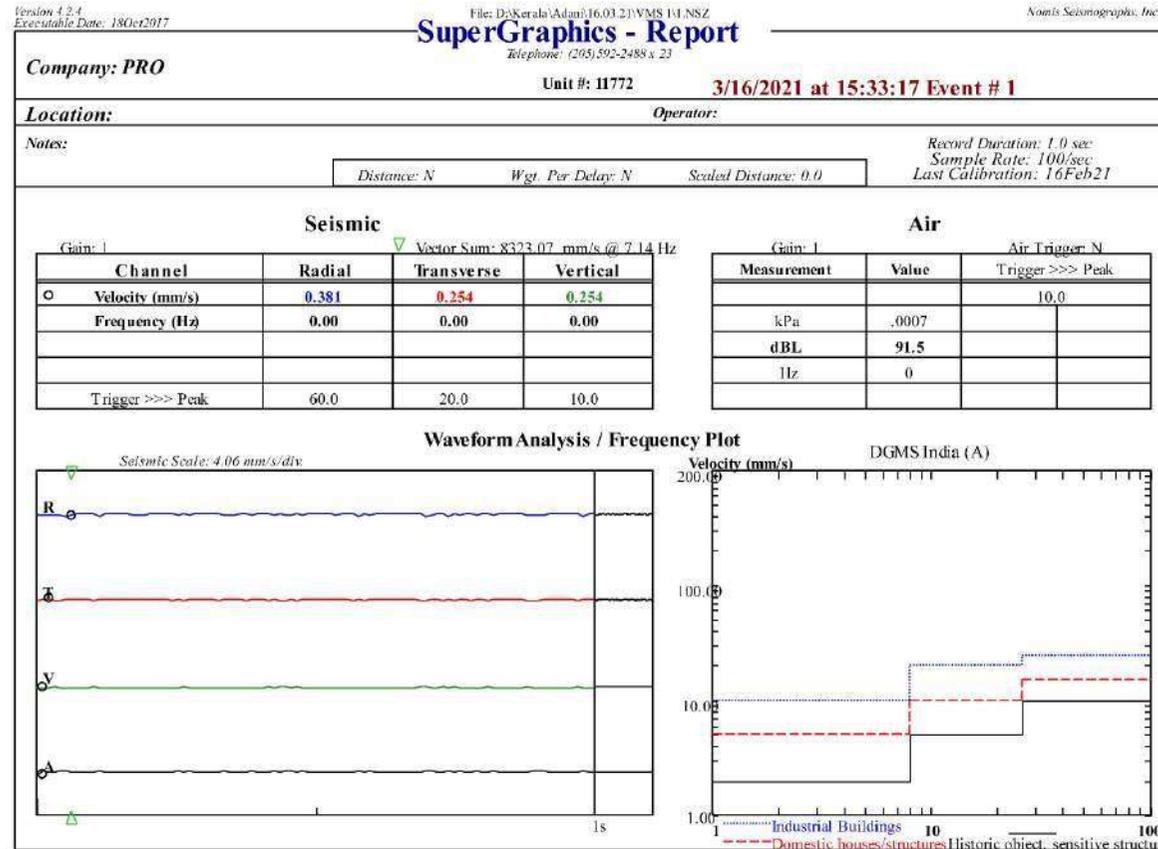
During the post blast observations, the following conditions were identified:

- Backbreak was observed of about 0.5 - 1.0 m.
- Muckpile was found to be adequately fragmented.
- The throw of the blast has been around 15 m which is considered to be normal.
- A drop of about 0.5 to 0.75 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 15 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring village was well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.8 & 3.9.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



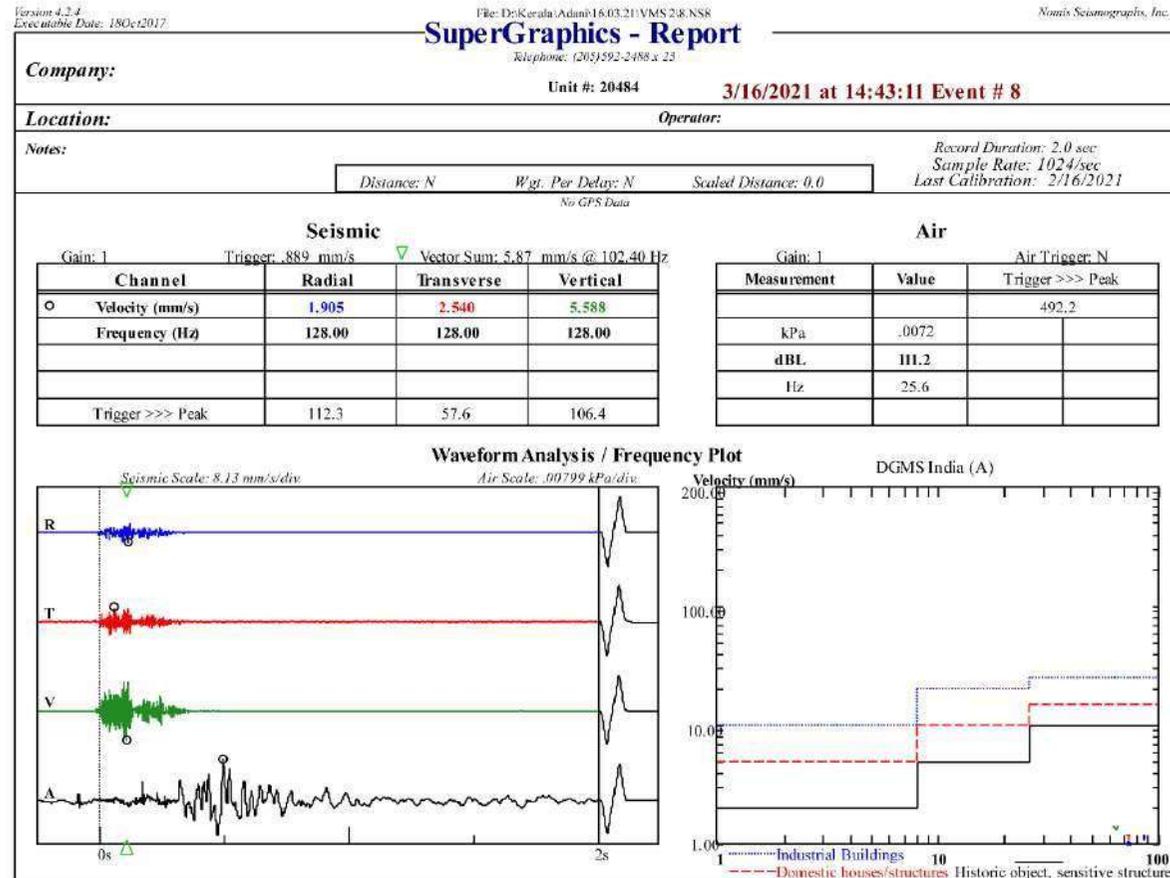
VMS_52 Location : EVENT



Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_53 Location : EVENT



VMS_3 Location : EVENT REPORT



Event Report

Date/Time Tran at 14:41:51 March 16, 2021
Trigger Source Geo: 0.492 mm/s, Mic: 106.0 dB(L)
Range Geo: 127.0 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 5993 V 2.61 MiniMate
Battery Level 6.6 Volts
Unit Calibration March 1, 2021 by UES New Delhi
File Name G993IWA0.TR0

Notes

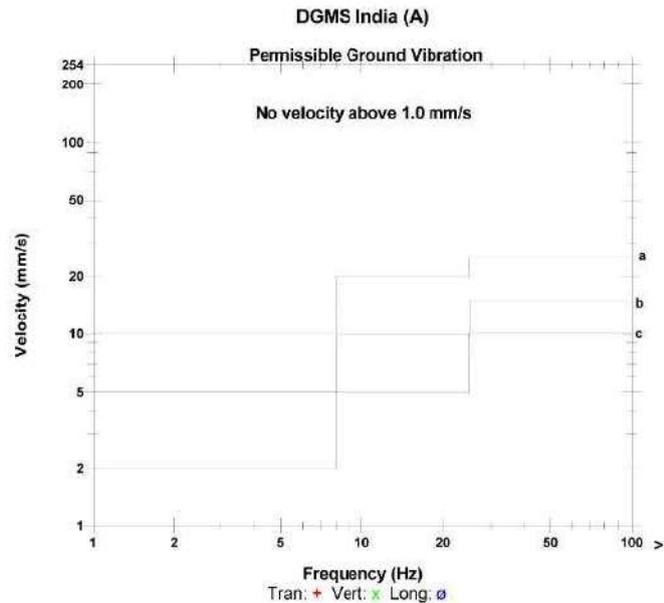
Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 07:25:35 (V8.12)

Extended Notes

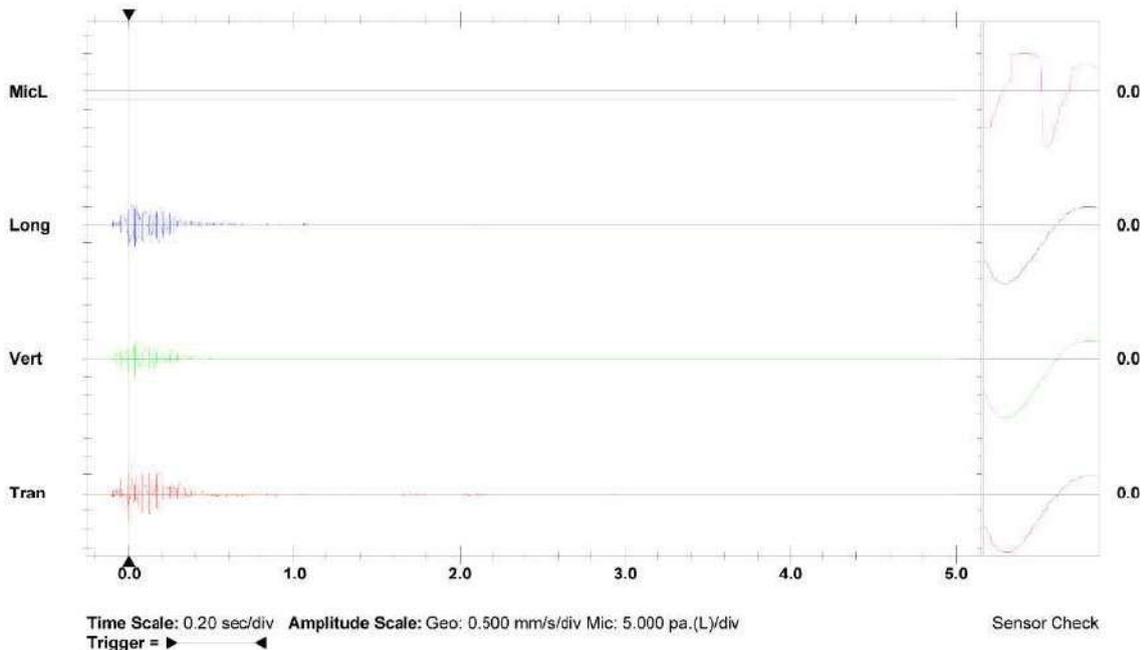
Microphone Linear Weighting
PSPL 100.00 dB(L) at 0.293 sec
ZC Freq N/A
Channel Test Check (Freq = 0.0 Hz Amp = 30 mv)

	Tran	Vert	Long	
PPV	0.889	0.508	0.572	mm/s
ZC Freq	>100	N/A	N/A	Hz
Time (Rel. to Trig)	0.009	0.038	0.005	sec
Peak Acceleration	0.060	0.053	0.046	g
Peak Displacement	0.001	0.001	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.8	8.0	8.1	Hz
Overswing Ratio	3.6	3.5	3.5	

Peak Vector Sum 0.968 mm/s at 0.009 sec
 N/A: Not Applicable



- a) Industrial Buildings
- b) Domestic houses/structures
- c) Historic objects, sensitive structures



VMS_5 Location : EVENT REPORT



Event Report

Date/Time Tran at 14:43:02 March 16, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4887 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F6871WA0.VQ0

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 07:20:35 (V8.12)

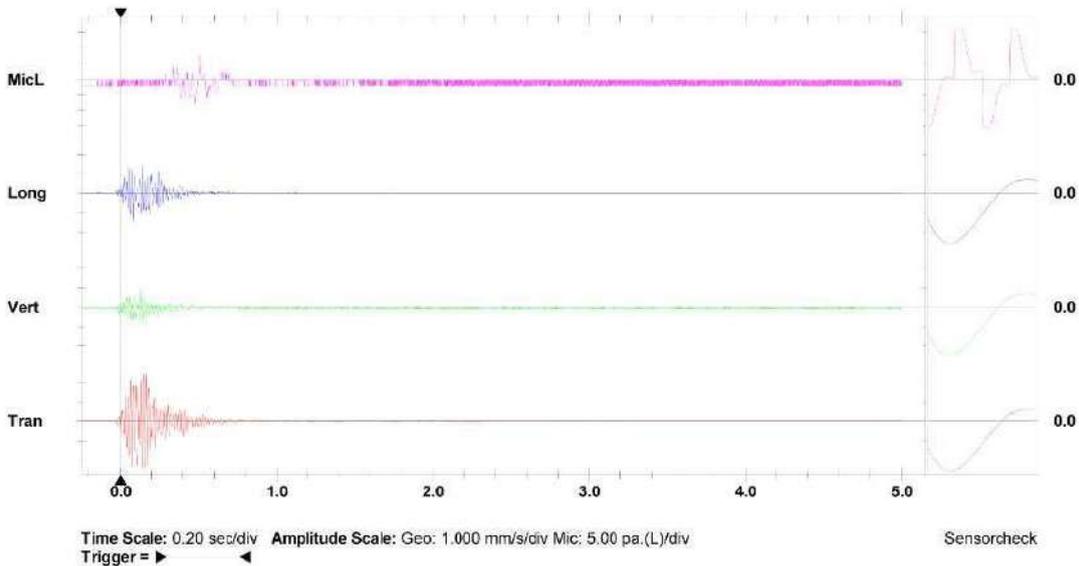
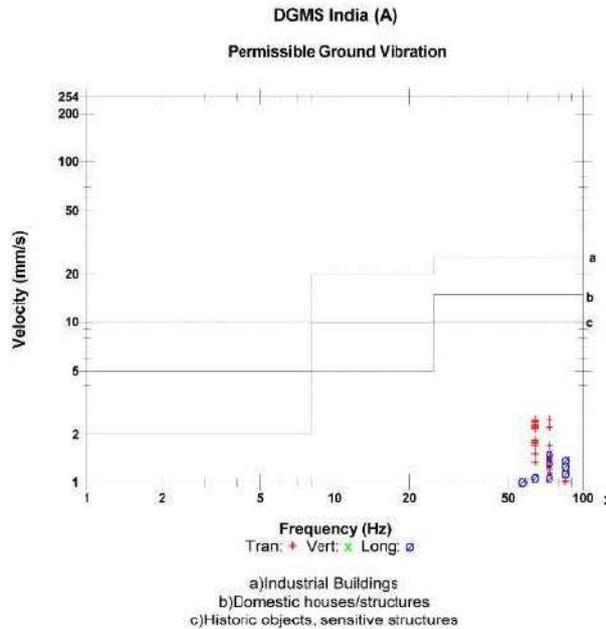
Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 112.0 dB(L) at 0.479 sec
ZC Freq 17 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	2.48	0.953	1.52	mm/s
ZC Freq	73	64	73	Hz
Time (Rel. to Trig)	0.147	0.126	0.139	sec
Peak Acceleration	0.113	0.0530	0.0729	g
Peak Displacement	0.00629	0.00229	0.00316	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.5	8.0	7.7	Hz
Overswing Ratio	3.5	3.2	3.2	

Peak Vector Sum 2.81 mm/s at 0.140 sec



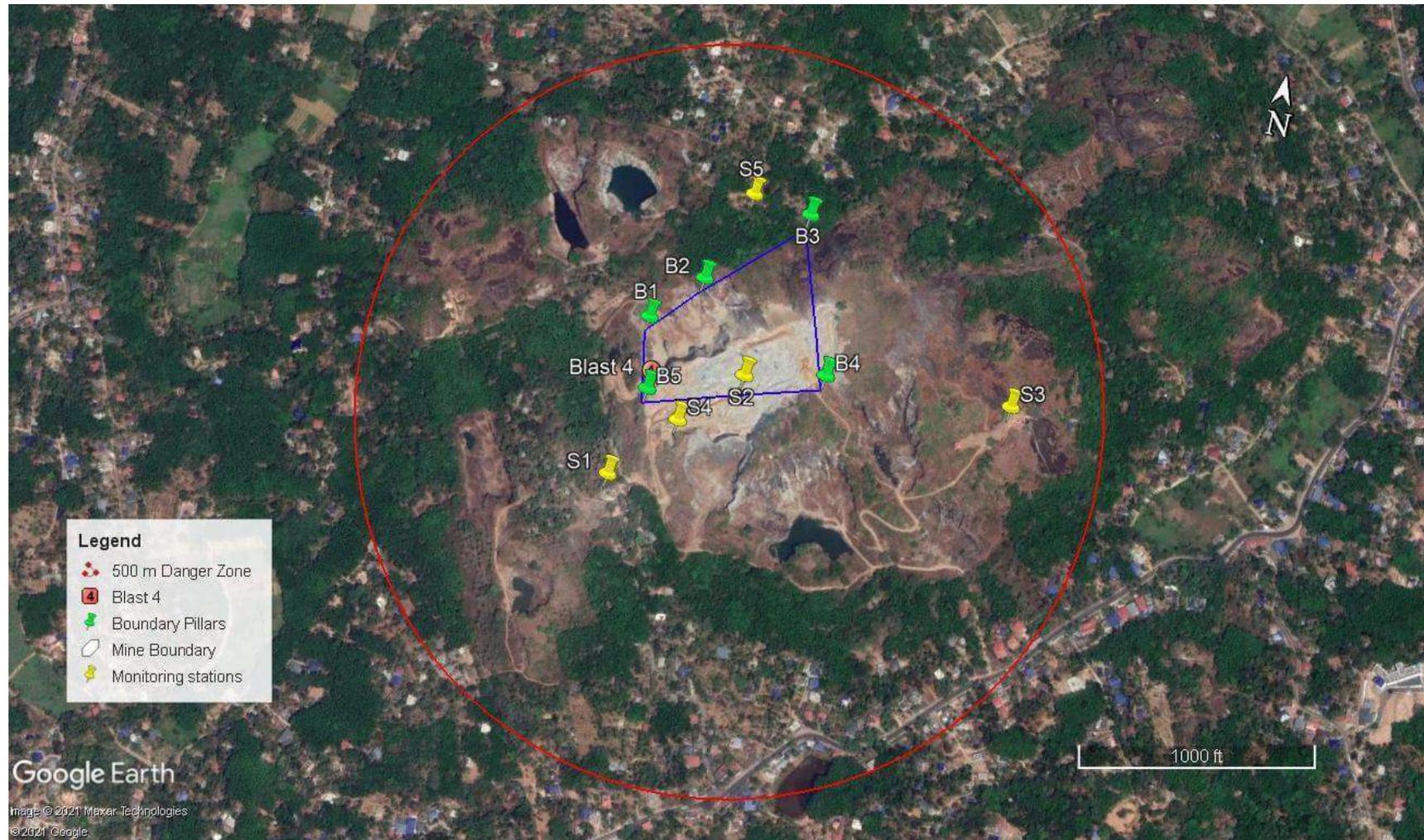


Figure 3.8 Imagery shows the location blast site 4 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



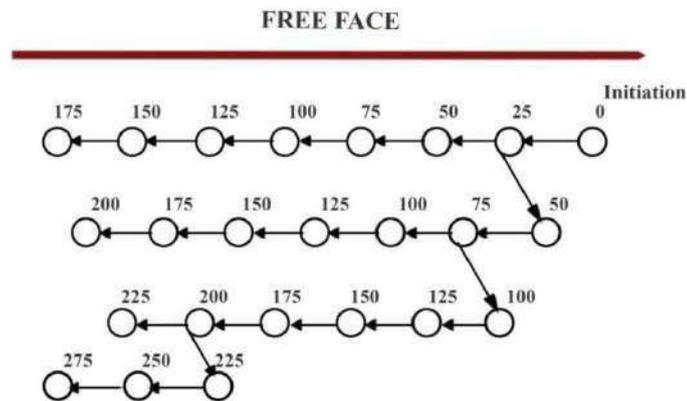
Blast No 5: The fifth blast was conducted on 16th March, 2021 and the adopted blasting pattern and details are given in the Table 3.10 and 3.11. The Figure 3.9 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.10

Table 3.10 Co-ordinates of Blast & Instrument Locations

Sl. No.	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B5)			8°43'47.55"	76°50'19.50"	---		
2	VMS_1 Location	11772	296	8°43'39.00"	76°50'15.00"	1.47 Within permissible limit	18.9	Belonging to the owner, maximum value is 15 mm/s
3	VMS_2 Location	20484	102	8°43'44.17"	76°50'19.88"	7.52 Within permissible limit	63.1	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	359	8°43'45.28"	76°50'31.27"	0.397 Within permissible limit	12.9	Not belonging to the owner, maximum value is 5 mm/s
5	VMS_4 Location	4688	185	8°43'41.81"	76°50'17.47"	Not Triggered		Belonging to the owner
6	VMS_5 Location	4687	151	8°43'52.19"	76°50'18.62"	0.429 Within permissible limit	36.1	Not belonging to the owner, maximum value is 5 mm/s

Table 3.11 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	24	0.625	1.25	15



NUMBER OF HOLES : 24

CHARGE PER DELAY : 1.363 Kg/delay

Figure 3.9 Schematic diagram of adopted blasting pattern for the blast 5

Post Blast Observations

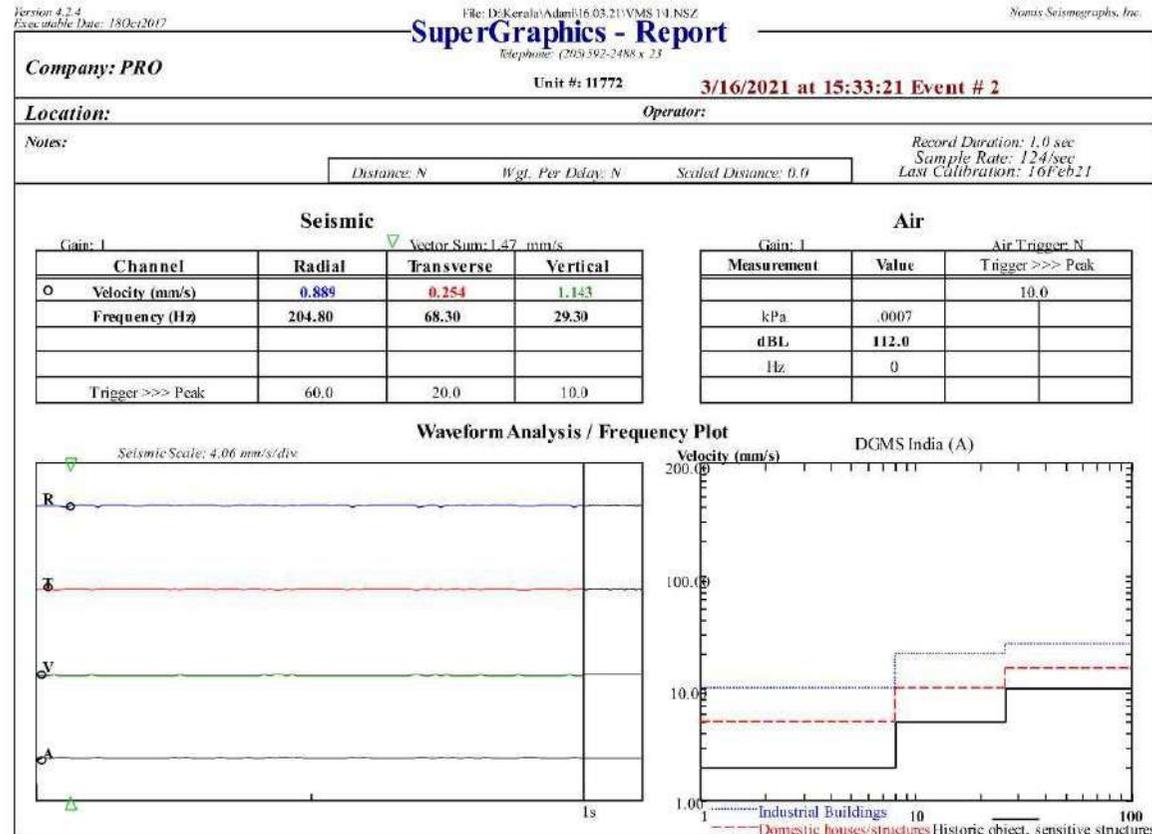
During the post blast observations, the following conditions were identified:

- No Backbreak was observed.
- Muckpile was found to be adequately fragmented.
- The throw of the blast has been around 10 m which is considered to be normal.
- A drop of about 0.75 to 1 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 12 to 15 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring village was well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.10 & 3.11.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



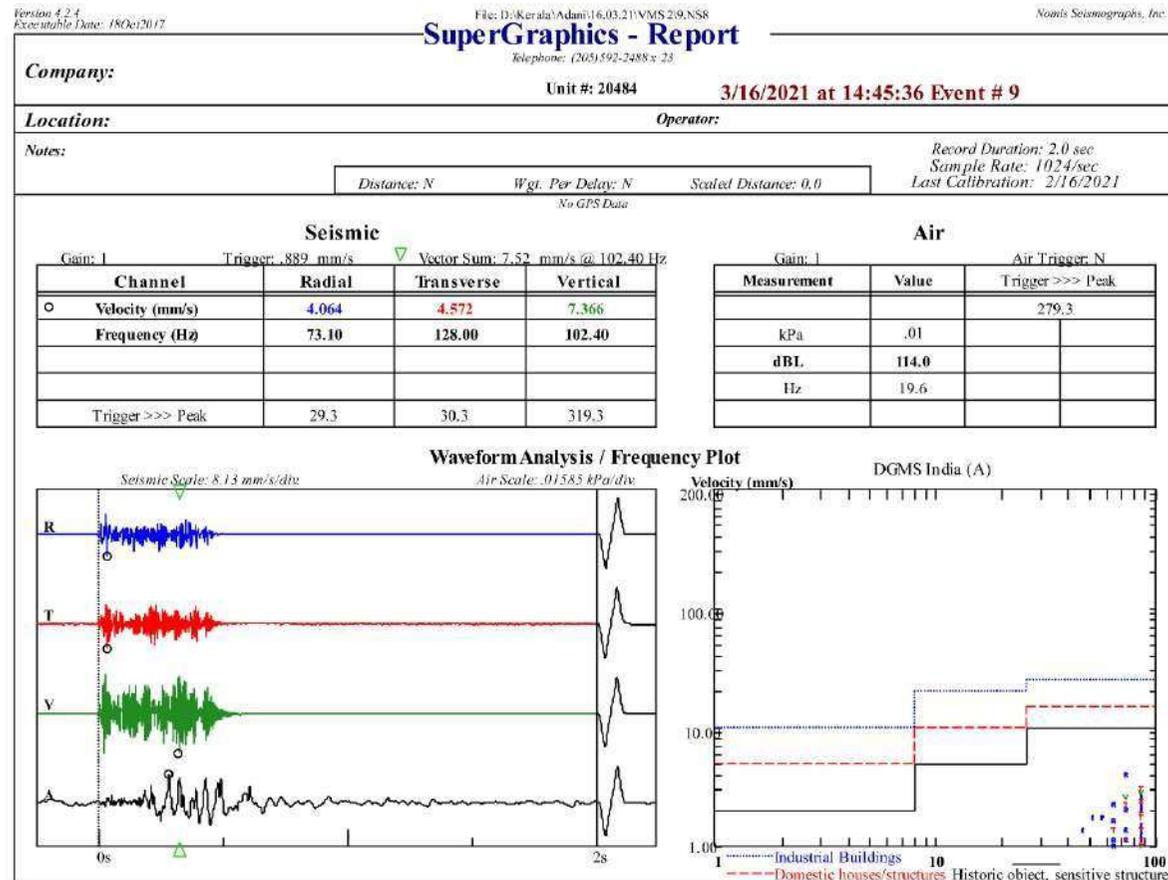
VMS_59 Location : EVENT



Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_60 Location : EVENT



VMS_3 Location : EVENT REPORT



Event Report

Date/Time MicL at 14:44:10 March 16, 2021
Trigger Source Geo: 0.492 mm/s, Mic: 106.0 dB(L)
Range Geo: 127.0 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 5993 V 2.61 MiniMate
Battery Level 6.6 Volts
Unit Calibration March 1, 2021 by UES New Delhi
File Name G993IWA0.XM0

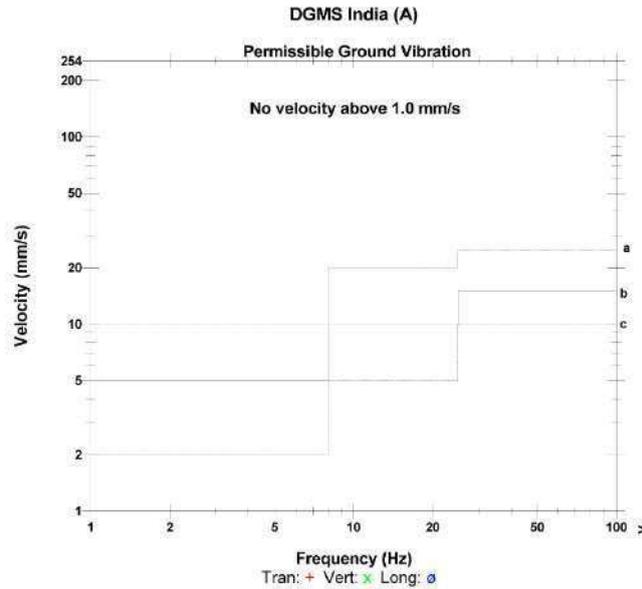
Notes
Location: KADAVILA STONE QUARRY
Client: ADANI PORT PVT LTD
User Name: ANNA UNIVERSITY
Converted: February 26, 2011 07:25:35 (V8.12)

Extended Notes

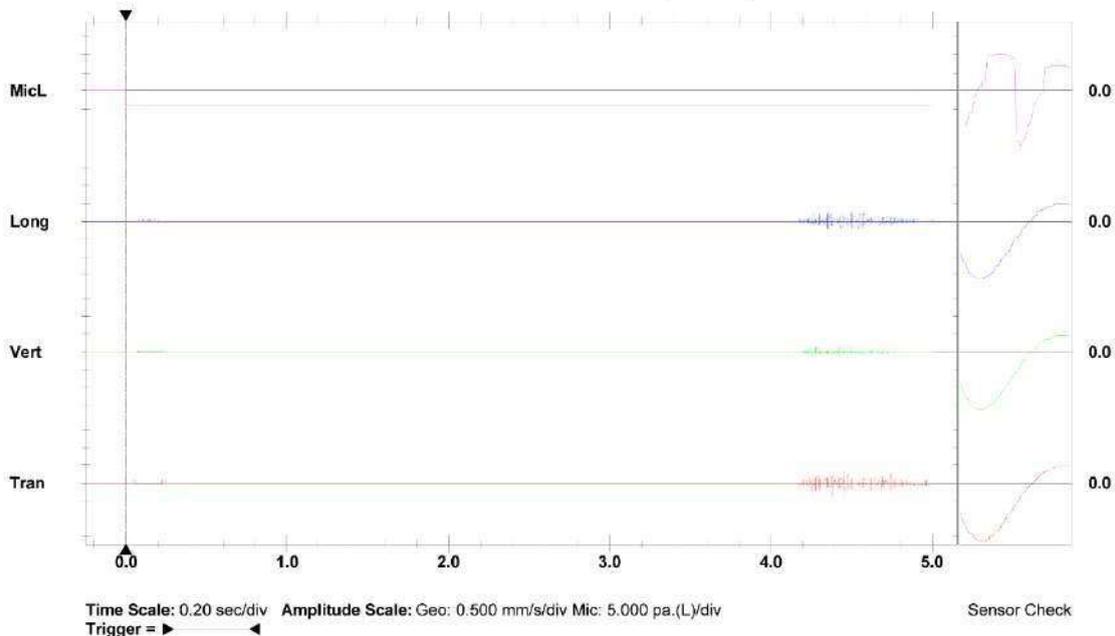
Microphone Linear Weighting
PSPL 106.0 dB(L) at 0.293 sec
ZC Freq N/A
Channel Test Check (Freq = 0.0 Hz Amp = 27 mv)

	Tran	Vert	Long	
PPV	0.381	0.191	0.254	mm/s
ZC Freq	N/A	N/A	N/A	Hz
Time (Rel. to Trig)	4.392	4.386	4.362	sec
Peak Acceleration	0.027	0.020	0.020	g
Peak Displacement	0.000	0.000	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.8	8.0	8.0	Hz
Overswing Ratio	3.6	3.5	3.5	

Peak Vector Sum 0.397 mm/s at 4.392 sec
N/A: Not Applicable



- a) Industrial Buildings
- b) Domestic houses/structures
- c) Historic objects, sensitive structures



Printed: March 30, 2021 (V 10.72 - 10.72)

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VMS_5 Location : EVENT REPORT



Event Report

Date/Time MicL at 14:45:26 March 16, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687IWA0.ZQ0

Notes

Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 07:20:35 (V8.12)

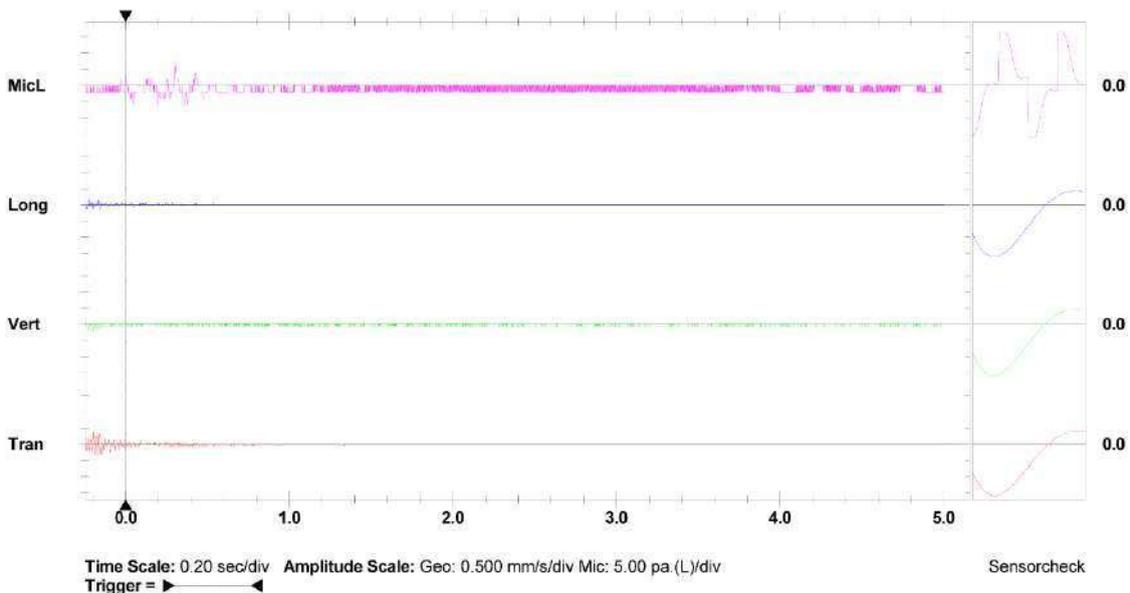
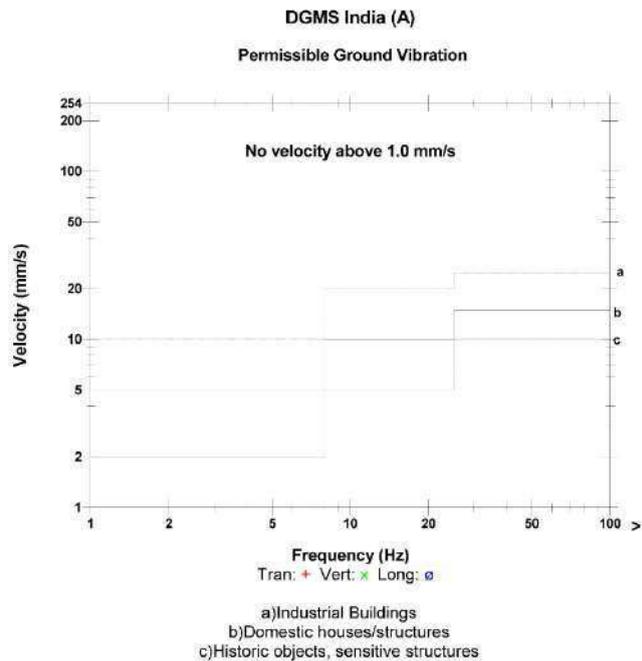
Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 109.5 dB(L) at 0.049 sec
ZC Freq 9.1 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	0.381	0.191	0.191	mm/s
ZC Freq	73	64	85	Hz
Time (Rel. to Trig)	-0.169	-0.197	-0.164	sec
Peak Acceleration	0.0199	0.0133	0.00663	g
Peak Displacement	0.00084	0.00003	0.00003	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.5	7.8	7.7	Hz
Overswing Ratio	3.4	3.2	3.2	

Peak Vector Sum 0.429 mm/s at -0.199 sec



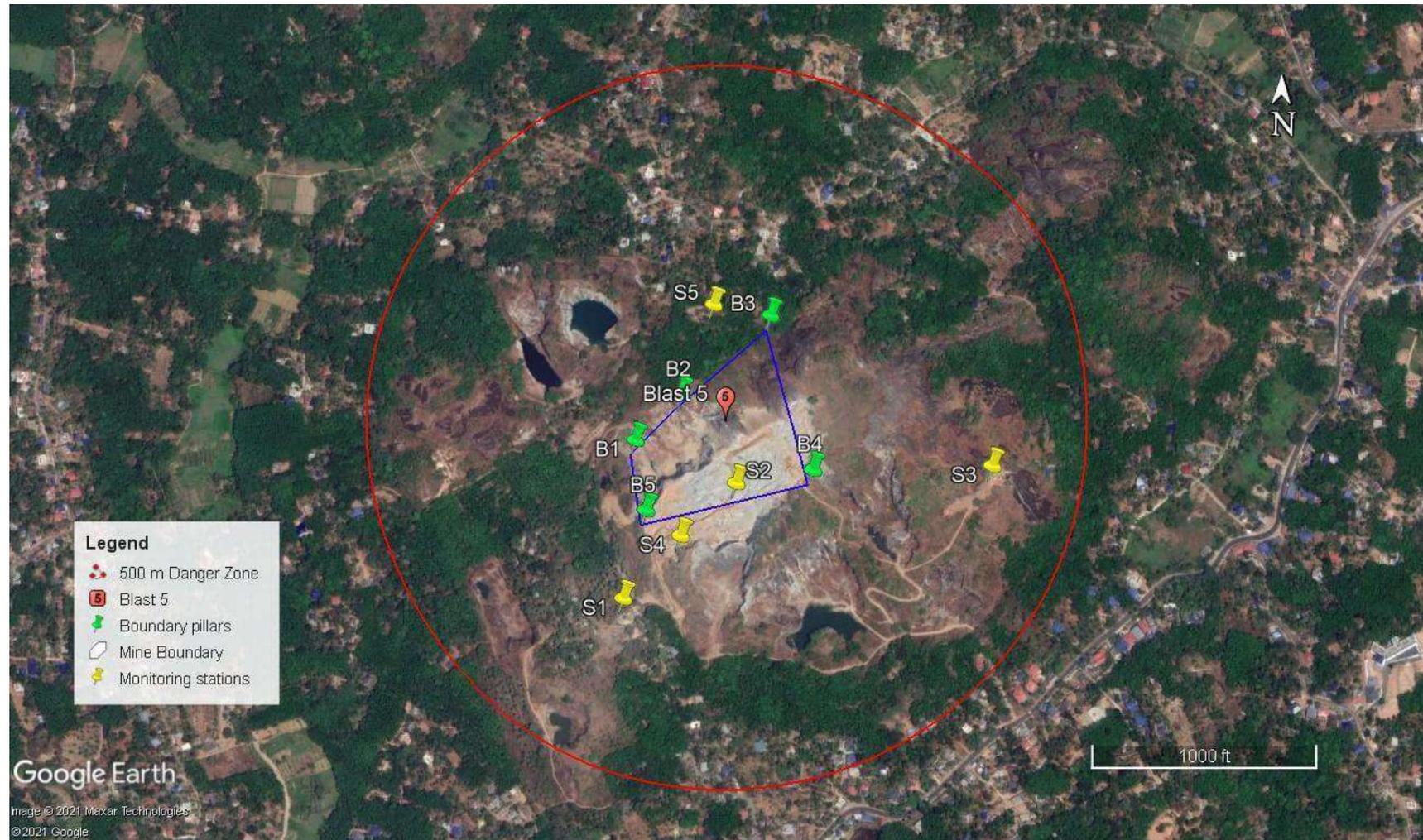


Figure 3.10 Imagery shows the location blast site 5 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



Blast No 6: The sixth blast was conducted on 17th March, 2021 and the adopted blasting pattern and details are given in the Table 3.12 and 3.13. The Figure 3.11 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.12

Table 3.12 Co-ordinates of Blast & Instrument Locations

Sl. No.	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B6)			8°43'44.44"	76°50'16.85"	---		
2	VMS_1 Location	11772	80	8°43'41.81"	76°50'17.47"	9.8 Within permissible limit	30.4	Belonging to the owner, maximum value is 15 mm/s
3	VMS_2 Location	20484	95	8°43'44.17"	76°50'19.88"	3.41 Within permissible limit	92.6	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	174	8°43'38.74"	76°50'16.72"	2.11 Within permissible limit	6.9	Not belonging to the owner, maximum value is 5 mm/s
5	VMS_4 Location	4688	170	8°43'48.033 "	76°50'12.81"	0.778 Within permissible limit	52.4	Not belonging to the owner, maximum value is 5 mm/s
6	VMS_5 Location	4687	165	8°43'47.04"	76°50'12.20"	0.683 Within permissible limit	73.4	Not belonging to the owner, maximum value is 5 mm/s

Table 3.13 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	60	0.625	1.875	37.5

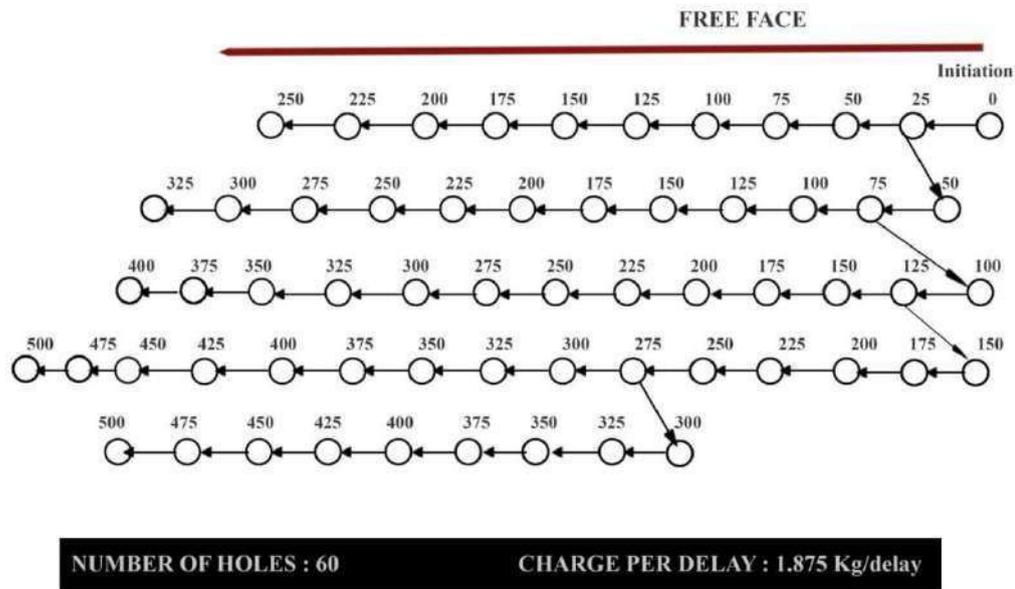


Figure 3.11 Schematic diagram of adopted blasting pattern for the blast 6

Post Blast Observations

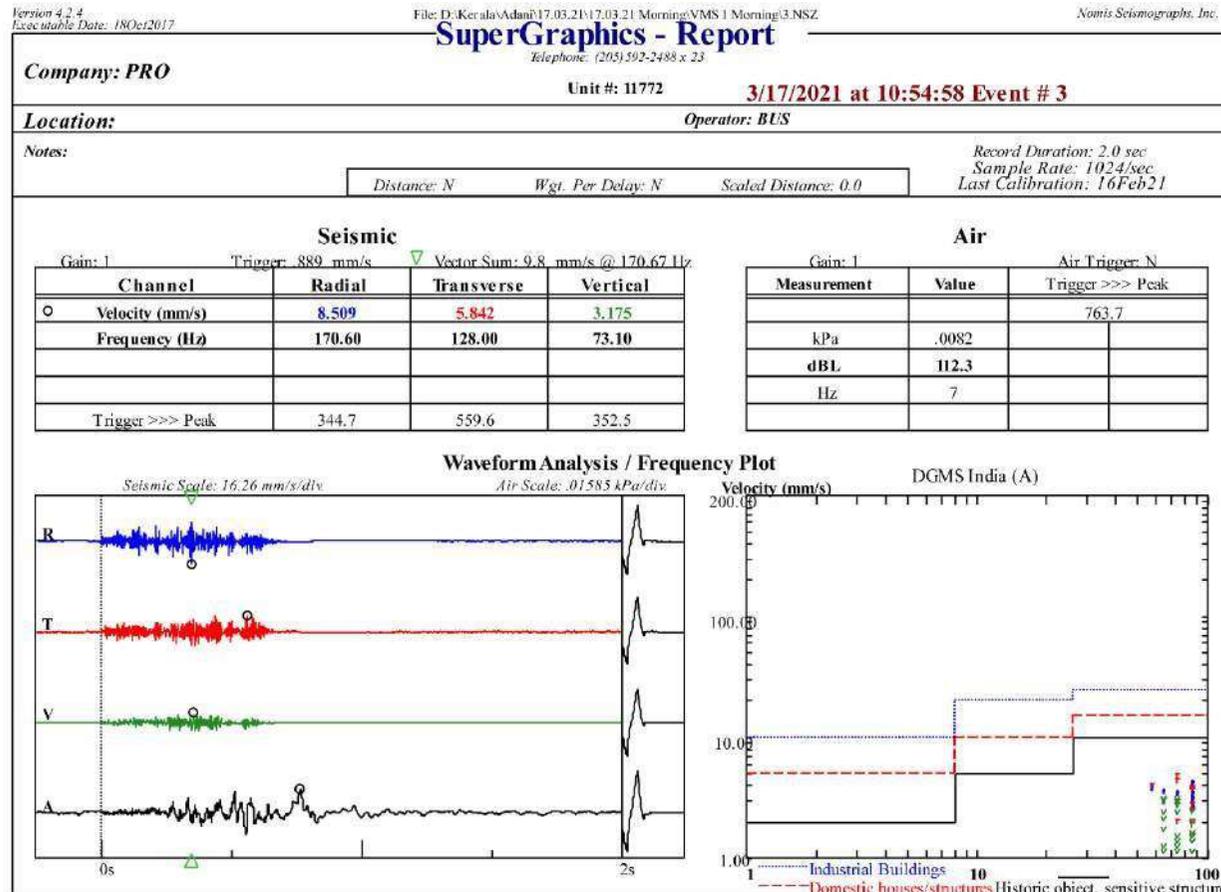
During the post blast observations, the following conditions were identified:

- No Backbreak was observed.
- Muckpile was found to be adequately fragmented.
- The throw of the blast has been around 10 to 12 m which is considered to be normal.
- A drop of about 0.75 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 10 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring houses were well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.12 & 3.13.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



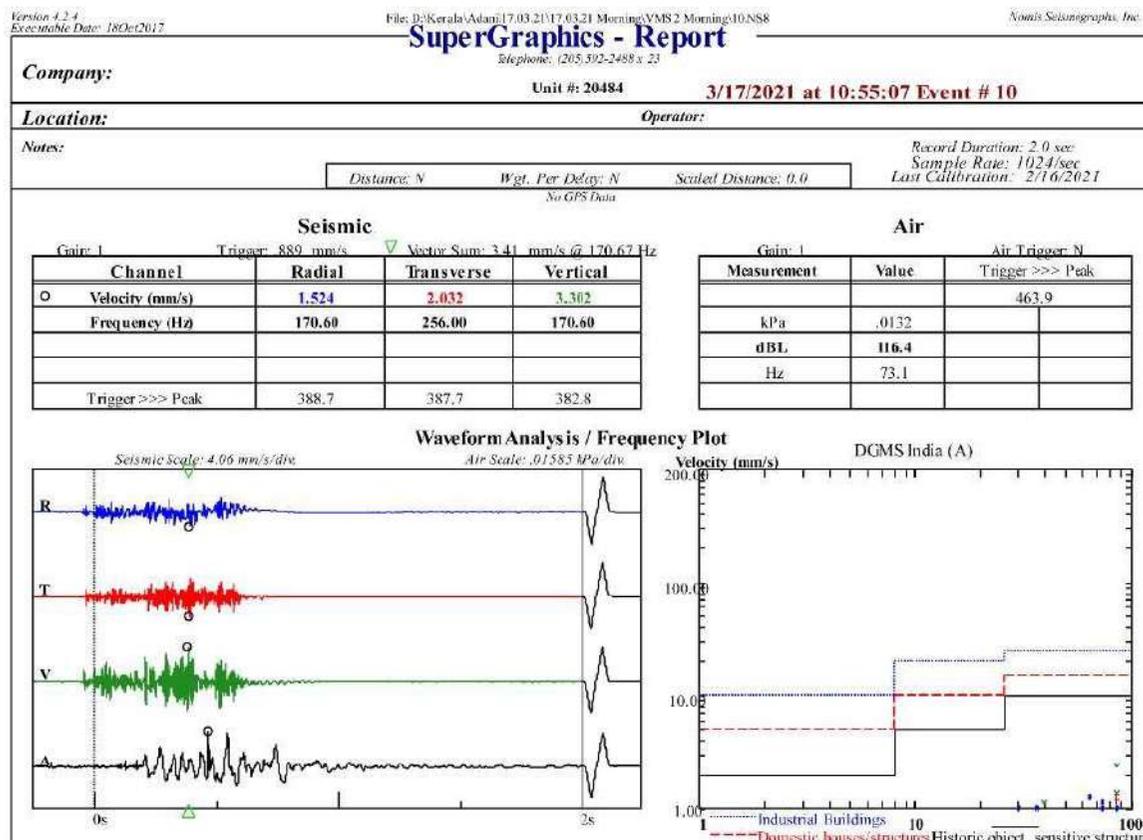
VMS_66 Location : EVENT



Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_67 Location : EVENT



VMS_68 Location : EVENT



Event Report

Date/Time Long at 10:53:35 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 5993 V 2.61 MiniMate
Battery Level 6.6 Volts
Calibration March 1, 2021 by UES New Delhi
File Name G993IWBK.XB0

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 05:03:19 (V8.12)

Extended Notes

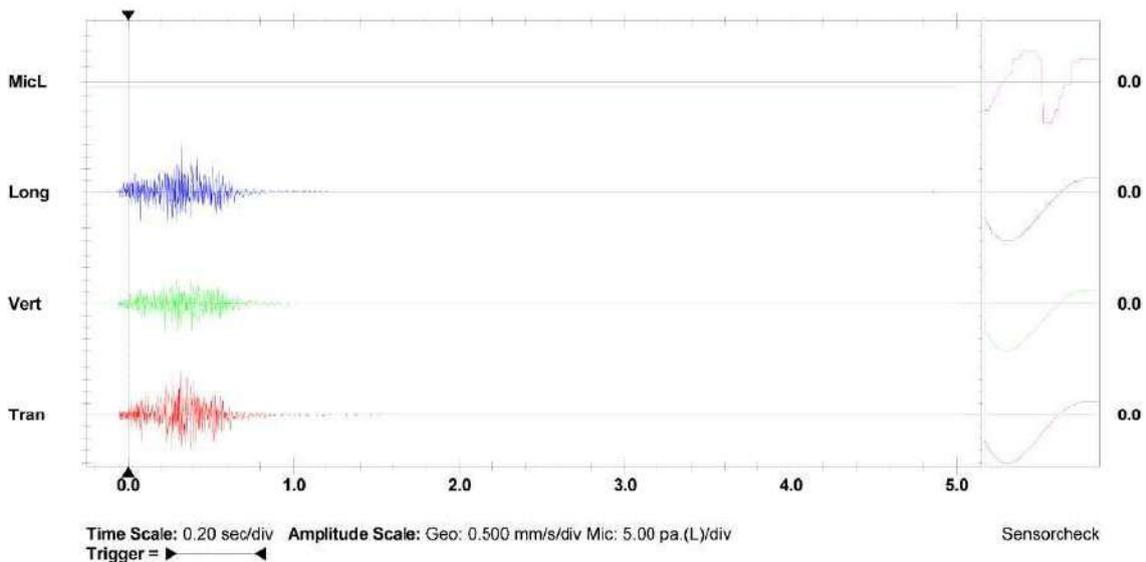
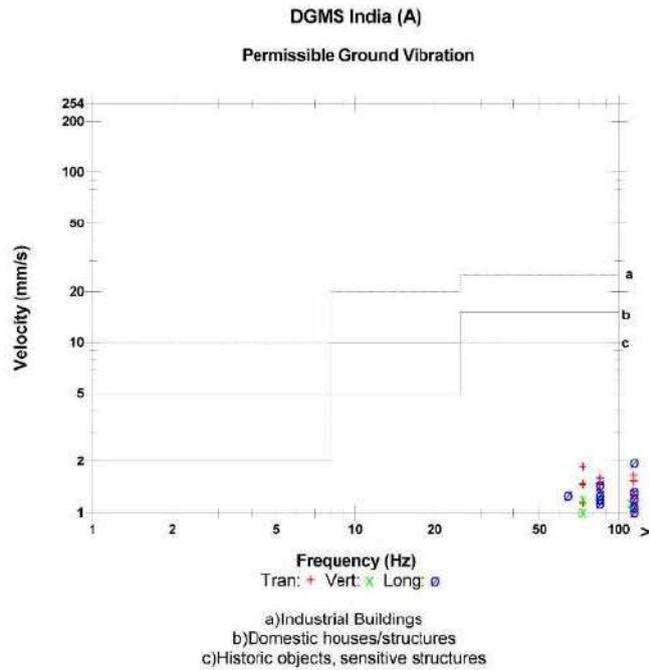
Post Event Notes

Microphone Linear Weighting
PSPL 100.0 dB(L) at 0.293 sec
ZC Freq N/A
Channel Test Check (Freq = 0.0 Hz Amp = 14 mv)

	Tran	Vert	Long	
PPV	1.84	1.27	1.97	mm/s
ZC Freq	73	85	N/A	Hz
Time (Rel. to Trig)	0.321	0.224	0.323	sec
Peak Acceleration	0.186	0.0994	0.192	g
Peak Displacement	0.00326	0.00205	0.00270	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.8	8.0	7.7	Hz
Overswing Ratio	3.6	3.5	3.7	

Peak Vector Sum 2.11 mm/s at 0.321 sec

N/A: Not Applicable



VMS_69 Location : EVENT



Event Report

Date/Time MicL at 10:54:58 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 3.0 sec at 1024 sps

Serial Number 4688 V 2.6 MiniMate
Battery Level 6.5 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F688IWBK.ZM0

Notes
Location: KADAVILA STONE QUARRY
Client: ADANI PORT PVT LTD
User Name: ANNA UNIVERSITY
Converted: February 26, 2011 05:00:31 (V8.12)

Extended Notes

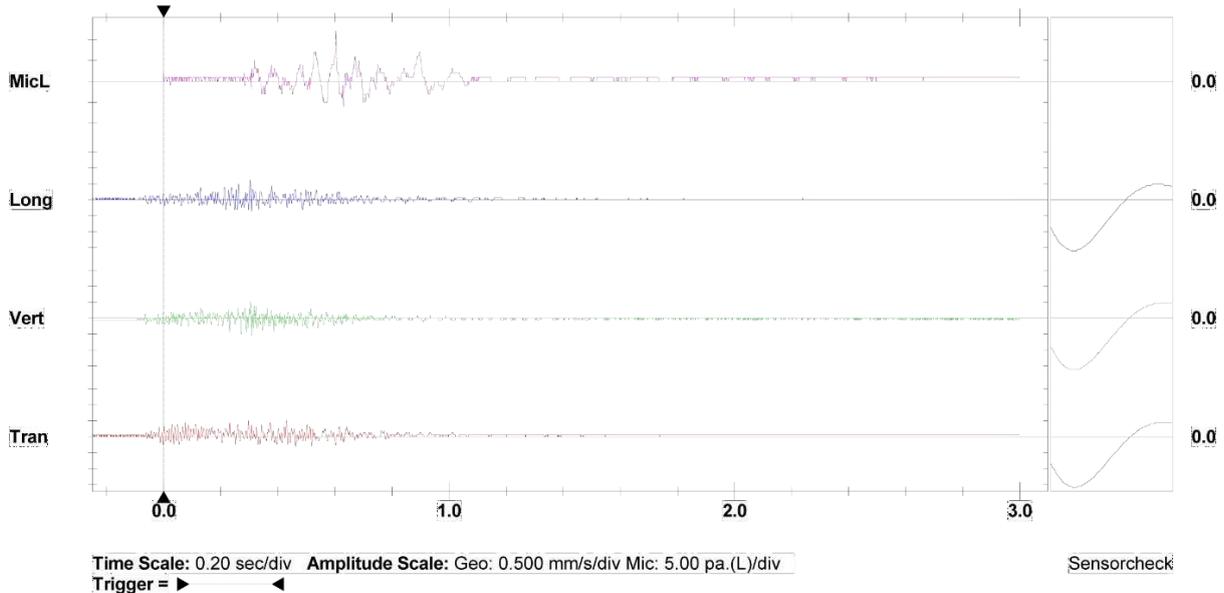
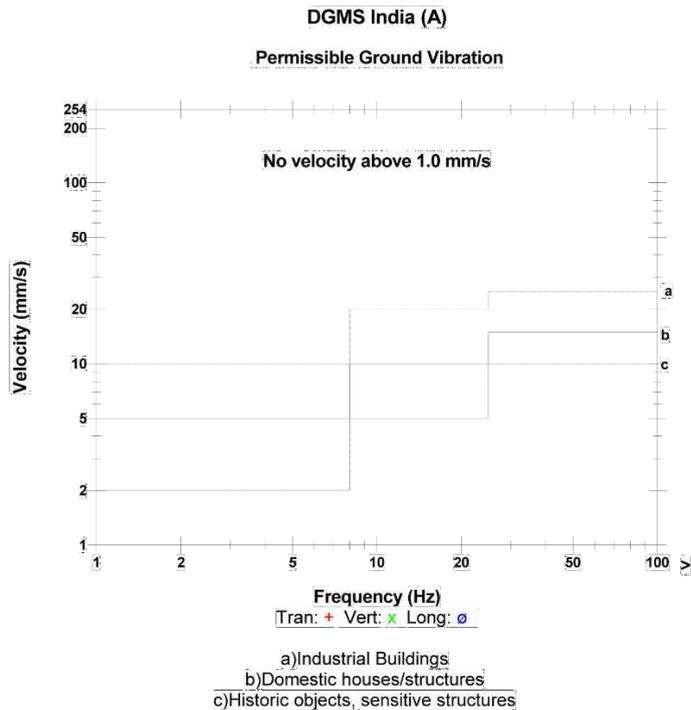
Post Event Notes

Microphone Linear Weighting
PSPL 112.6 dB(L) at 0.604 sec
ZC Freq 14 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 490 mv)

	Tran	Vert	Long	
PPV	0.508	0.572	0.635	mm/s
ZC Freq	85	N/A	85	Hz
Time (Rel. to Trig)	0.298	0.309	0.304	sec
Peak Acceleration	0.0265	0.0464	0.0331	g
Peak Displacement	0.00127	0.00096	0.00112	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.7	7.8	8.2	Hz
Overswing Ratio	3.4	3.6	3.3	

Peak Vector Sum 0.778 mm/s at 0.309 sec

N/A: Not Applicable



VMS_70 Location : EVENT



Event Report

Date/Time MicL at 10:54:50 March 17, 2021
Trigger Source Geo: 0.492 mm/s
Range Mic: 106 dB(L)
Record Time Geo: 127 mm/s
 5.0 sec at 1024 sps

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F6871WBK.ZE0

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 05:05:54 (V8.12)

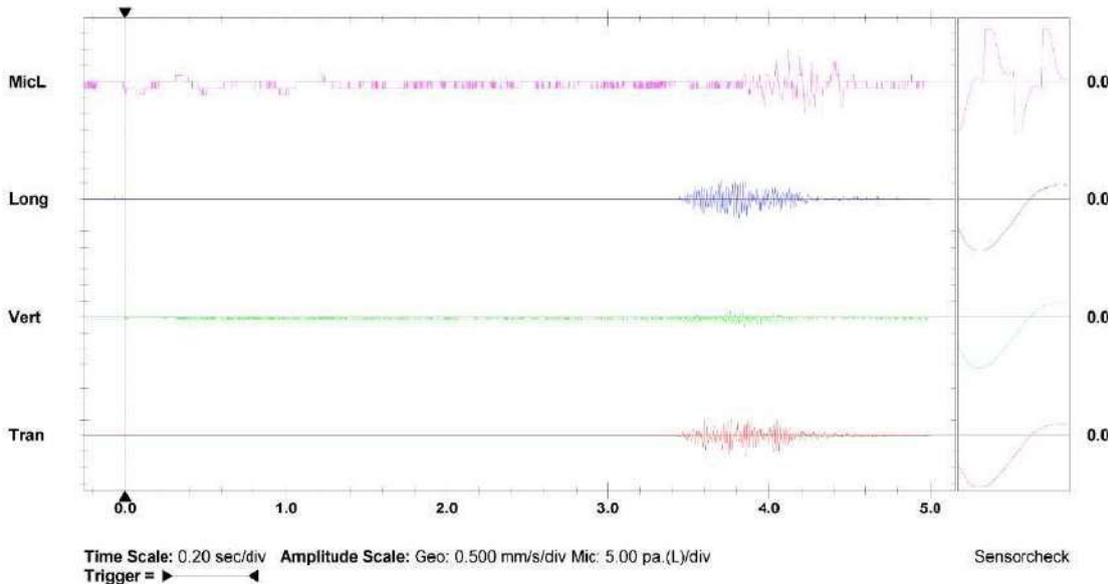
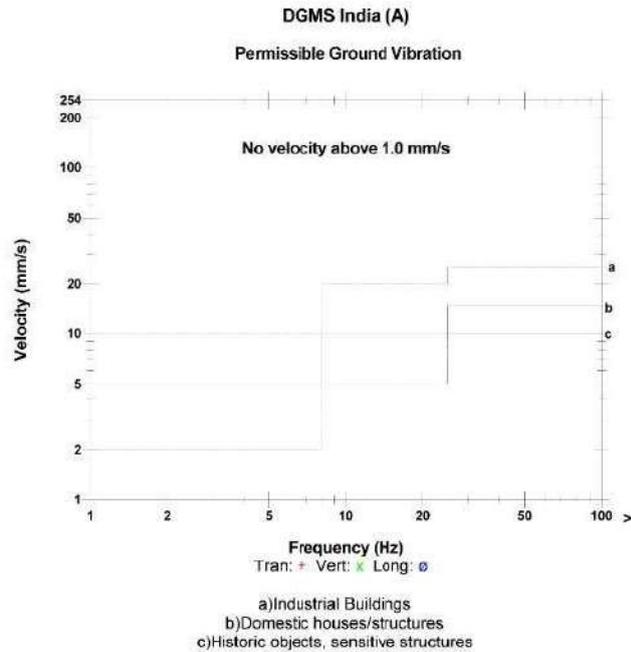
Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 114.0 dB(L) at 4.122 sec
ZC Freq 30 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	0.635	0.318	0.572	mm/s
ZC Freq	64	73	57	Hz
Time (Rel. to Trig)	3.755	3.843	3.705	sec
Peak Acceleration	0.0265	0.0199	0.0265	g
Peak Displacement	0.00198	0.00047	0.00149	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.6	8.0	7.8	Hz
Overswing Ratio	3.5	3.2	3.2	

Peak Vector Sum 0.683 mm/s at 3.856 sec



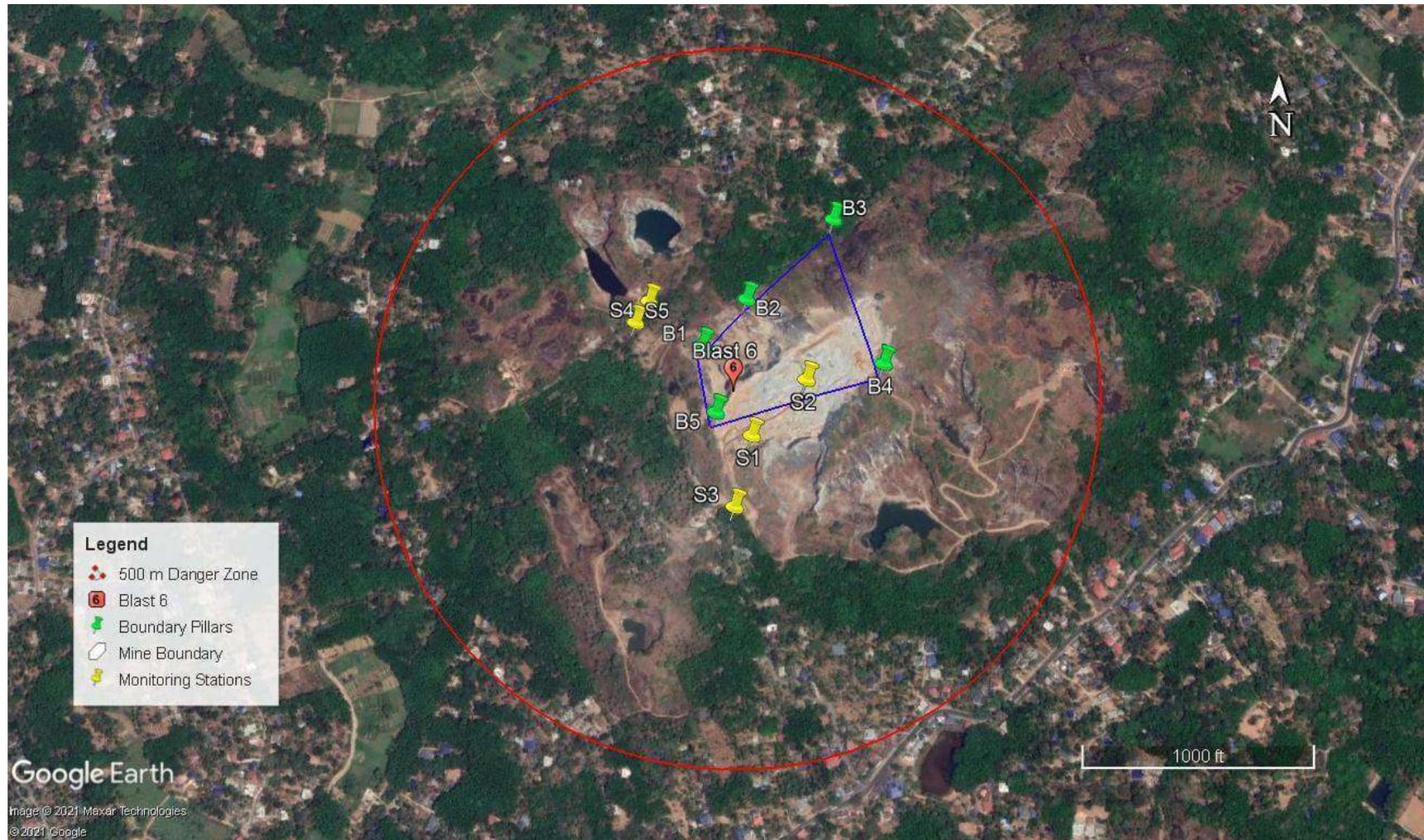


Figure 3.12 Imagery shows the location blast site 6 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



Blast No 7: The seventh blast was conducted on 17th March, 2021 and the adopted blasting pattern and details are given in the Table 3.14 and 3.15. The Figure 3.13 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.14

Table 3.14 Co-ordinates of Blast & Instrument Locations

Sl. No.	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B7)			8°43'43.82"	76°50'15.93"	---		
2	VMS_1 Location	11772	75	8°43'41.81"	76°50'17.47"	11.09 Within permissible limit	70.9	Belonging to the owner, maximum value is 15 mm/s
3	VMS_2 Location	20484	125	8°43'44.17"	76°50'19.88"	2.51 Within permissible limit	68.2	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	157	8°43'38.74"	76°50'16.72"	2.24 Within permissible limit	6.9	Not belonging to the owner, maximum value is 5 mm/s
5	VMS_4 Location	4688	160	8°43'48.033"	76°50'12.81"	1.17 Within permissible limit	47.2	Belonging to the owner, maximum value is 15 mm/s
6	VMS_5 Location	4687	154	8°43'47.04"	76°50'12.20"	1.89 Within permissible limit	56.3	Not belonging to the owner, maximum value is 5 mm/s

Table 3.15 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	50	0.625	1.736	31.25

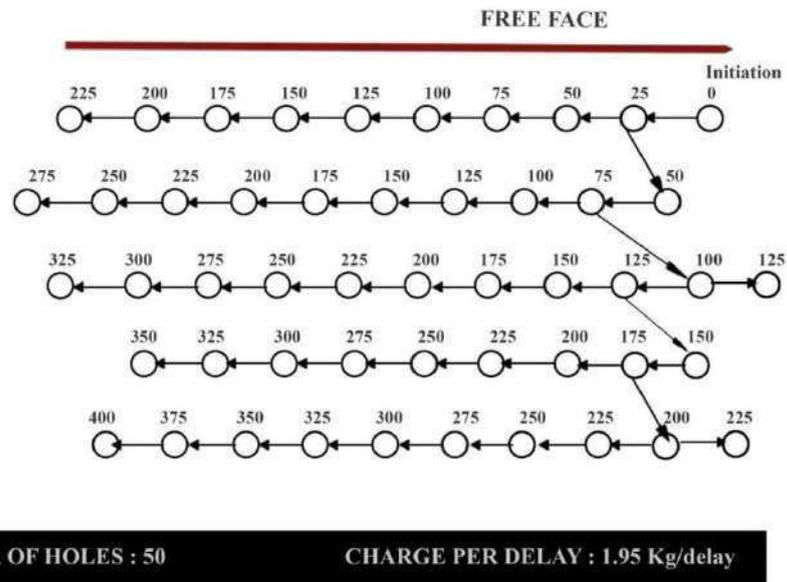


Figure 3.13 Schematic diagram of adopted blasting pattern for the blast 7

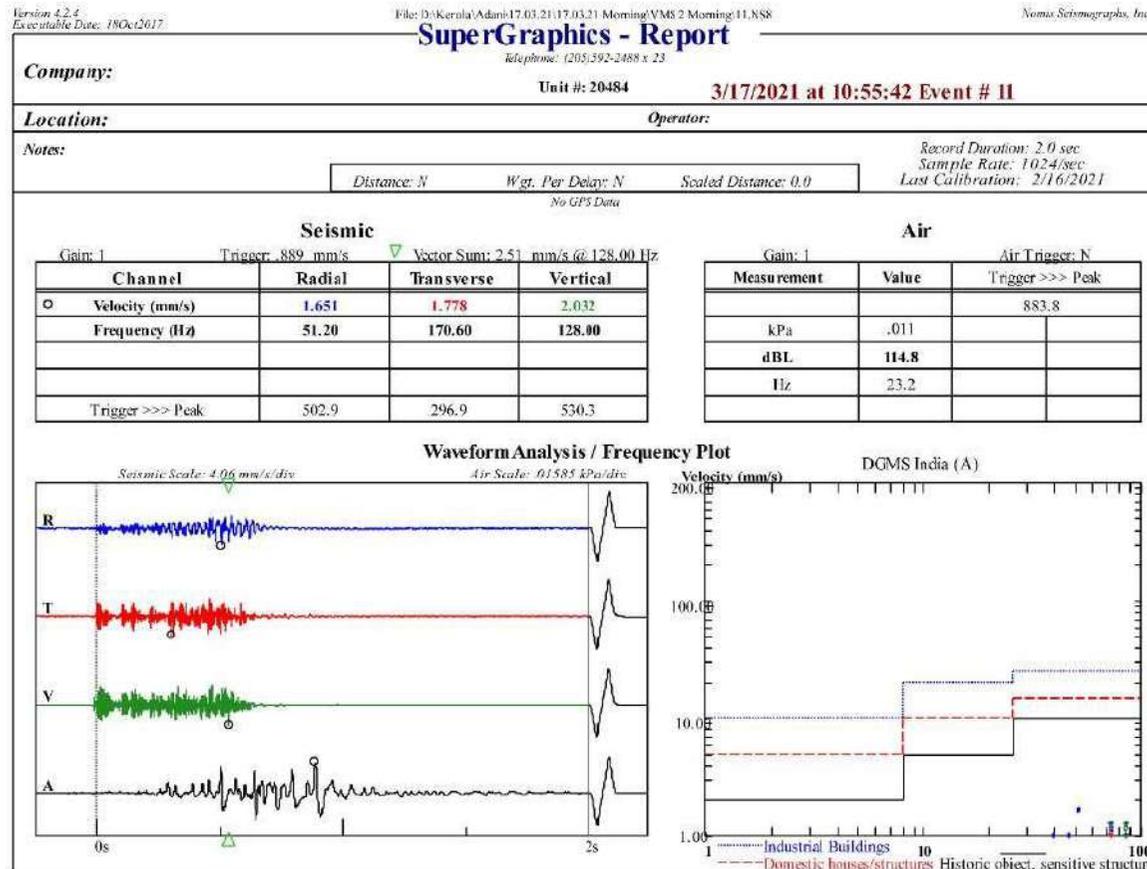
Post Blast Observations

During the post blast observations, the following conditions were identified:

- Backbreak was observed of about 0.5 m.
- Muckpile was found to be adequately fragmented.
- The throw of the blast has been around 15 m which is considered to be normal.
- A drop of about 0.50 to 0.75 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 15 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring houses were well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.14 & 3.15.**



VMS_2 Location : EVENT REPORT



VMS_76 Location : EVENT



Event Report

Date/Time Tran at 10:54:10 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo : 127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 5993 V 2.61 MiniMate
Battery Level 6.6 Volts
Calibration March 1, 2021 by UES New Delhi
File Name G993IWBK.YA0

Notes

Location: KADAVILA STONE QUARRY
Client: ADANI PORT PVT LTD
User Name: ANNA UNIVERSITY
Converted: February 26, 2011 05:03:19 (V8.12)

Extended Notes

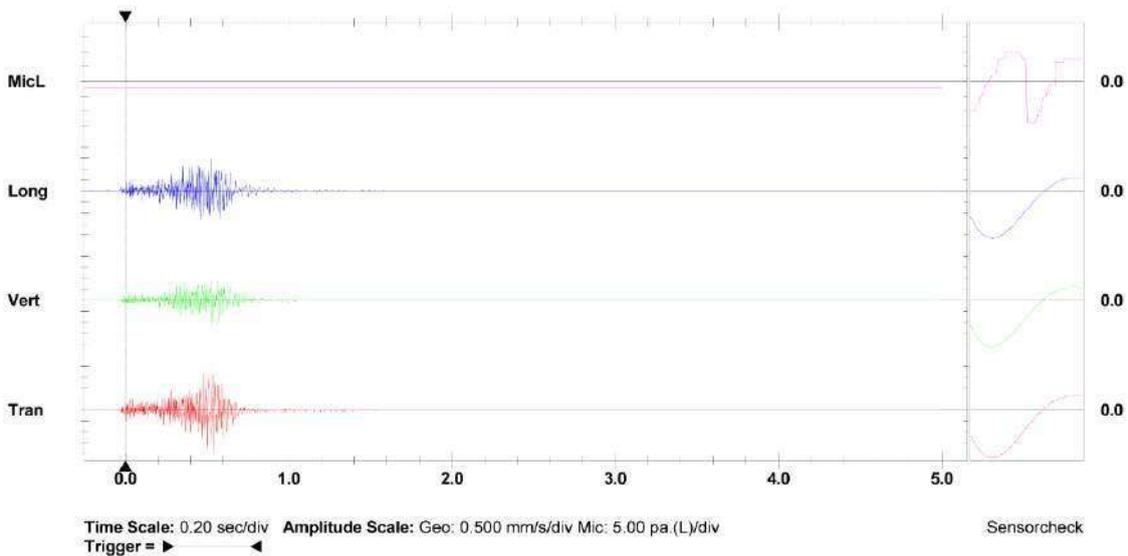
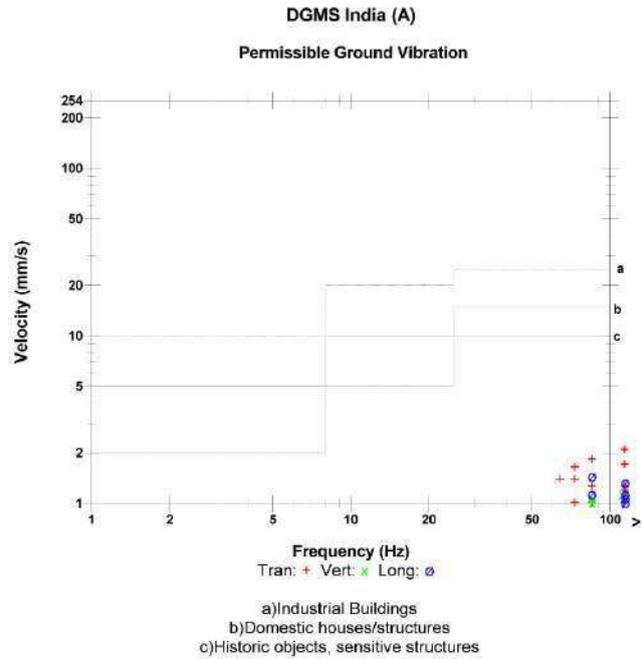
Post Event Notes

Microphone Linear Weighting
PSPL 100.0 dB(L) at 0.293 sec
ZC Freq N/A
Channel Test Check (Freq = 0.0 Hz Amp = 14 mv)

	Tran	Vert	Long	
PPV	2.10	1.14	1.46	mm/s
ZC Freq	>100	N/A	85	Hz
Time (Rel. to Trig)	0.544	0.524	0.526	sec
Peak Acceleration	0.152	0.0862	0.126	g
Peak Displacement	0.00375	0.00251	0.00295	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.8	8.0	7.7	Hz
Overswing Ratio	3.6	3.5	3.7	

Peak Vector Sum 2.24 mm/s at 0.544 sec

N/A: Not Applicable



VMS_77 Location : EVENT



Event Report

Date/Time Long at 10:55:33 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo : 127 mm/s
Record Time 2.0 sec at 1024 sps

Serial Number 4688 V 2.6 MiniMate
Battery Level 6.5 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F688IWBL.DLO

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 05:00:31 (V8.12)

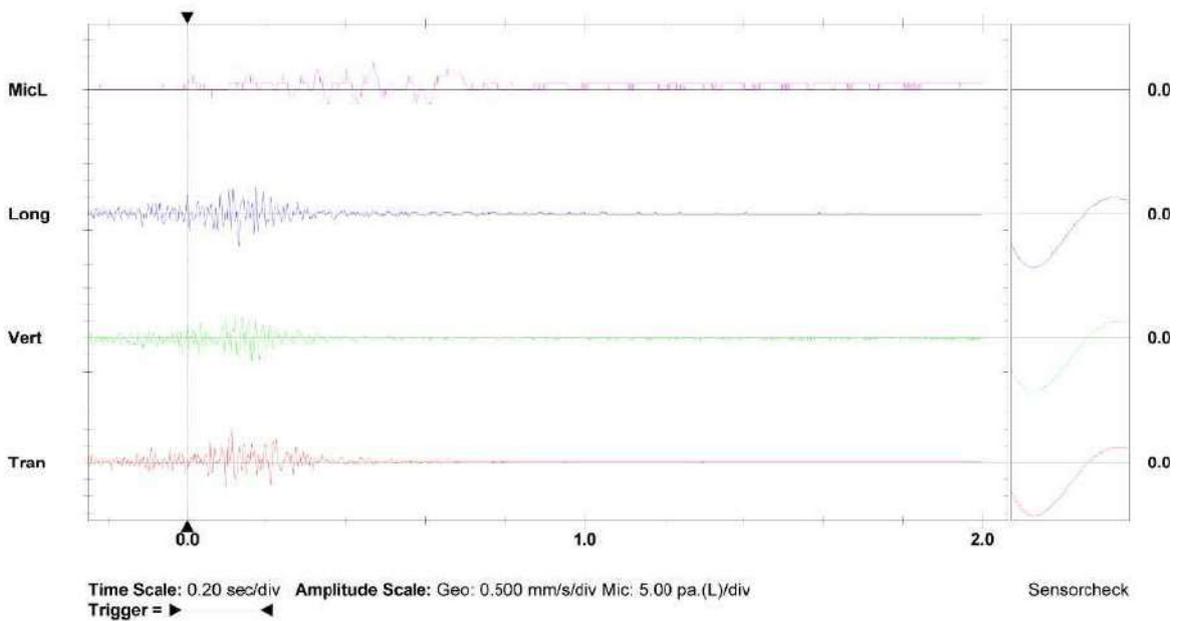
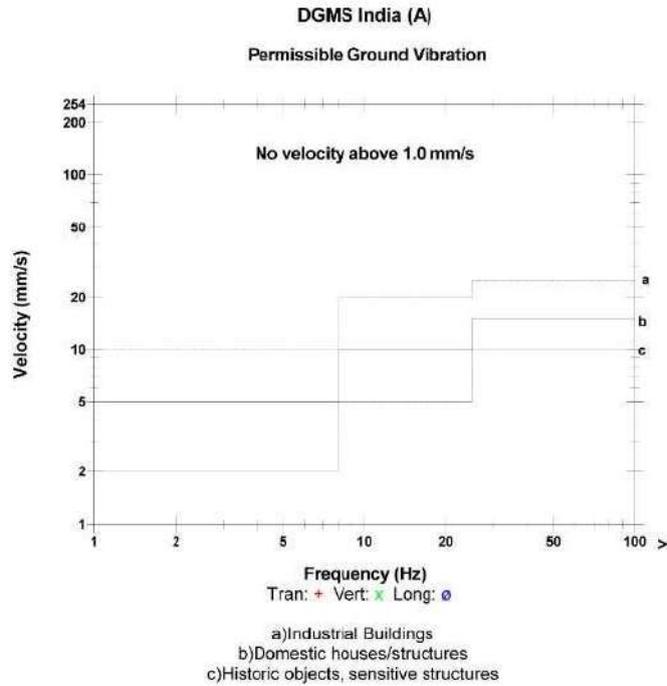
Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 112.0 dB(L) at 0.468 sec
ZC Freq 12 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 490 mv)

	Tran	Vert	Long	
PPV	0.953	0.699	0.953	mm/s
ZC Freq	57	>100	73	Hz
Time (Rel. to Trig)	0.111	0.163	0.128	sec
Peak Acceleration	0.0398	0.0398	0.0464	g
Peak Displacement	0.00366	0.00220	0.00198	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.7	7.8	8.2	Hz
Overswing Ratio	3.4	3.6	3.3	

Peak Vector Sum 1.17 mm/s at 0.128 sec



VMS_78 Location : EVENT



Event Report

Date/Time Tran at 10:55:28 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps.

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687IWBL.0G0

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 05:05:54 (V8.12)

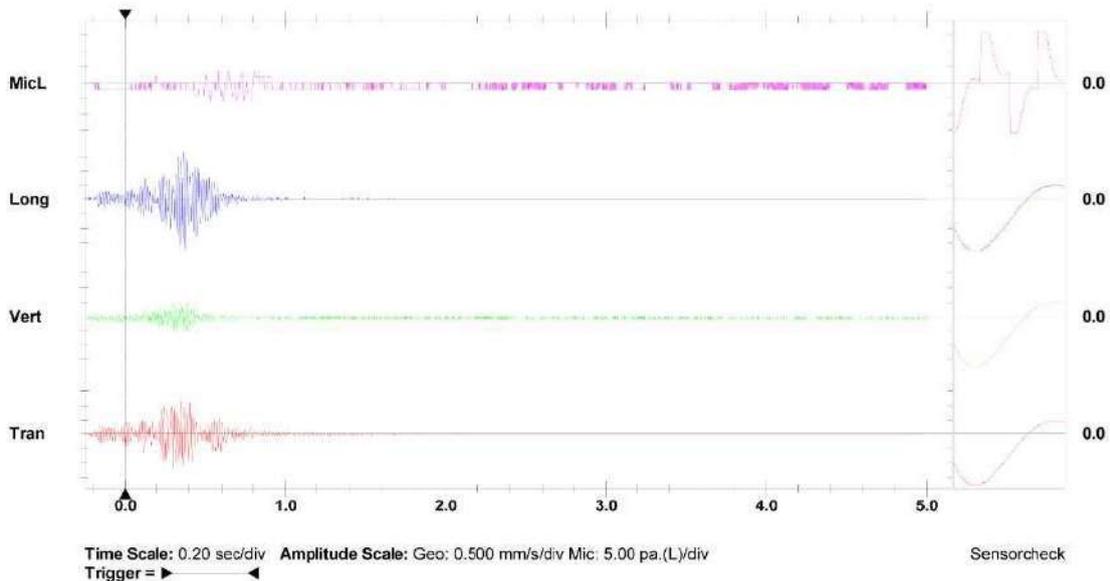
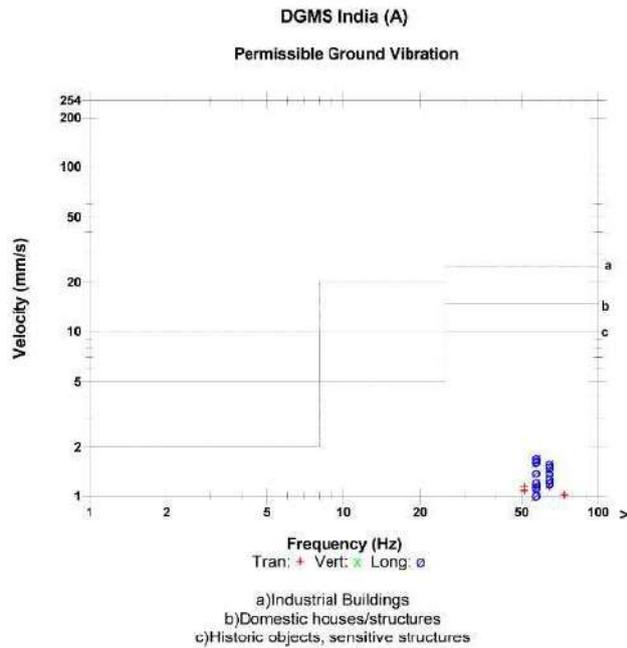
Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 109.5 dB(L) at 0.527 sec
ZC Freq 18 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	1.14	0.572	1.71	mm/s
ZC Freq	64	64	57	Hz
Time (Rel. to Trig)	0.299	0.312	0.377	sec
Peak Acceleration	0.0530	0.0398	0.0663	g
Peak Displacement	0.00347	0.00146	0.00490	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.6	8.0	7.8	Hz
Overswing Ratio	3.5	3.2	3.2	

Peak Vector Sum 1.89 mm/s at 0.369 sec



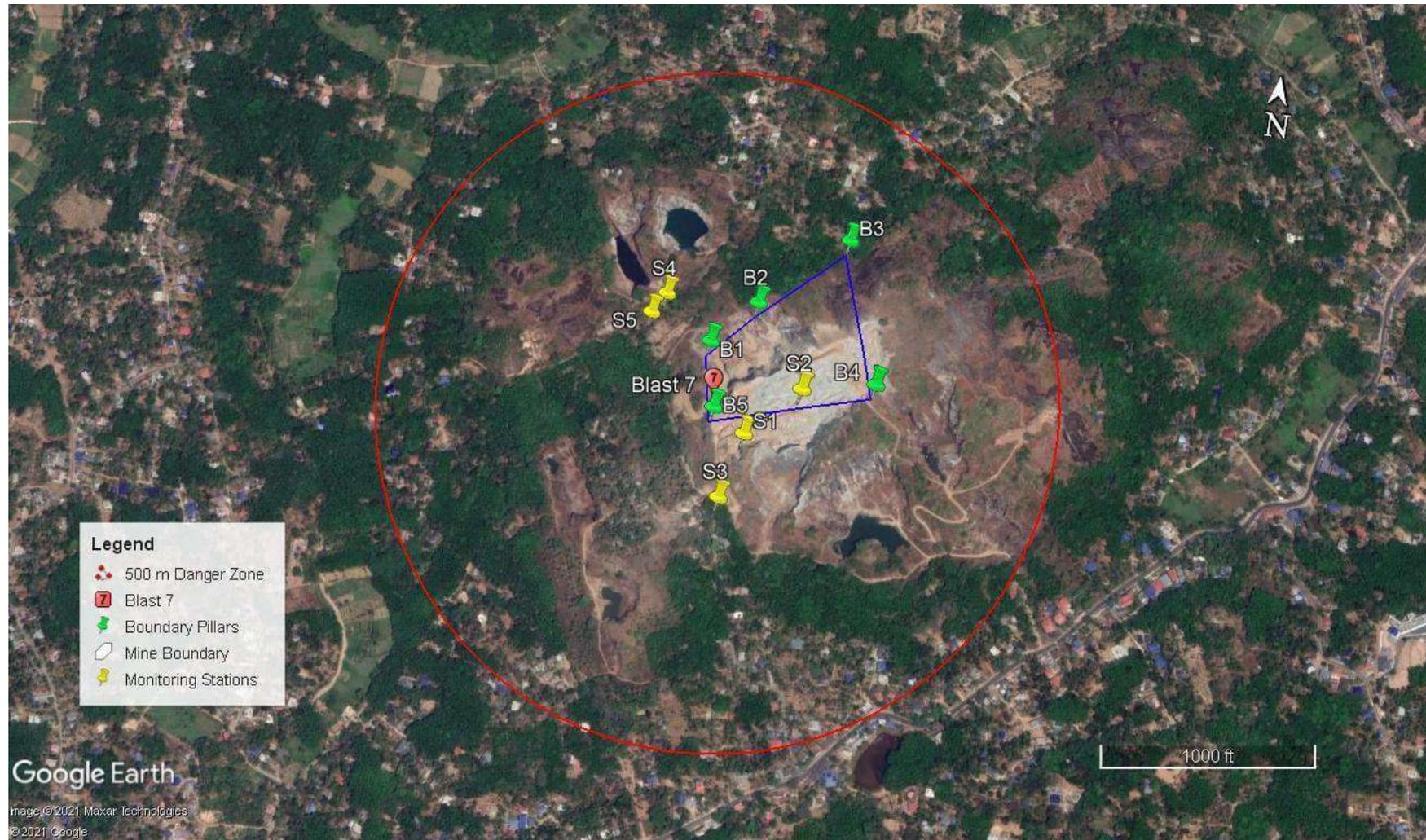


Figure 3.14 Imagery shows the location blast site 7 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



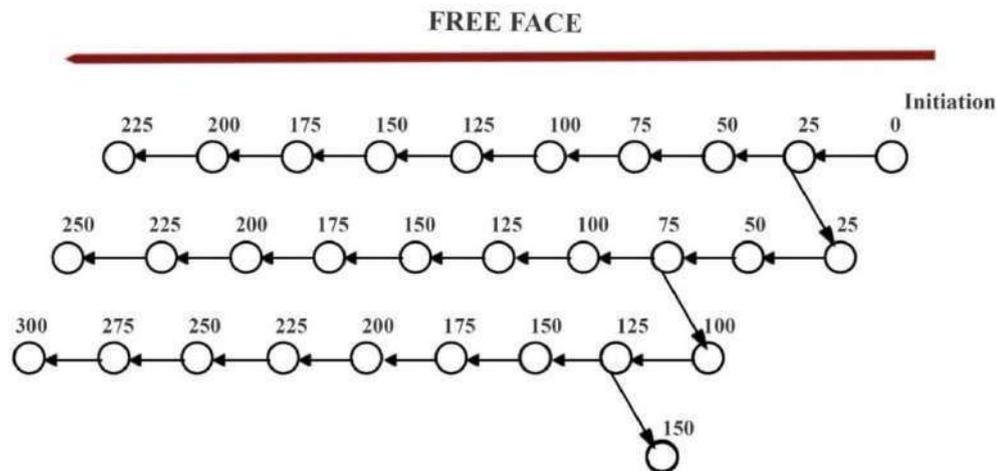
Blast No 8: The eighth blast was conducted on 17th March, 2021 and the adopted blasting pattern and details are given in the Table 3.16 and 3.17. The Figure 3.15 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.16

Table 3.16 Co-ordinates of Blast & Instrument Locations

Sl. No.	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B8)			8°43'45.29"	76°50'17.95"	---		
2	VMS_1 Location	11772	105	8°43'41.81"	76°50'17.47"	6.12 Within permissible limit	64.4	Belonging to the owner, maximum value is 15 mm/s
3	VMS_2 Location	20484	68	8°43'44.17"	76°50'19.88"	2.3 Within permissible limit	78.0	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	218	8°43'38.33"	76°50'16.16"	Not Triggered		Not belonging to the owner
5	VMS_4 Location	4688	182	8°43'48.033"	76°50'12.81"	1.40 Within permissible limit	62.4	Not belonging to the owner, maximum value is 5 mm/s
6	VMS_5 Location	4687	282	8°43'53.22"	76°50'22.62"	1.68 Within permissible limit	6.9	Not belonging to the owner, maximum value is 5 mm/s

Table 3.17 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.50	2.4	30	0.625	1.339	18.75



NUMBER OF HOLES : 30

CHARGE PER DELAY : 1.56 Kg/delay

Figure 3.15 Schematic diagram of adopted blasting pattern for the blast 8

Post Blast Observations

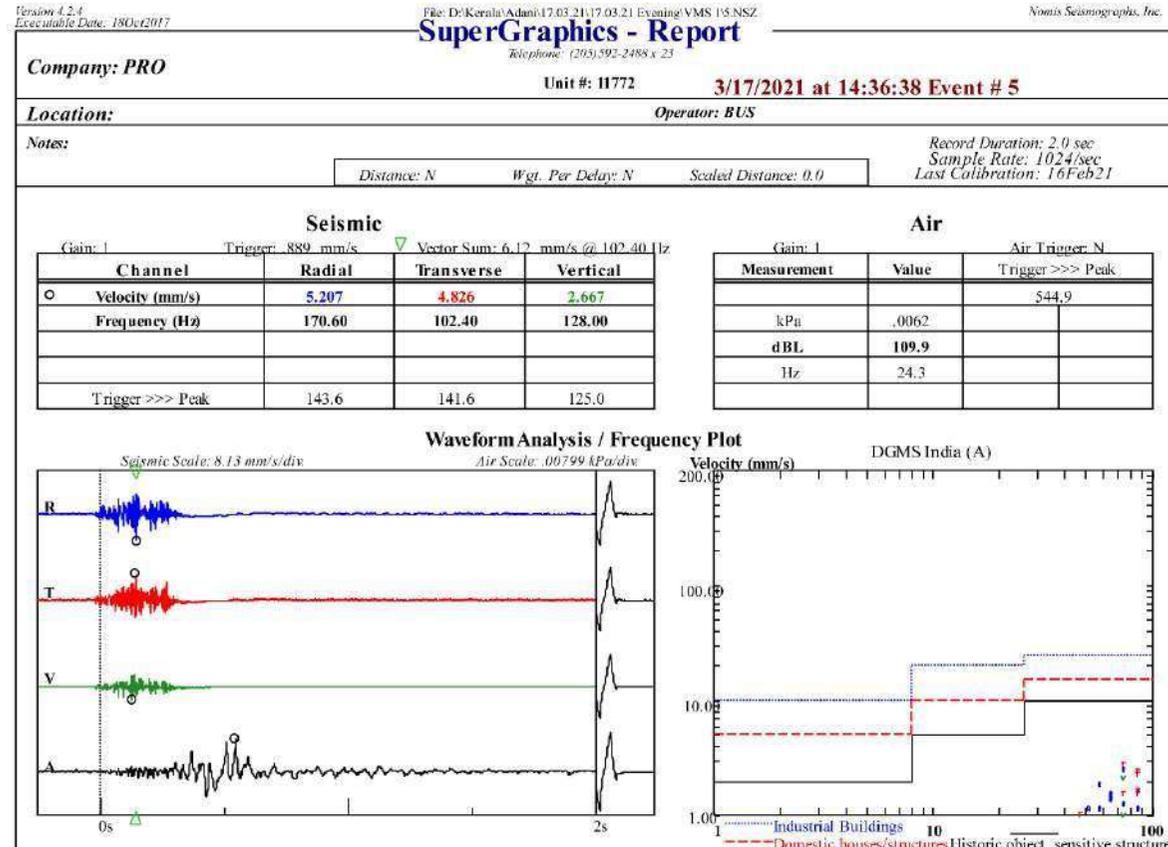
During the post blast observations, the following conditions were identified:

- No Backbreak was observed.
- Muckpile was found to be adequately fragmented.
- The throw of the blast has been around 10 m which is considered to be normal.
- A drop of about 0.75 to 1.0 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 10 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring houses were well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.16 & 3.17.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



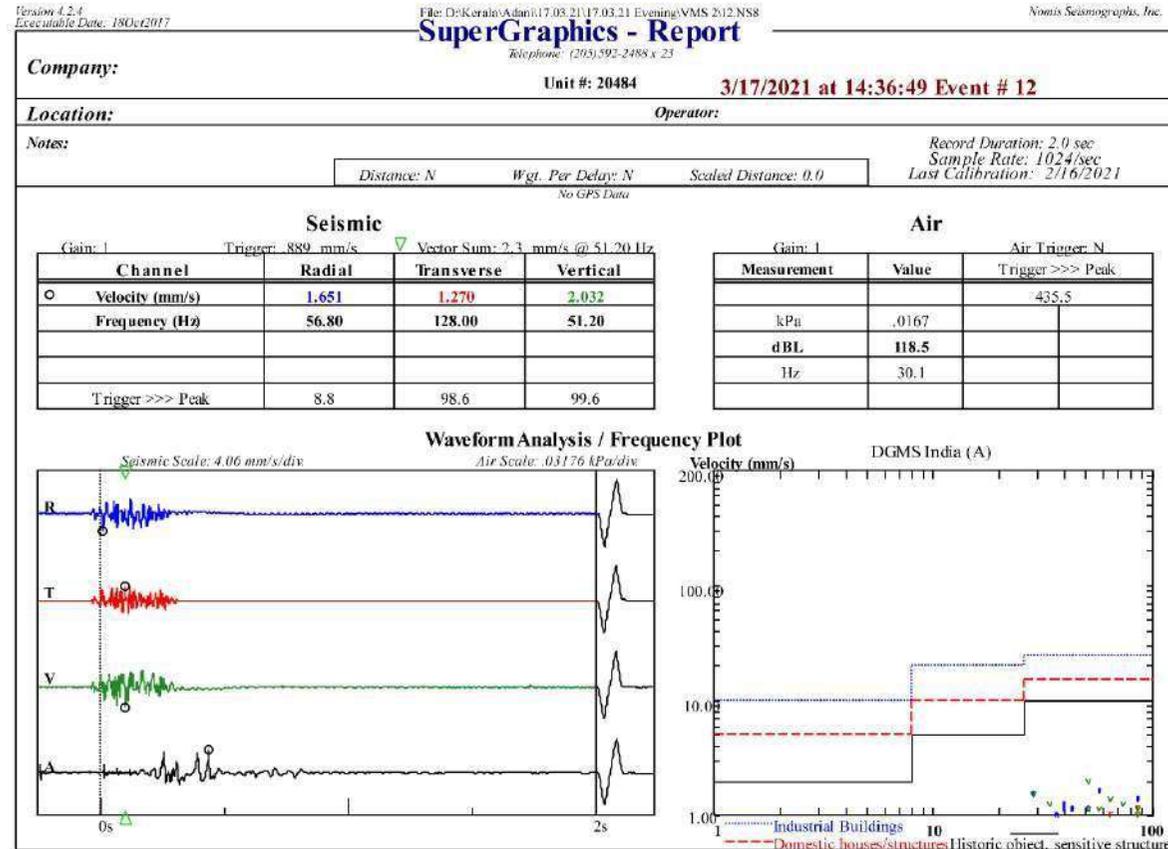
VMS_82 Location : EVENT



Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_83 Location : EVENT



VMS_84 Location : EVENT



Event Report

Date/Time Long at 14:38:38 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo: 127 mm/s
Record Time 2.0 sec at 1024 sps

Serial Number 4688 V 2.6 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F688IWBV.920

Notes

Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:23:50 (V8.12)

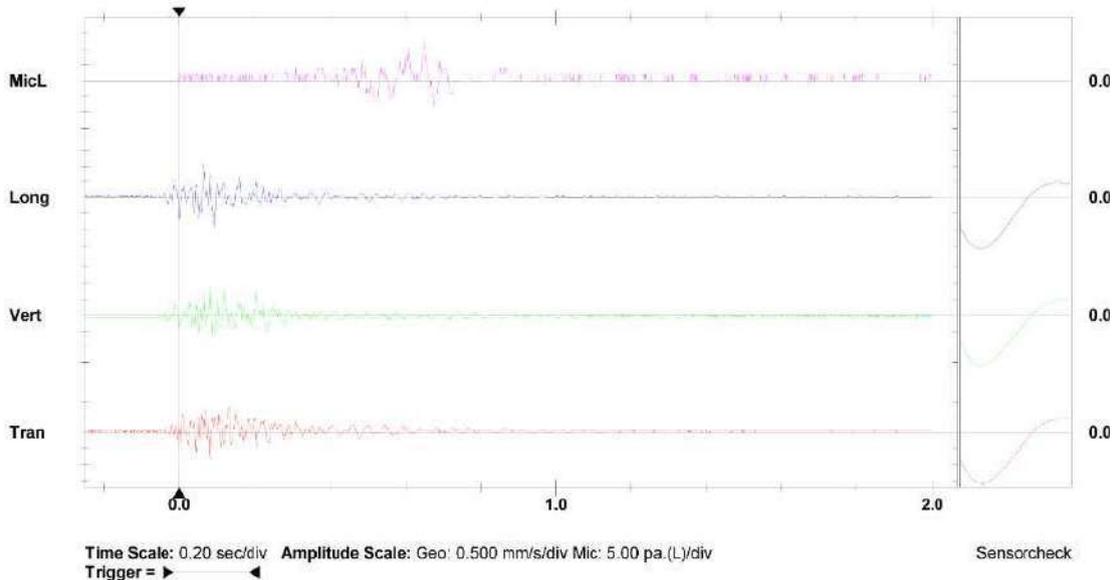
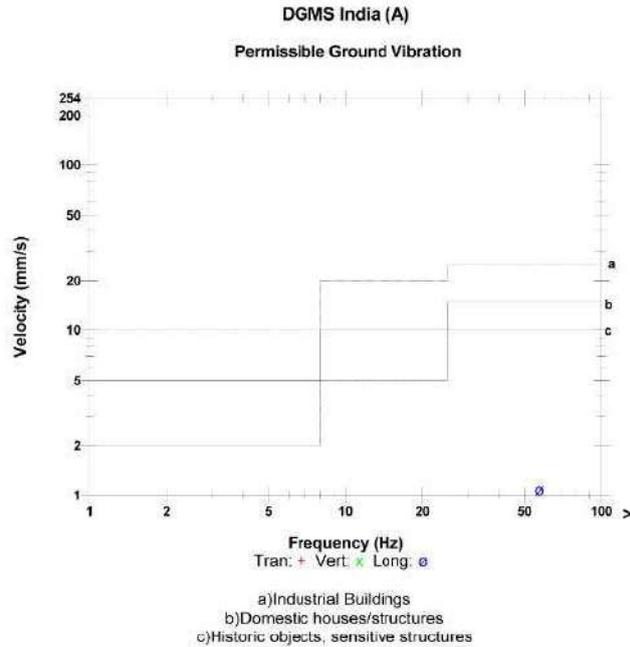
Extended Notes

Post Event Notes

Microphone Linear Weighting
PSPL 115.6 dB(L) at 0.651 sec
ZC Freq 18 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 491 mv)

	Tran	Vert	Long	
PPV	0.826	0.889	1.08	mm/s
ZC Freq	85	57	57	Hz
Time (Rel. to Trig)	0.082	0.083	0.064	sec
Peak Acceleration	0.0398	0.0398	0.0464	g
Peak Displacement	0.00239	0.00276	0.00282	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.7	7.8	8.2	Hz
Overswing Ratio	3.4	3.6	3.3	

Peak Vector Sum 1.40 mm/s at 0.083 sec



VMS_85 Location : EVENT



Event Report

Date/Time Vert at 14:37:06 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687IWBV.9J0

Notes

Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:26:47 (V8.12)

Extended Notes

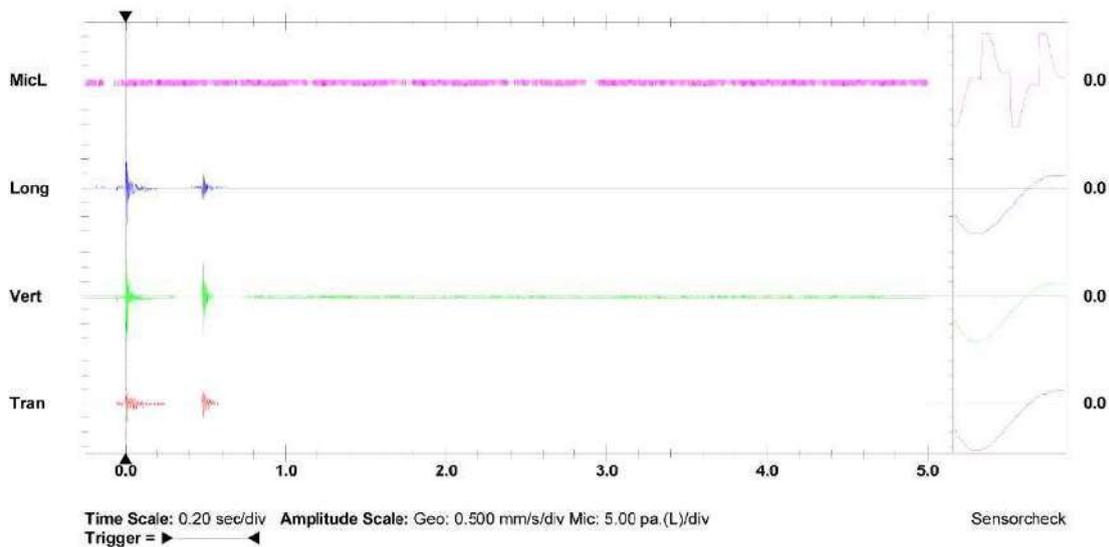
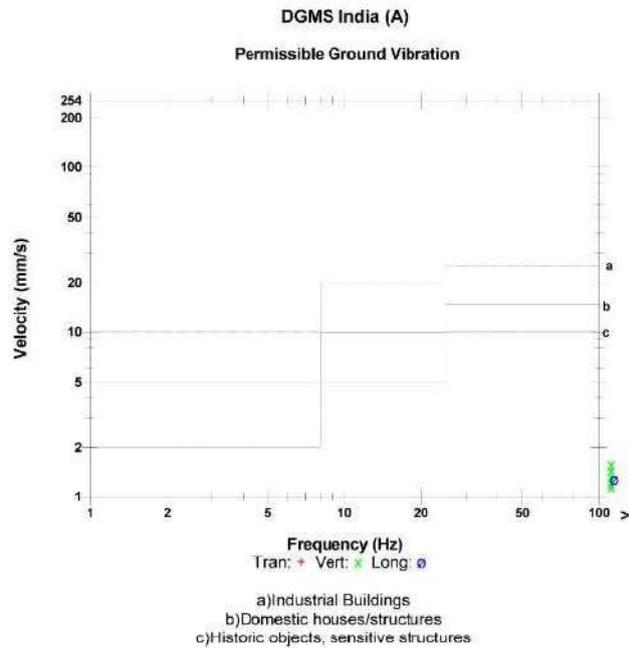
Post Event Notes

Microphone Linear Weighting
PSPL 100.0 dB(L) at 0.003 sec
ZC Freq N/A
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	0.635	1.59	1.27	mm/s
ZC Freq	N/A	>100	N/A	Hz
Time (Rel. to Trig)	0.007	0.008	0.009	sec
Peak Acceleration	0.0729	0.212	0.133	g
Peak Displacement	0.00099	0.00136	0.00118	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.6	7.8	7.7	Hz
Overswing Ratio	3.5	3.2	3.6	

Peak Vector Sum 1.68 mm/s at 0.010 sec

N/A: Not Applicable



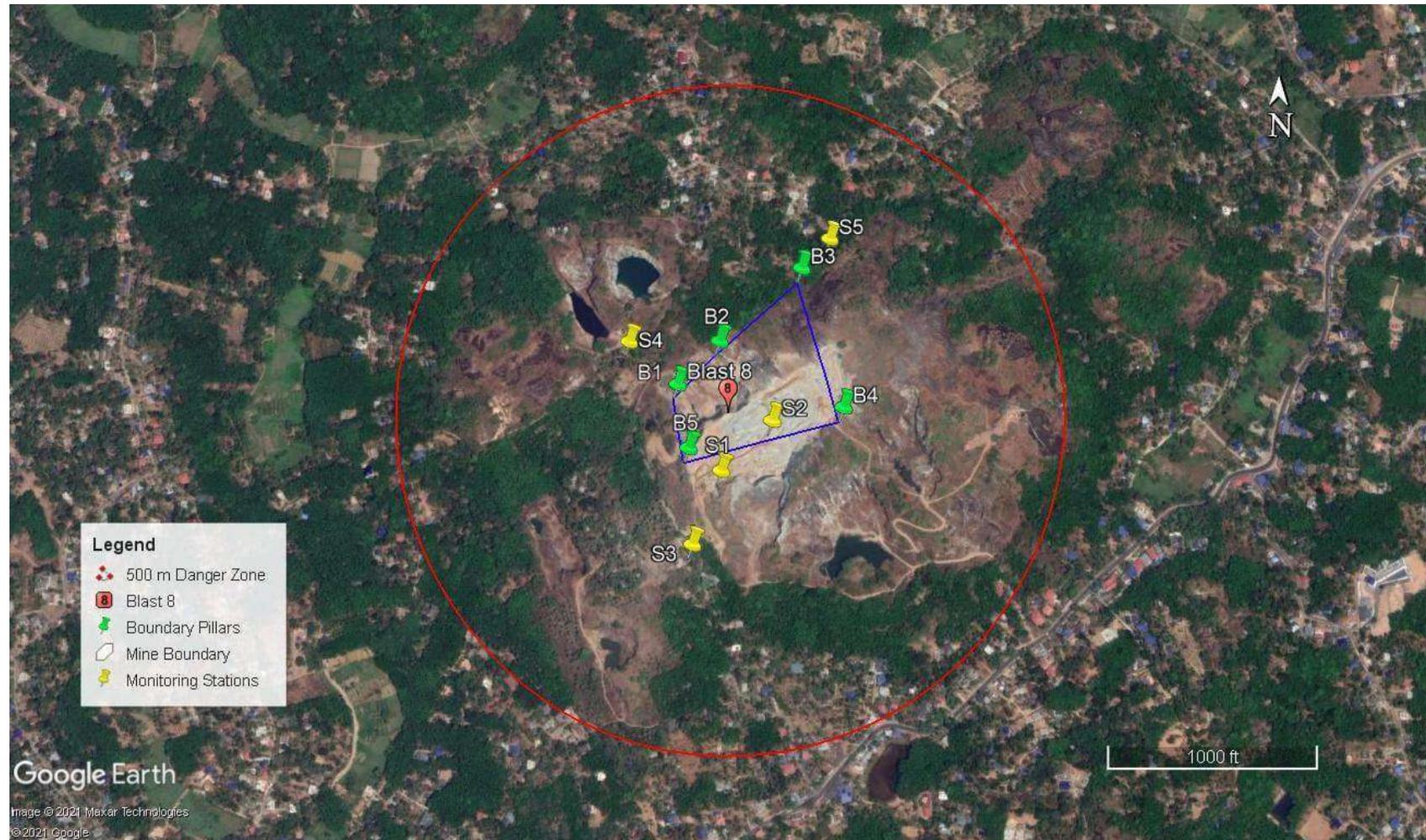


Figure 3.16 Imagery shows the location blast site 8 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry

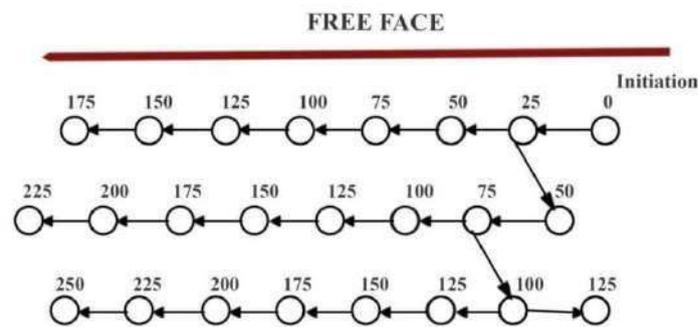
Blast No 9: The ninth blast was conducted on 17th March, 2021 and the adopted blasting pattern and details are given in the Table 3.18 and 3.19. The Figure 3.17 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.18

Table 3.18 Co-ordinates of Blast & Instrument Locations

Sl. No.	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B9)			8°43'47.24"	76°50'19.47"	---		
2	VMS_1 Location	11772	186	8°43'41.81"	76°50'17.47"	3.47 Within permissible limit	67.8	Belonging to the owner, maximum value is 15 mm/s
3	VMS_2 Location	20484	91	8°43'44.17"	76°50'19.88"	1.75 Within permissible limit	69.2	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	293	8°43'38.33"	76°50'16.16"	Not Triggered		Not belonging to the owner
5	VMS_4 Location	4688	205	8°43'48.033"	76°50'12.81"	0.524 Within permissible limit	63.7	Not belonging to the owner, maximum value is 5 mm/s
6	VMS_5 Location	4687	209	8°43'53.22"	76°50'22.62"	1.00 Within permissible limit	56.3	Not belonging to the owner, maximum value is 5 mm/s

Table 3.19 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	24	0.625	1.0714	15



NUMBER OF HOLES : 24

CHARGE PER DELAY :

Kg/delay

Figure 3.17 Schematic diagram of adopted blasting pattern for the blast 9

Post Blast Observations

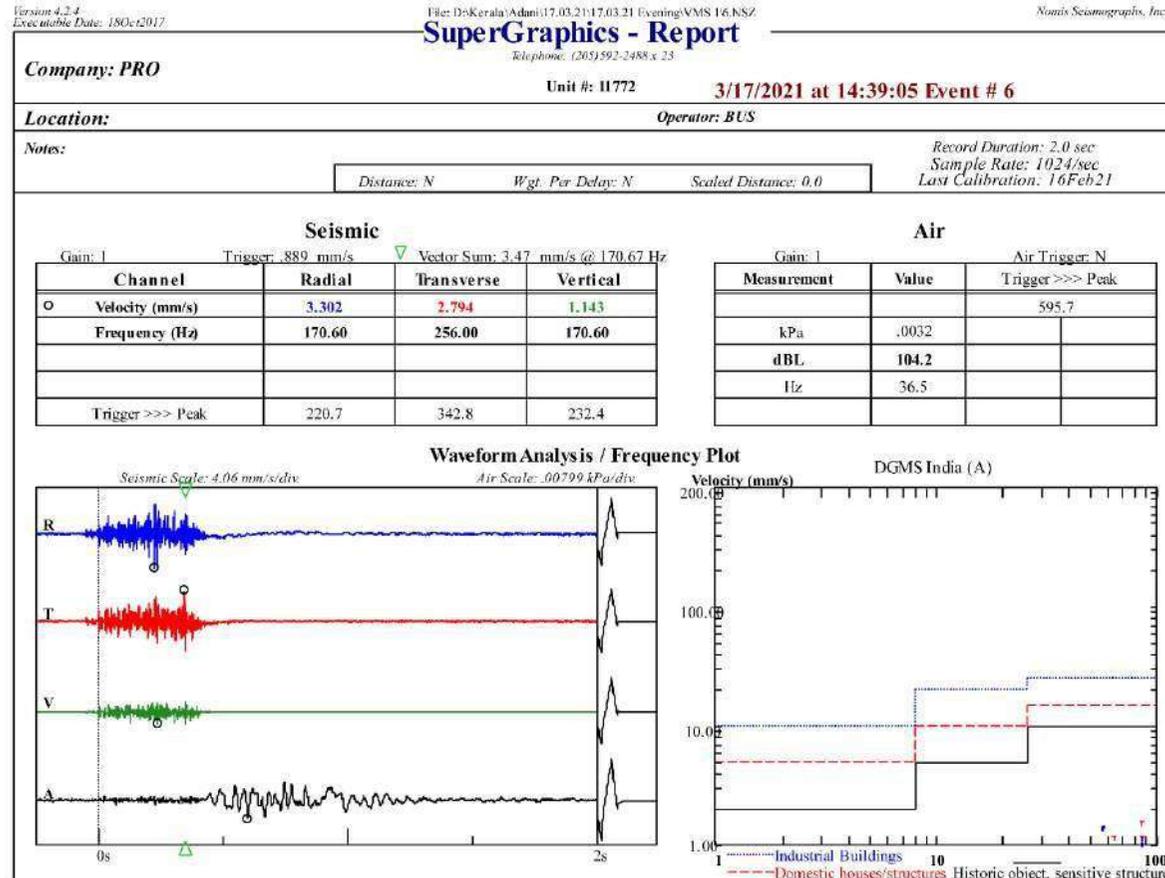
During the post blast observations, the following conditions were identified:

- No Backbreak was observed.
- Muckpile was found to be adequately fragmented.
- The throw of the blast has been around 8 to 10 m which is considered to be normal.
- A drop of about 0.50 to 1.0 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 10 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring houses were well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.18 & 3.19.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



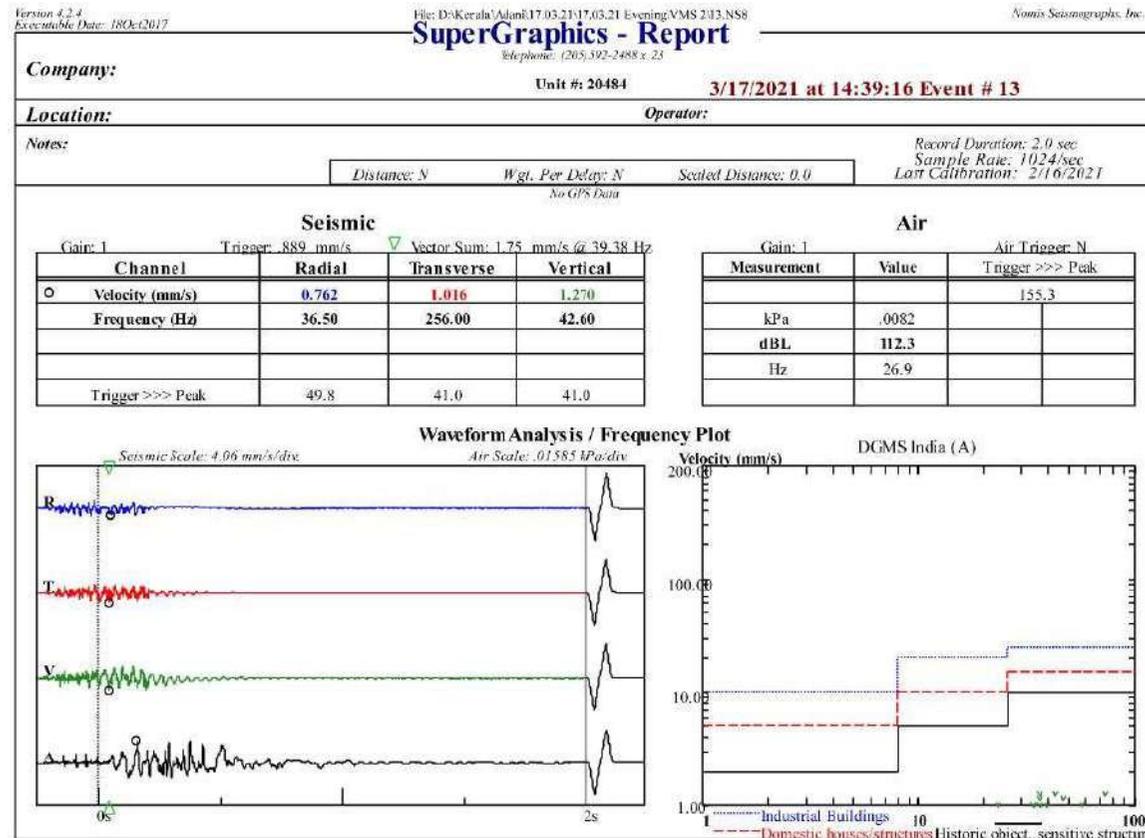
VMS_89 Location : EVENT



Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited



VMS_90 Location : EVENT



VMS_91 Location : EVENT



Event Report

Date/Time MicL at 14:39:04 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 2.0 sec at 1024 sps

Serial Number 4688 V 2.6 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F688IWBV.D40

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:23:50 (V8.12)

Extended Notes

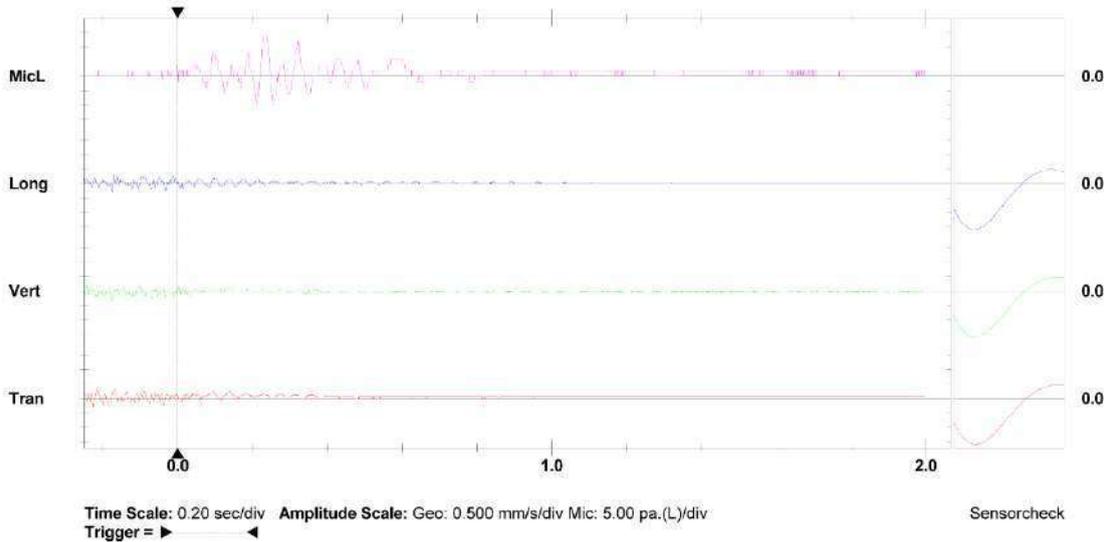
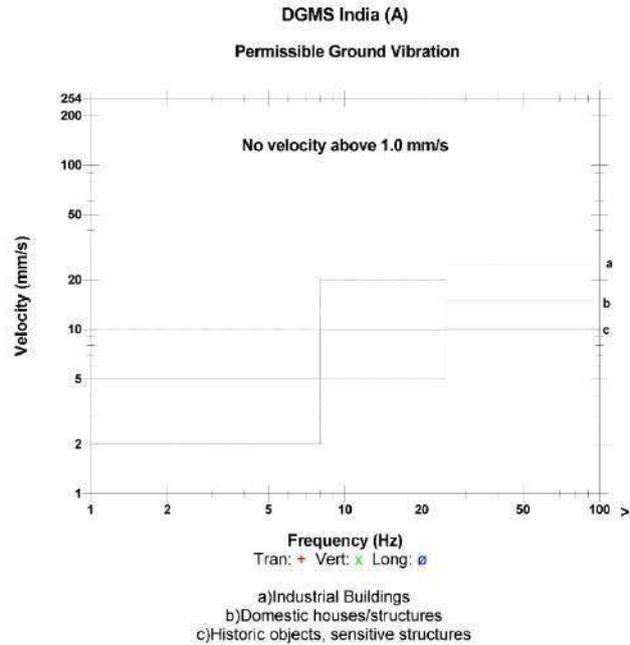
Post Event Notes

Microphone Linear Weighting
PSPL 116.9 dB(L) at 0.231 sec
ZC Freq 18 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 491 mv)

	Tran	Vert	Long	
PPV	0.318	0.318	0.318	mm/s
ZC Freq	85	64	N/A	Hz
Time (Rel. to Trig)	-0.225	-0.176	-0.175	sec
Peak Acceleration	0.0199	0.0133	0.0199	g
Peak Displacement	0.00127	0.00050	0.00090	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.7	7.8	8.2	Hz
Overswing Ratio	3.4	3.6	3.3	

Peak Vector Sum 0.524 mm/s at -0.175 sec

N/A: Not Applicable



VMS_92 Location : EVENT



Event Report

Date/Time Long at 14:39:00 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo :127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4687 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687\WBV.D00

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:26:47 (V8.12)

Extended Notes

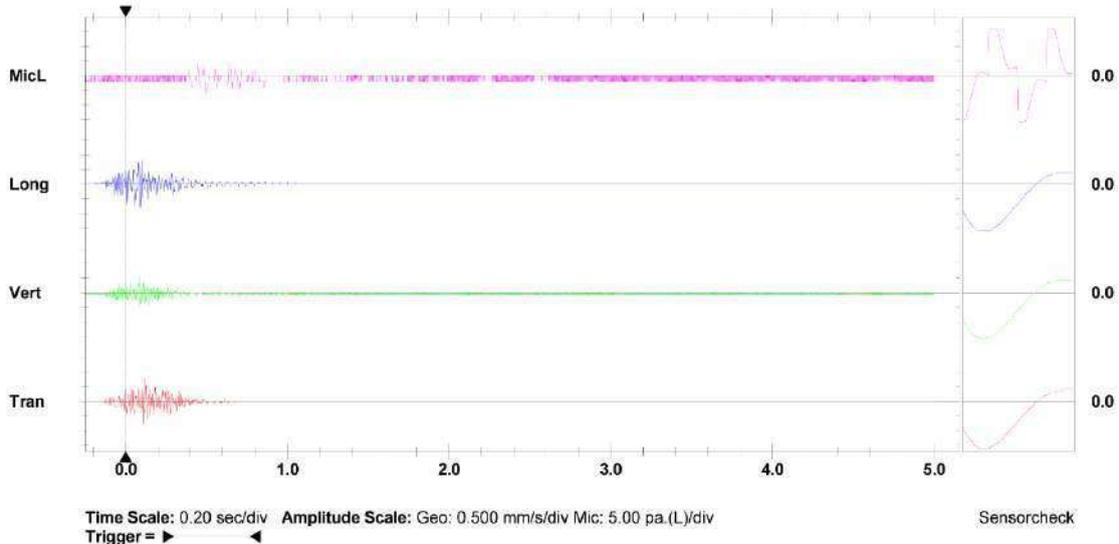
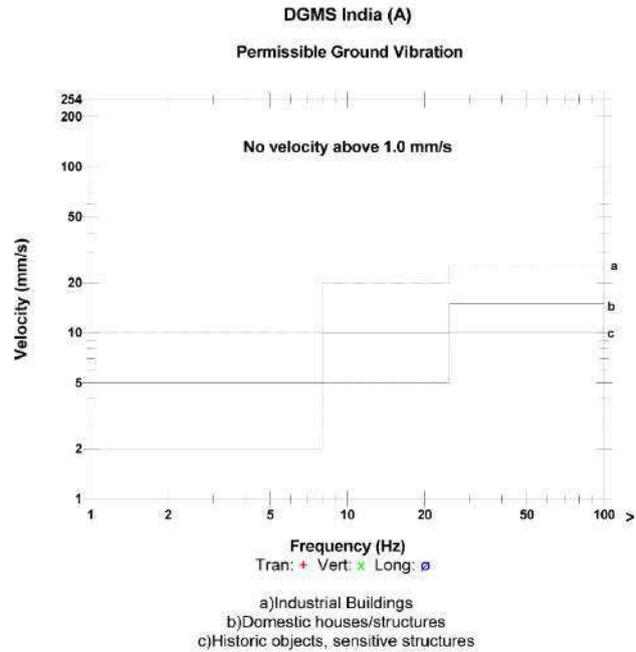
Post Event Notes

Microphone Linear Weighting
PSPL 109.5 dB(L) at 0.492 sec
ZC Freq 18 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	0.826	0.572	0.889	mm/s
ZC Freq	>100	N/A	>100	Hz
Time (Rel. to Trig)	0.112	0.090	0.101	sec
Peak Acceleration	0.0530	0.0464	0.0464	g
Peak Displacement	0.00121	0.00087	0.00152	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.6	7.8	7.7	Hz
Overswing Ratio	3.5	3.2	3.6	

Peak Vector Sum 1.00 mm/s at 0.101 sec

N/A: Not Applicable



Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited

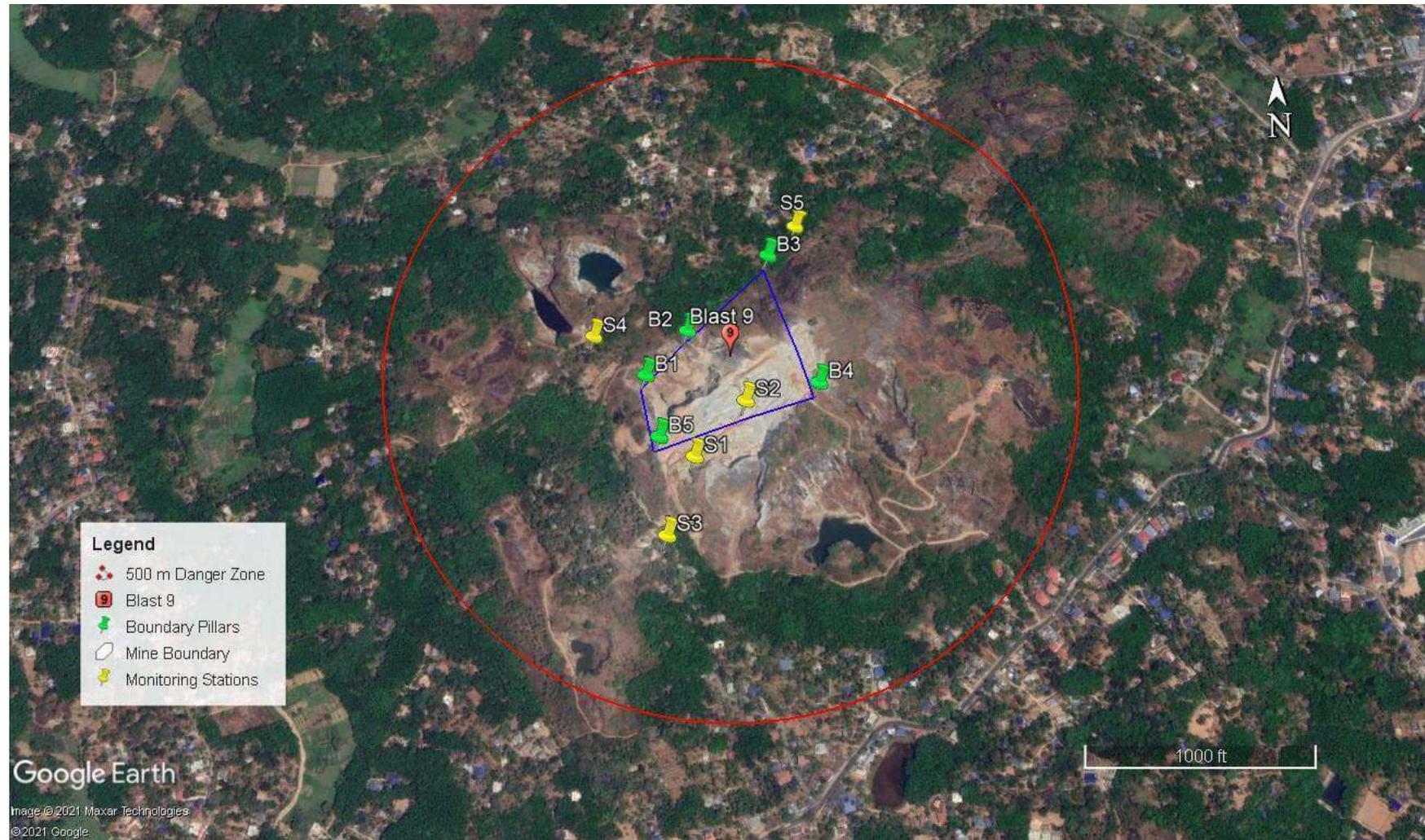


Figure 3.18 Imagery shows the location blast site 9 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry



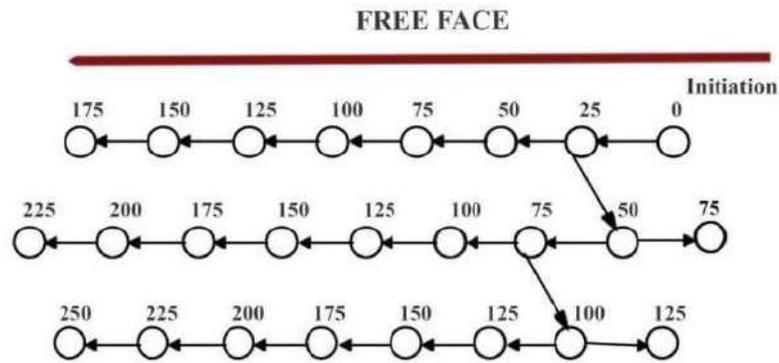
Blast No 10: The tenth blast was conducted on 17th March, 2021 and the adopted blasting pattern and details are given in the Table 3.20 and 3.21. The Figure 3.19 depicts the blasting pattern and location of blasting site and monitoring station is provided in the Figure 3.20

Table 3.20 Co-ordinates of Blast & Instrument Locations

Sl. No.	Location	Serial of Instrument	Distance (m)	Latitude (N)	Longitude (E)	PPV (mm/s)	Noise dB(A)	Type of structure/ Permissible limit
1	Blast Location (B10)			8°43'45.74"	76°50'20.27"	---		
2	VMS_1 Location	11772	146	8°43'41.81"	76°50'17.47"	3.4 Within permissible limit	56.2	Belonging to the owner, maximum value is 15 mm/s
3	VMS_2 Location	20484	46	8°43'44.17"	76°50'19.88"	2.29 Within permissible limit	72.1	Belonging to the owner, maximum value is 15 mm/s
4	VMS_3 Location	5993	259	8°43'38.33"	76°50'16.16"	Not Triggered		Not belonging to the owner
5	VMS_4 Location	4688	245	8°43'48.03 3"	76°50'12.81"	0.206 Within permissible limit	59.1	Not belonging to the owner, maximum value is 5 mm/s
6	VMS_5 Location	4687	243	8°43'53.22"	76°50'22.62"	0.318 Within permissible limit	56.3	Not belonging to the owner, maximum value is 5 mm/s

Table 3.21 Details of Blast Parameters

Average Burden (m)	Average Spacing (m)	Average Hole Depth (m)	No. of holes (Nos.)	Maximum Charge per Hole (kg)	Maximum Charge per Delay (kg)	Total quantity of Explosives used (kg)
1.2	1.5	2.4	25	0.625	1.1161	15.625



NUMBER OF HOLES : 25

CHARGE PER DELAY :

Kg/delay

Figure 3.19 Schematic diagram of adopted blasting pattern for the blast 10

Post Blast Observations

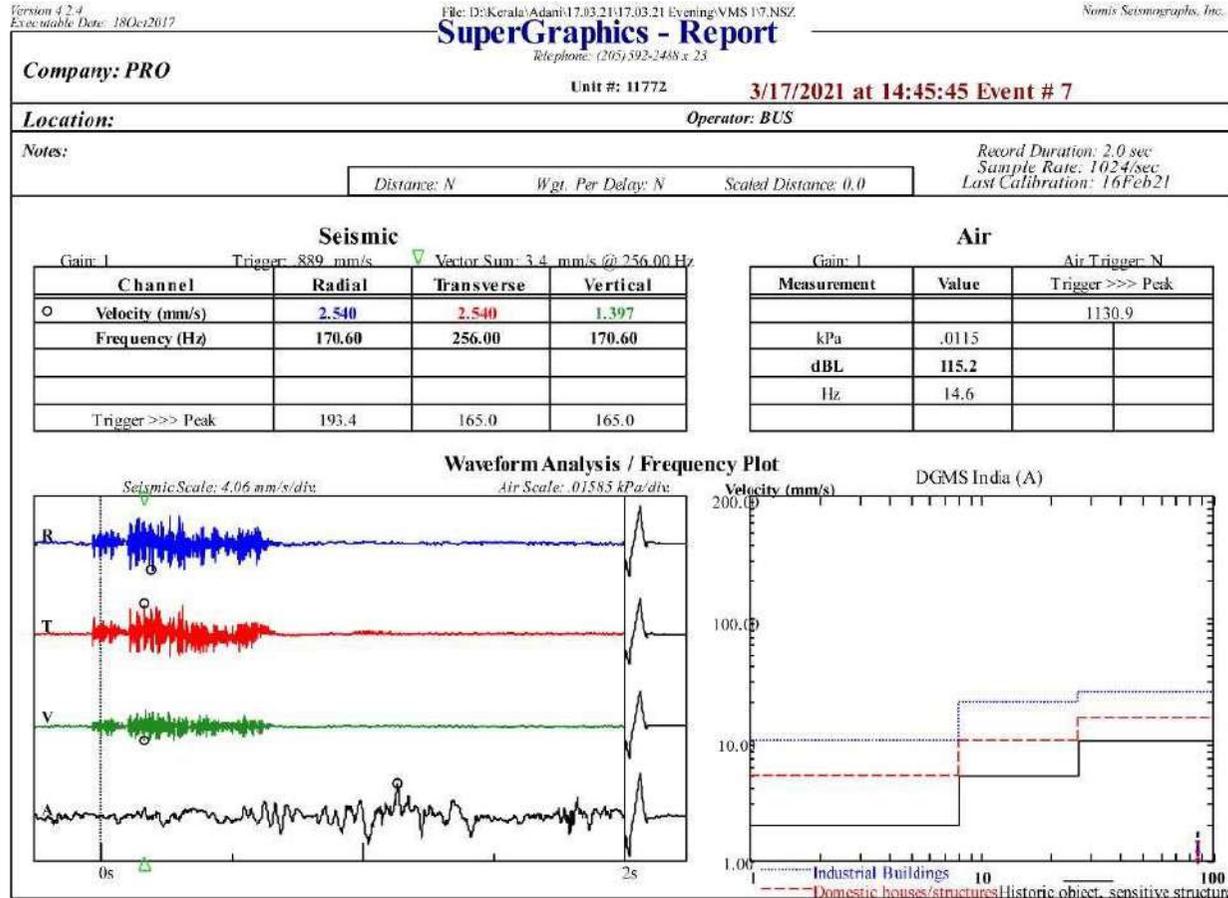
During the post blast observations, the following conditions were identified:

- No Backbreak was observed.
- Muckpile was found to be adequately fragmented.
- The throw of the blast has been around 10 m which is considered to be normal.
- A drop of about 0.50 to 1.0 m from the top surface of bench has been found at the rear side of the blasted muck pile.
- No fly rock has travelled beyond 10 to 15 m from the blast.
- No misfires have occurred.
- The ground vibrations level monitored in the Neighbouring houses were well within permissible level.
- Few big sized boulders have been found on the blasted muck pile.
- Summary of the field data related to the above blast is given in **Table 3.18 & 3.19.**

Scientific study on Blast Induced Ground Vibration for Kadavila-1 Stone Quarry, Nagaroor village, Chirayinkeezh Taluk, Thiruvananthapuram District, Kerala of M/s. Adani Vizhinjam Port Private Limited

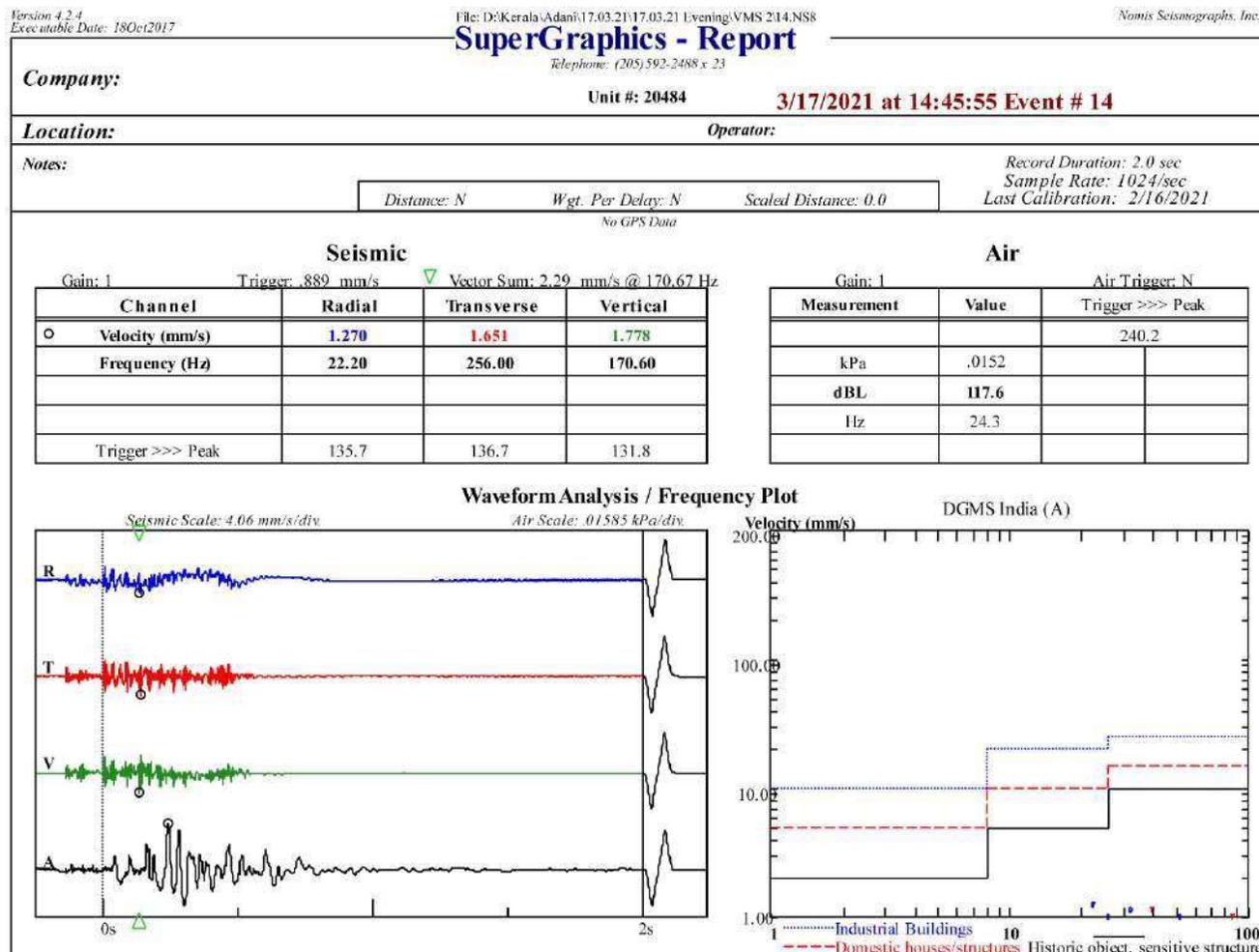


VMS_1 Location : EVENT REPORT





VMS_2 Location : EVENT REPORT



VMS_98 Location : EVENT



Event Report

Date/Time MicL at 14:45:43 March 17, 2021
Trigger Source Geo: 0.492 mm/s
Range Geo :127 mm/s
Record Time 2.0 sec at 1024 sps

Serial Number 4688 V 2.6 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F688IWBV.070

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:23:50 (V8.12)

Extended Notes

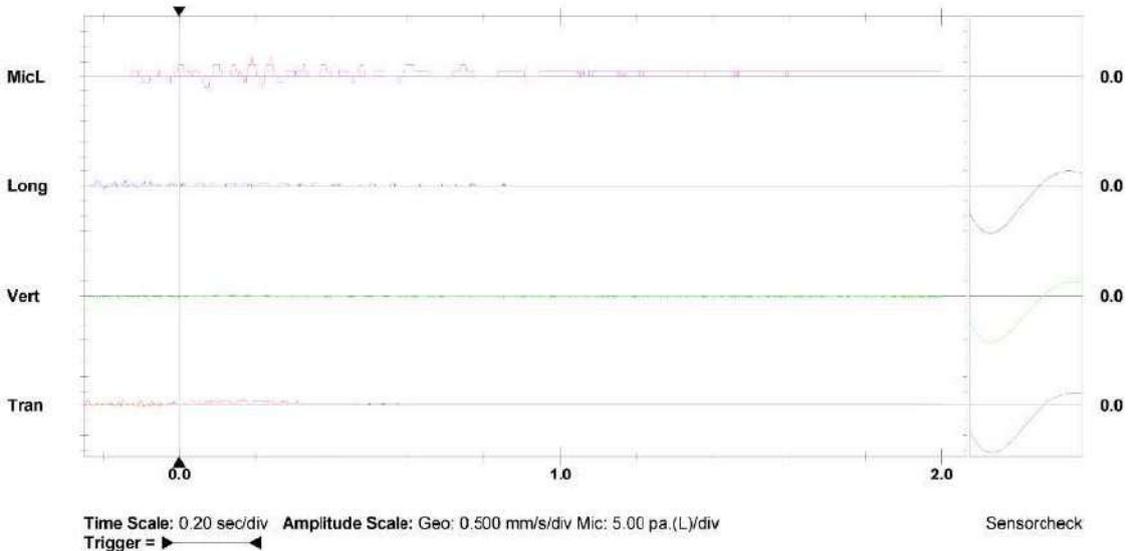
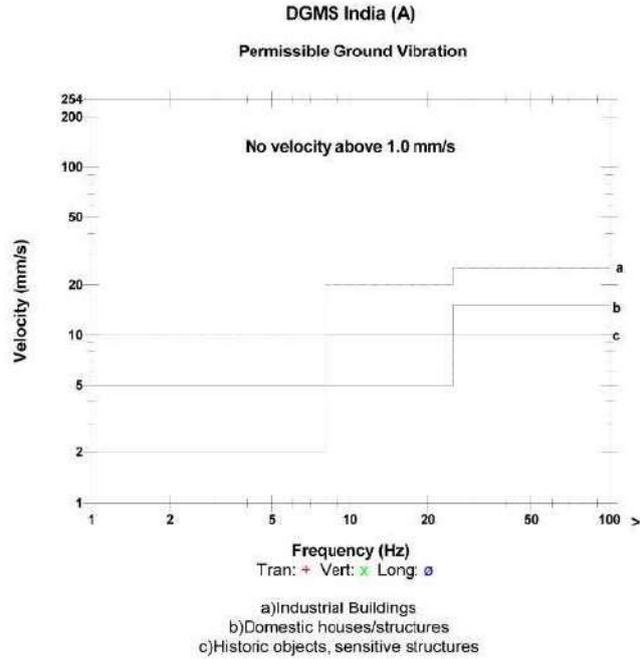
Post Event Notes

Microphone Linear Weighting
PSPL 109.5 dB(L) at 0.191 sec
ZC Freq 20 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 491 mv)

	Tran	Vert	Long	
PPV	0.191	0.127	0.191	mm/s
ZC Freq	64	N/A	47	Hz
Time (Rel. to Trig)	-0.240	-0.242	-0.216	sec
Peak Acceleration	0.0133	0.00663	0.00663	g
Peak Displacement	0.00003	0.00003	0.00003	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.7	7.8	8.2	Hz
Overswing Ratio	3.4	3.6	3.3	

Peak Vector Sum 0.206 mm/s at -0.240 sec

N/A: Not Applicable



VMS_99 Location : EVENT



Event Report

Date/Time MicL at 14:45:38 March 17, 2021
Trigger Source Geo: 0.492 mm/s
 Mic: 106 dB(L)
Range Geo: 127 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 4887 V 2.61 MiniMate
Battery Level 6.4 Volts
Calibration April 21, 2017 by UES, New Delhi
File Name F687IWBV.020

Notes
 Location: KADAVILA STONE QUARRY
 Client: ADANI PORT PVT LTD
 User Name: ANNA UNIVERSITY
 Converted: February 26, 2011 04:26:47 (V8.12)

Extended Notes

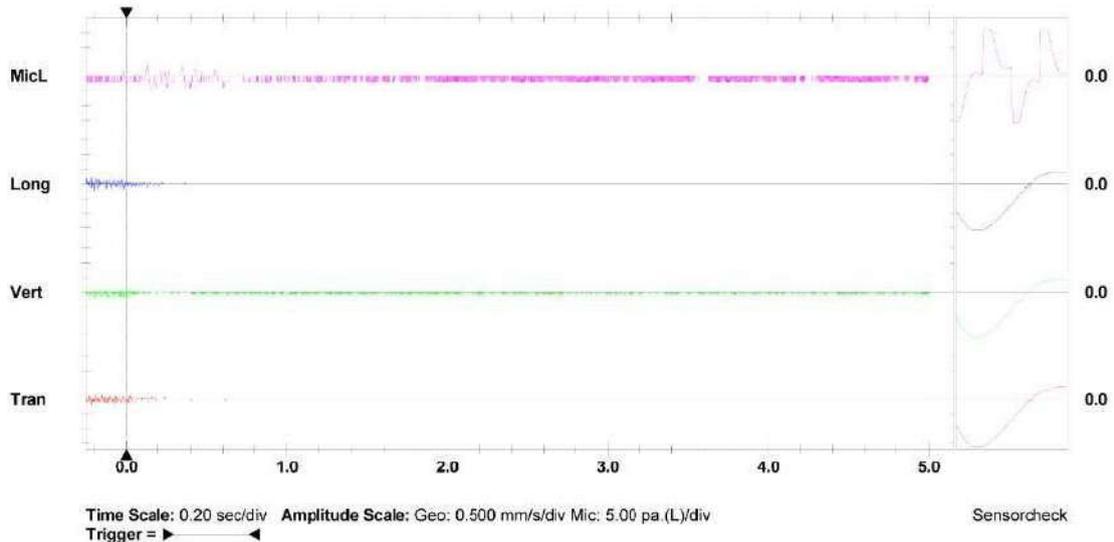
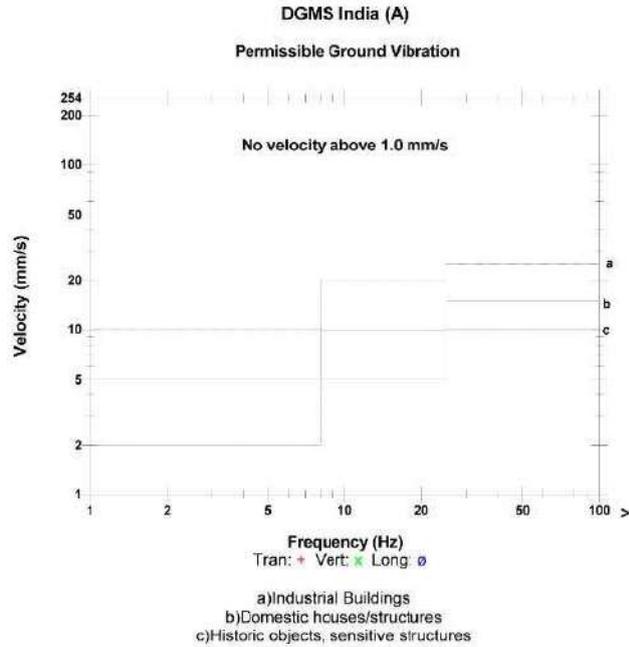
Post Event Notes

Microphone Linear Weighting
PSPL 109.5 dB(L) at 0.149 sec
ZC Freq 18 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	0.191	0.254	0.254	mm/s
ZC Freq	N/A	N/A	N/A	Hz
Time (Rel. to Trig)	-0.074	-0.005	-0.198	sec
Peak Acceleration	0.0133	0.0199	0.0199	g
Peak Displacement	0.00006	0.00016	0.00019	mm
Sensorcheck	Passed	Passed	Passed	
Frequency	7.6	7.8	7.7	Hz
Overswing Ratio	3.5	3.2	3.4	

Peak Vector Sum 0.318 mm/s at -0.198 sec

N/A: Not Applicable



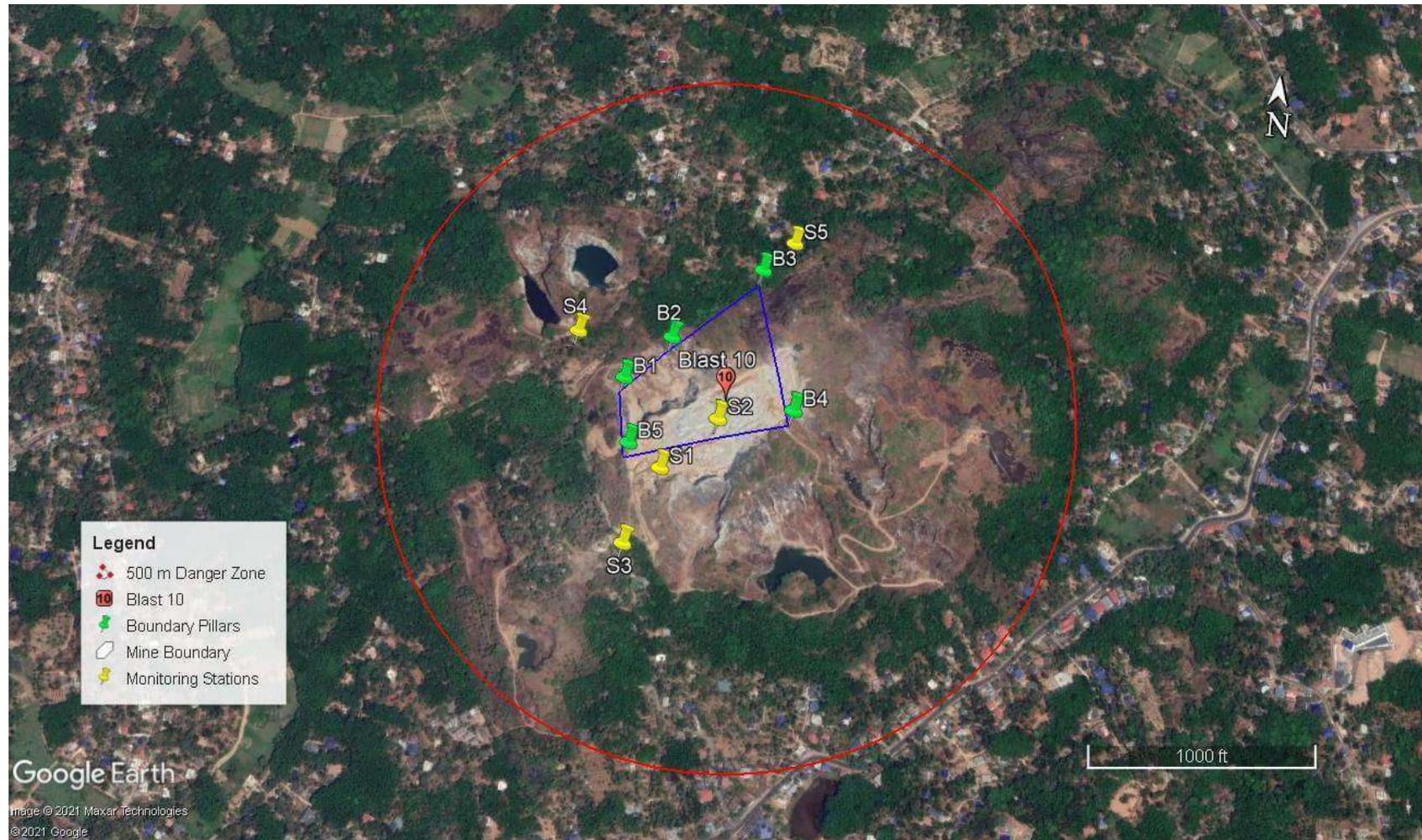


Figure 3.20 Imagery shows the location blast site 10 and its corresponding monitoring stations of M/s. Kadavila-1 Stone Quarry

3.2 Blast Vibration Monitoring

To minimise generation of blast induced ground vibrations and thereby their adverse effects on the residential buildings, and other structures, the blast vibration predictor equation for the quarry area has been developed by determining the field constants (which are site specific) by monitoring ground vibrations during all **10 trial blasts** in M/s. Kadavila-1 Stone Quarry. This monitoring was carried out by five numbers of seismographs of INSTANTEL (3 Nos.) and NOMIS (2 Nos.) make by locating them at different locations and distances from the blasting site.

Based on the parameters like the maximum explosive charge per delay, measured peak particle velocities (PPV), distances of each of the blasting sites to the monitoring stations of that particular blast, predictor equations for the site have been developed using regression analysis. This predictor equation was used to calculate the maximum (safe) explosive charge per delay by substituting the distance of the blasting site from the nearest residential structures.

Blast design for the trial blasts was based on the information collected from the site, the empirical relations normally used for blast design and the current practices prevailing in the quarry. Results of the trial blasts, rock type, height of the bench, existence of structures to be protected from blast vibrations like the residential structures of the village, etc. have been taken into account, in this report, while designing the future blasts for M/s. Kadavila-1 Stone Quarry.

3.2.1 Tolerable PPV Levels of the Residential Buildings and other structures of Nagaroor village (Kadavila village)

The guidelines by DGMS and others (given in **Section No. 1.3**) specify the tolerable PPV levels surface civil structures of various types can tolerate at different frequencies. Amongst them, DGMS recommends the least (most conservative and therefore safe) permissible peak particle velocities to which different types of structures should be subjected to, for ensuring their safety. Hence, these standards are considered for blast design in this report.

The **minimum and maximum blast vibration frequencies** recorded during the trial blasts ranged between **7.5 to 256 Hz** respectively. Keeping in view the minimum



frequency recorded during the trial blasts, the maximum PPV, structures of any type, can tolerate without damage fall within the frequency range of **8 to 25 Hz** recommended by DGMS in the **Table 1.2** and the same are given in the **Table 3.22**. Based on the DGMS recommendations, it is indicated in the **Table 3.22 (A)** that the tolerable PPVs measured at the foundation level of the structures are **10 mm/s for the domestic houses/structures made up of kutchha brick and cement** and **20 mm/s for the Industrial buildings (RCC & framed structures)** not belonging to the quarry management and **5 mm/s for other structures of historical importance like dam and bridges** if located within the vicinity of the quarry.

However, to avoid confusion for the people in the field, the maximum explosive charge per delay is calculated for this quarry to restrict the peak particle velocity to **5.0 mm/s only** (irrespective of the type of structure), which is more conservative and safer as shown in the **Table 3.22 (B)**. Further it will secure the safety of Domestic houses & structures/Residential buildings located in the Kadavila village whose safety is also very important.

Table 3.22 Permissible Maximum PPV for Residential buildings and other civil structures for blast induced ground vibration frequencies ranging between 8 to 25 Hz

Type of structure		Max. Permissible PPV, mm/s with Dominant excitation frequency in the range of 8-25 Hz
(A) Buildings / structures not belonging to the owner		
(i)	Domestic houses/structures (kutchha brick & cement), Residential & other Buildings of Vaniyamkulam village	10
(ii)	Industrial buildings (RCC & framed structures)	20
(iii)	Sensitive structures like Dam & Bridges in the Surrounding villages	5
(B) Maximum PPV considered for calculation of Max. Charge per Delay		
	For all types of structure of Nagaroor village	5



3.3 Development of Predictor Equation

The vibration data generated during the trial blasts was analysed and a regression curve for the same at **95%** degree of confidence level has been drawn and indicated in **Figure 3.21**. The **95%** degree of confidence level was chosen because this is the minimum level at which all the measured data points were lying below this line(level). Based on the regression analysis, the predictor equation for the area has been developed and given in Equation 3.

$$V = 1026 * (SD)^{(-1.01)} \quad \dots \quad (3)$$

where,

V	=	Peak particle velocity (PPV), mm/s
SD	=	Scaled distance, m/\sqrt{kg}
k and β	=	Rock constants, which are site specific and

SD is calculated by equation (2).

$$SD = \frac{D}{\sqrt{W}} \quad (m/\sqrt{kg})$$

where,

D	=	Distance between the blasting site and the vibration monitoring station, m
W	=	Maximum explosive charge per delay, kg.

Accordingly, the safe (maximum) explosive charge per delay to be used and the maximum number of drill holes to be charges with same delay number for various distances of the blasting site from the structures like residential buildings and other structures in the Nagaroor Village, Chirayinkeezhu Taluk, Thiruvananthapuram District, Kerala to restrict the PPV to a maximum of 5.0 mm/s **with 95% confidence** are calculated using the predictor **equation (3)** developed for the site. **Table 3.23** gives the recommended maximum explosive charge per delay and the maximum number of drillholes to be charges with same delay number in M/s. Kadavila-1 Stone Quarry. Similarly, **Figure 3.21** depicts the maximum explosive charge recommended per delay.

Table 3.23 Maximum explosive charge recommended per delay for various distances of the blasting site to the structure to be protected like Residential buildings and other structures to restrict the blast vibrations (Peak Particle Velocity) to a maximum of 5 mm/s with 95% confidence level

Predictor Equation: $V = 1026 * (SD)^{-1.01}$		
Sl. No.	Shortest distance between the nearest structure to be protected to the blasting site, m	Maximum permissible explosive charge per delay, kg (rounded off to the nearest kg)
1	150	0.57
2	200	1.01
3	250	1.57
4	300	2.26
5	350	3.08
6	400	4.02
7	450	5.09
8	500	6.28
9	550	7.60
10	600	9.05

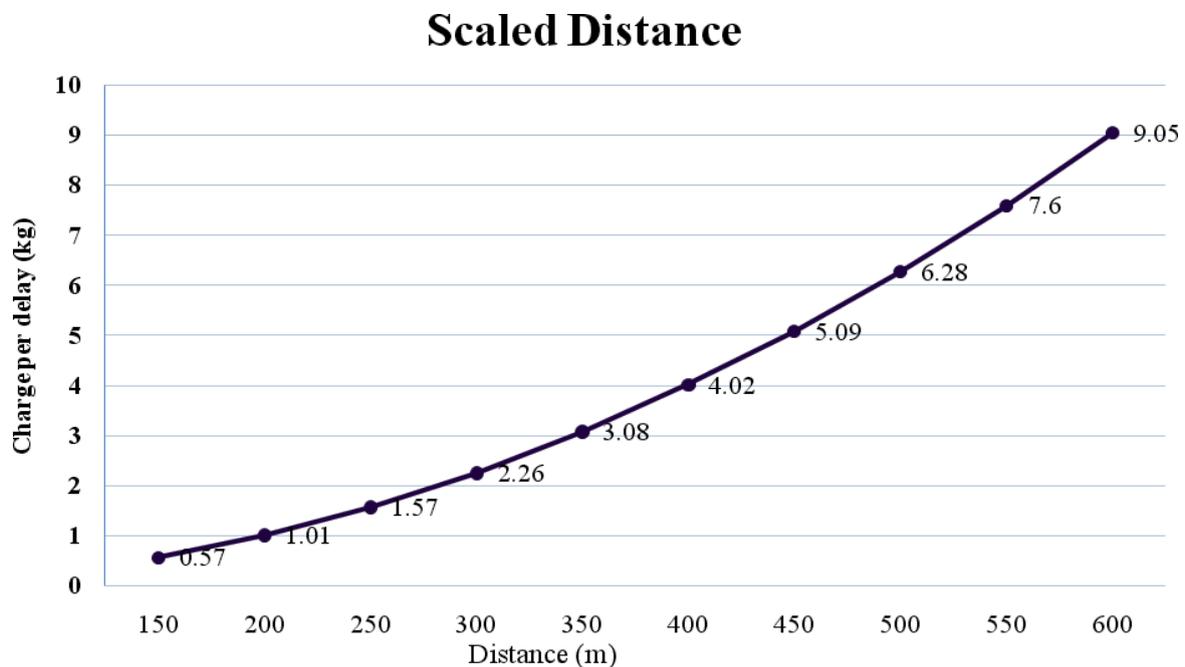


Figure 3.21 Relationship between maximum charge per delay and distance between the blasting site and the structure to be protected to restrict the blast induced ground vibrations (PPV) to a maximum of 5 mm/s

3.4 Results and Discussions

Ten trial blasts were carried out 16.03.2021 to 17.03.2021 and blast vibrations were monitored using five seismographs located at various distances. The minimum and maximum charge per delay varied from 1.07 to 2.17 kg. A maximum of 80 holes were drilled with jack hammer drilling equipment with a maximum number of holes per delay of six. In all the 10 trial blasts, ground vibrations were monitored at 47 locations around the blasting sites and neighbouring village. Out of the total 47 measurements made, vibrations were recorded by the instruments only at 36 stations. The vibrations recorded behind the blast free face were of highest magnitude. The magnitude of vibration recorded in the flank of direction of initiation was lower than those on the opposite side of the flank of blast initiation.

The maximum vibration recorded was 0.968 mm/s with associated dominant peak frequency range of 8.1 at a distance of 465 m from the site of blasting where the total explosive detonated in the blasting round was 18.75 kg and explosives weight per delay was 1.33 kg. Further, the maximum vibration of 0.397 mm/s was recorded at a distance of 359 m with associated dominant peak frequency range of 8 Hz from the blasting site where the total explosive detonated in the blasting round was 15 kg and the corresponding explosives weight per delay was 1.25 kg.

All the 10 blasts were carried out using NONEL shock tube detonators with an in-hole delay of 250 ms and surface delay of 25 ms. Fast attenuation of vibration was recorded at shorter distances whereas at far-off distances the attenuation was slow and was influenced by low frequency blast wave characteristics.

The recorded dominant frequencies of vibrations were in the range of 7.5 to 256 Hz. The FFT analyses of vibration data revealed that the concentration of vibration energy was in the range of 29.30 to 170.6 Hz. However, keeping in view the minimum frequency recorded during the trial blasts, the maximum PPV structures of any type, can tolerate without damage fall within the frequency range of 8 to 25 Hz. However, to avoid confusion for the people in the field, the maximum explosive charge per delay is calculated for this quarry to restrict the peak particle velocity to 5.0 mm/s only (irrespective of the type of structure), which is more conservative and safer as shown in the Table 3.22. Further it will secure the safety of Domestic

houses & structures/Residential buildings located in the Nagaroor Village, Chirayinkeezhu Taluk, Thiruvananthapuram District, Kerala whose safety is also very important.

Similarly, the maximum level of air over-pressure monitored at a distance of 205 m in the neighbouring village as 63.7 dB(A). All the recorded data were well within the threshold level of air over pressure/noise as per DGMS standard {85 dB(A)} and hence it will not cause any damage to the windows etc. of the houses/structures of the concerned village. Further, there was no ejection of flyrocks beyond the distance of 15 m in any of these blasts.

The analyses of vibration data recorded from detonation of blasts with higher amount of explosives generated higher level of vibrations at near-by-distances in comparison to the blasts which were detonated at the same bench face with lesser amount of explosives although the blast design and explosives parameters were kept identical. The explosives detonated in a delay in both the blasts were similar in weight.

The propagation equation for prediction of blast vibration have been established and are given as Equations 3. The permissible explosive weight per delay may be computed from the Equation to contain vibration within safe limits for distances of houses/structures concerned. For convenience, the permissible explosive weight per delay has been computed and is given in Table 3.23.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

4.0 Conclusions and Recommendations

The Anna University team have conducted scientific study to evaluate damage potential of the blast induced ground vibration and air overpressure induced by blasting operations at Kadavila-1 Stone Quarry located in the Nagaroor village. Altogether 10 experimental blast rounds were conducted in Kadavila-1 Stone Quarry. Comprehensive vibration monitoring was carried out during the blasting experiment. In all the 10 trial blasts, ground vibrations were monitored at 47 locations around the blasting sites and neighboring village which includes domestic houses and other prominent structures of the village such as the houses are not belonging to the owner of mine management.

It is observed that the blast induced ground vibration and air overpressure (noise) monitored at the locations such as houses (which are not belonging to the mine management) beyond a distance of 130 m from the blasting site remained **less than 3.00 mm/s and 63.7 dB(A) against recommended safe values of 5.0 mm/s and 85 dB(A)** respectively. Ground vibration beyond a distance of 300 m decayed to less than 1.0 mm/s in majority of the cases observed. Therefore, it may be concluded that observed blast induced ground vibration values are safe and well within the permissible limit as per recommendations of Directorate General of Mine Safety (DGMS).

Based on the scientific study, it is concluded that **the blast induced ground vibrations and noise levels generated by the controlled blasting carried out in Kadavila-1 Stone Quarry was within permissible level and therefore is not affecting the residential buildings and other structures. Further, it has been observed that no flying fragments or projectiles travelled beyond 10 m from the site of blast. Hence, controlled blasting can be carried out at Kadavila-1 Stone Quarry by following the blasting parameters as recommended in the Table No. 4.1.**



Here, it is recommended that the permissible explosive weight per delay may be computed from the Equation to contain vibration within safe limits for distances of houses/structures concerned. Hence, the maximum charge per delay shall not exceed the value specified in **Table 3.22** corresponding to the distance between the blasting site and the residential building or any sensitive structure.

Further, it is recommended to continue the present method of fragmenting the oversized rocks using Rock breakers and wherever possible, to adopt muffling using old tyres / old conveyor belts in the blasting operation which will not only minimize the flyrock generation as well as condense the noise generation considerably.

However, it may be noted that the recommendations of this report are site specific and can be effectively implemented only in M/s. Kadavila-1 Stone Quarry and not to the quarries outside the study area.



Table 4.1 Summary of suggested Controlled Blast Design for M/s. Kadavila-1 Stone Quarry

Sl. No.	Parameter		Value
1.	Blast hole diameter		33 mm
2.	Burden		1.2 m
3.	Spacing		1.5 m
4.	Height of the bench		6.00 m
5.	Stemming length		Minimum 0.70 m
6.	Drilling patterns to be followed		Rectangular / Staggered
7.	Specific charge	For creating Initial (Box) Cut	0.16 to 0.17 kg/m ³
		For production blasting	0.15 to 0.16 kg/m ³
8.	Loading Density	Cap-sensitive Emulsion (or) Slurry Cartridges	0.26 kg/m
9.	Average explosive Quantity/hole	Cap-sensitive Emulsion (or) Slurry Cartridges	0.50 kg
10	Maximum explosive charge per drillhole during production blasting	Cap-sensitive Emulsion (or) Slurry Cartridges	125 g 0.625 to 0.688 kg
11	Detonators recommended		NONEL based detonators of 17/25 ms surface delay with an in-hole delay of 250 ms
12	Type of explosive recommended		Emulsion (or) slurry cartridge type (ø=25 mm)
13	Initiation system recommended		Inverse initiation
14	Method of connecting detonator		Series
15	Maximum charge per delay		As stated in Table 3.22 based on the distance of the blasting site from the structure and the type of structure to be protected



REFERENCES

1. Anon, (2019). Metalliferrous Mines Regulations 2019, Ministry of Labour & Employment, Govt. of India.
2. Anon, (1991). CMRI Report of Investigation, GAP/V/II, April, 1983 – December, 1987, CMRI, Dhanbad.
3. Anon, (1997). Technical Circulars of No. 7 of 1997 issued by Directorate General of Mines Safety, Govt. of India.
4. Anon, (1997). IS 4081 – 1986, Indian Standard Safety code for Blasting and related Drilling Operations.
5. Anon, (2001). IS 14881 : 2001, Indian Standard Method of Blast Vibration Monitoring – Guidelines.
6. Anon, (2005). Role of Blasting Design Parameters on Ground Vibration and Correlation of Vibration Level to Blasting damage to Surface Structures, Report of Coal S & T Project carried out by national Institute of Rock Mechanics, Western Coal Fields Ltd. And The Singareni Collieries Co. Ltd.
7. Dhar, B.B., Pal Roy, P. and Singh, R.B. (1993). Optimum blasting for Indian geo-mining conditions – suggestive standard and guidelines, CMRI Publication, India, p 40.
8. Dowding, Charles H., (1996), Construction Vibration, Prentice-Hall Inc, New Jersey, 620p.
9. Persson, P.; Holmberg, R. and Lee, J., (1994), Rock Blasting and Explosives Engineering, CRC Press, 551p.
10. Siskind, D. E., (1980), Structure response and damage produced by ground vibration from surface mine blasting, USBM, Washington, 74p.



DISCLAIMER

The scientific investigation presented in this report was carried out by Department of Mining Engineering, Anna University, Chennai. The findings were based on **10 Nos. of trial blasts** carried out with **33 mm diameter holes** to a maximum **depth of 2.4 m** using cap-sensitive **Emulsion explosive** cartridges of **25 mm diameter** along with **NONEL**. Blast design for Kadavila-1 Stone Quarry. given in this report is based on the scientific investigations including the results of the trial blasts.

The Department of Mining Engineering, Anna University, Chennai is not responsible for the results produced, if there is any change in the conditions like – increase in strength of the explosives used, using more explosive charge per delay than recommended in **Table – 3.23** of this report, adopting faulty initiation sequence, not following the recommendations of this report etc.

The **Department of Mining Engineering, Anna University, Chennai is no way responsible for proper implementation of the recommendations of this report, as the day-to-day activities in the mine are neither under its control nor possible for it to control.**

In view of the above, neither the authors of this report nor the Department of Mining Engineering, Anna University assume any liability with respect to any claims, damages or losses which may result from the implementation of the conclusions and recommendations / results of this report. This report is only for the guidance of quarry management and the Kadavila-1 Stone Quarry management has to decide on all other safety and operational aspects of the actual blasting operation for the Kadavila-1 Stone Quarry. It is also the responsibility of the management to take all statutory and other additional safety precautions and measures while carrying out the blasting as the same have not been stated in this report.




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ANNEXURE – I

DGMS Technical (S & T) Circular No. 7 of 1997

Sub: Damage of structures due to blast induced ground vibrations in the mining areas.

1. Introduction

In response to increase demand for coal and other minerals, a number of large mechanised opencast mines have come into operation. Some of these opencast workings are located near surface structure like residential buildings, schools, commercial shops, hutments with large number of inhabitants etc. Whenever blasting is done in these opencast mines, ground vibrations are generated outward from the blast area and cause damage to surrounding surface structures. The vibrations radiating from the blast holes while passing through surface structures, induce vibrations on the structures causing resonance. The components of ground motion can affect the structures through compression and tension and also through vertical and horizontal shearing effects. Blast induced ground vibrations create socioeconomic problems for the mine managements as well as the people residing in vicinity of these mines. As only 20-30 % of energy of commercial explosives used in the mines is utilized for fragmenting the rock, the rest of energy is transmitted through the earth in the form of ground vibrations resulting in damage to the surrounding structures.

2.0 Damager Criteria

The peak particle velocity has so far been considered as the best criteria for evaluating blast vibrations in terms of its potential to cause damage. The extensive studies on the problems have established that the frequency of the waves is also equally important factor to consider the effect of damage. The blasting damage is generally classified into following four categories:

Sl. No.	Category	Description of damage
i.	No appreciable damage	No formation of noticeable cracks.
ii.	Threshold damage	Formation of fine cracks, fall of plaster, opening & lengthening of old cracks, loosening of joints, dislodging of loose objects etc.
iii.	Minor damage	Superficial not affecting the strength of structure(s). Hair line cracks in masonry around openings near partition, broken windows. Fall of loose mortar etc.
iv.	Major damage	Formation of several large cracks, serious weakening of structures, shifting of foundation, fall of masonry, ruptures of opening vaults etc.



3.0 Natural Frequencies

Elements of building construction such as sprung floors, stud partition walls, ceiling and windows can all react as mass-spring systems; each with its own natural frequencies of about 4-24 Hz (low frequencies) Ground vibrations at these frequencies amplified by the structures increase the risk of damage. When the low frequency ground vibration coincides with the natural frequency of the structure resonance is originated. The resonance is a state in which the structure absorbs most energy progressively becoming deformed with time, until plastic deformation occurs. Therefore even the low peak particle velocity of ground vibrations at natural frequency of structure is more harmful to the structure. Natural frequencies of brick and concrete structure generally vary from 8-16 Hz.

4.0 Structural response

All structures develop cracks from natural causes like periodic changes in humidity, temperature and wind velocity. Changes in soil moisture cause foundation cracks. The width of old cracks change seasonally and number of cracks increase with the time. This damage is independent of damage caused by blasting.

The cracking location and the wall material have an influence on the particle velocity at which cracking begins. If the entire structure is not inspected thoroughly, there may be chances of biased opinion on the type of cracks. Thus it is important to place transducer properly for the correct assessment of damage.

In the mud houses, number of cracks develop before blasting and these cracks widened and extended with the passage of time. These cracks are further widened and get extended due to blast induced ground vibrations. Concrete structures vibrate for longer duration than brick and mud structures. Concrete walls have free top and show no cracks at vibration levels for which mud and brick walls can damage. Cracks develop in concrete walls with large vibration level. Cracks in brick-structures can be observed in junction of walls, roof and at window corners. Brick walls with clay mortar and cement-sand mortar behave in same fashion. Steel structures can sustain more vibration level.

The magnitude of vibrations on structures is much more than on the ground. Duration of vibration in structure is also longer than, that of ground vibration. Multi-storied buildings are more sensitive to blast vibration than the single-storied buildings.

To predict the extent of damage and to take preventive measures, it is necessary to measure ground vibrations due to blasting. Studies on structural response of ground



vibration in the structures of different constructions within the mining areas under Indian condition are limited and therefore such study should be carried out to ascertain the degree of damages for improvement and standardization of damage criteria under Indian conditions.

5.0 Measurement of blast induced vibrations

5.1 Instrumentation

The instrument selected for monitoring blast induced ground vibration shall be simple, light, compact, easily portable, battery operated, digital form output, triggering by geophone etc. Triaxial transducers for recording blast vibration shall have a liner frequency up to 500 Hz and capable of recording particle velocity up to 100 mm/s.

5.2 Methodology

The transducers shall be placed near the structure on the solid undisturbed ground and should be placed well in contact with the ground. For structural response, the transducers shall be placed horizontally over the wall, floors and ceiling. A minimum of 15 points of observations corresponding to a minimum of 10 blasts shall be made for better prediction with a high index of determination.

5.3 Predictor Equation

The least means square method of regression analysis shall be used to interpret the date. The square root scale distance shall be used for analysis and interpretation of data when blasting is done on surface and measurements are taken on the surface, or the blasting is done underground and measurements are taken underground. On the other hand, if blasting is done on the surface and the measurements taken underground the cube root scaled distance shall be used.

6.0 Guidelines on experimental blasting

6.1 Factors

Major factors affecting particle velocity of ground vibration are type and amount of explosive charge used, distance from the charge to the point of observation (surface structures), geological, structural and physical properties of the rock that transmits the vibrations, height of structures and blast geometry. Use of safe charge/delay, in hole delay with non- electric initiation systems. Proper burden, inclined holes in conformity with slope of bench, deck charge, air deck, sequential blasting, clearing off loose pieces of rocks from the blast site and proper stemming of holes bring reduction in blast induced ground vibrations. Controlled blasting methods in conjunction with effective muffling of holes will control ground vibrations and also arrest fly rock.

6.2 Plan

A plan showing structures belonging to the to the owner and not belonging to the owner in different prominent shades should be prepared. The plan shall incorporate details of construction of the structures in a tabular form. Plan should also show 50 m., 100m, 200 m and 300 m zones from the structures, the place of experimental study and the limit upto the which blasting is proposed to continue.

6.3 Study/ observations

In a particular mining area with built-up structures where deep hole blasting is to be introduced for the first time, experimental blasting shall be carried out by any research/ academic institute much before the structures fall within the blasting danger zone. The type of instruments, the methodology and predictor norm as recommended in para 5.0 shall be followed in measurement of blast induced vibrations. Based on the study, the safe charges for different zones shall be determined and recommendations made in the report. In a cluster of buildings of different types existing close to each other, the charge for the buildings/ structures requiring greater protection against damage shall be assessed and recommended.

6.4 Structural response

During the study the response of the structures assuming different natural frequencies should be calculated and plotted on a figure. Software with the different programmes are available now for the said plot and should be used for convenience.

6.5 Monitoring

In order to ensure effective control over the vibration and related damages there is a need for regular inhouse monitoring and the managements should train the blasting personnel during the experimental study and start observations on their own during the regular blasting operations.

7.0 Recommended permissible standards of blast induced ground vibrations:

7.1 Technical considerations

Permissible standards for different type of structures have been arrived at considering the importance of building and structures. The buildings of historical importance and multi- storied structures are likely to get damaged with low level of vibration and therefore permissible standards are to be lowest. Similarly buildings not belonging to the owner but with mud/brick in cement construction and others with good construction (RCC and framed structures) should also be protected but higher permissible standards than that of the level



fixed for first category has been allowed. The buildings belonging to the owner of the mine are constructed for a limited period generally equal to the life of the project. The management accept that these buildings constructed within the mining area are likely to suffer some damages during the extraction of minerals, but the damages should be repairable. Therefore, slightly higher permissible levels of vibrations have been allowed in such cases.

7.2 Permissible standards

Depending on the type of structures and the dominant excitation, the peak particle velocity (ppv) on the ground adjacent to the structure shall not exceed the values given below in the table.

Table: A1 Permissible Peak Particle Velocity (ppv) at the foundation level of structures in Mining Areas in mm/s

Type of structure		Dominant excitation frequency, Hz		
		<8 Hz	8-25 Hz	> 25 Hz
(A) Buildings / structures not belonging to the owner				
(i)	Domestic houses/structures (kutchha brick & cement)	5	10	15
(ii)	Industrial buildings (RCC & framed structures)	10	20	25
(iii)	Objects of historical importance & sensitive structures	2	5	10
(B) Buildings belonging to the owner with limited span of life				
(i)	Domestic houses/structures(kutchha brick & cement)	10	15	25
(ii)	Industrial buildings (RCC & framed structures)	15	25	50

In view of the complexities of the problems I hope you all would take adequate measures as recommended above to ensure that the blasts near surface structures are carried out with utmost care and precautions. The blast induced ground vibration should be within the permissible limits as specified above.

ANNEXURE – II PROCEDURE FOR DEALING WITH MISFIRES

Abstract of Regulation No. 167 of Metalliferrous Mines Regulations 1961 on Misfires:

- (1) When shots are fired electrically, no person shall re-enter or be permitted to re-enter the place of blasting until 5 minutes after firing of the shots and the source of electricity has been disconnected from the cable.
- (2) In the event of a misfire, the entrance or entrances to the place shall be barricaded or fenced so as to prevent inadvertent access; and no work other than that of locating or relieving the misfire shall be done therein until the misfire has been located and relieved. The place of the misfire shall be marked with a red flag.
- (3) In the event of a misfire, the tamping may be sludged out with compressed air or water under pressure. The hole shall thereafter be re-primed and fired.
- (5) Except where the misfire is due to faulty cable or a faulty connection, and the shot is fired as soon as practicable after the defect is remedied, or where a shot has been re-primed and fired under sub-regulation (3) another shot shall be fired in a relieving hole which shall be so placed and drilled in such a direction that at no point shall it be nearer than 30 centimetres from the misfired hole. The new hole shall be bored in the presence of a blaster, preferably the same person who fired the shot.
- (7) If a misfired hole is not dislodged by a relieving shot, the procedure laid down in sub-regulation (5) and (6) shall be repeated. A misfired hole which cannot be dealt with in the manner so prescribed shall be securely plugged with a wooden plug; and no person other than a blaster or a mining official or a person authorised for the purpose shall remove or attempt to remove such plug.
- (8) When a misfired shot is not found, or when a misfired shot is not relieved or re-blasted, the blaster shall, before leaving the mine, give information of the failure to such official as may relieve or take over charge from him. He shall also record, in a bound paged book kept for the purpose, a report on every misfire, whether suspected, and whether relieved or not relieved. It shall be the responsibility of the relieving blaster or official also to sign the report and later to record in the said book the action taken for relieving the misfired shot hole.
- (9) The blaster of the next shifts shall locate and re-blast the misfired hole, but if after a thorough examination of the place where the misfire was reported to have occurred, the blaster or other competent person holding a Manager's or Foreman's certificate appointed for the purpose by the Manager, is satisfied that no misfire had actually occurred, they may permit drilling in the place.

ANNEXURE - III

DGMS Technical (S & T) Circular No. 1 of 1995

Sub: Danger due to lightning/storm during blasting operation in mines

Recently, three accidents took place due to premature blasting by lightning when persons were killed/injured/escaped while they were in the process of charging explosives/connecting detonators etc. These accidents occurred as mentioned below:

1. While 9 deep holes and a number of secondary holes were being charged to be connected in series and fired, a lightning discharge due to thunderstorm caused premature firing of the deep holes, killed three persons and inflicted serious bodily injuries to one.
2. While a Blaster was carrying 100 primed cartridge of explosives with electric detonators in a card-board box on his shoulder, the cartridges exploded suddenly resulting in instant death of the Blaster.
3. While a Blaster and his helpers were about to take shelter after charging of the holes, suddenly there was a lightning/thunder-storm resulting in premature blast of the holes. Persons escaped unhurt.

Accidents due to above causes continue to occur despite very clear safety precautions laid down while granting permission under Reg. 106(2) (b) of MMR 1961 and Reg. 98 of CMR 1957 and also Circulars issued by DGMS recommending additional precautions to prevent such accidents. These precautions in brief are given below:

1. Shots shall not be fired except during the hours of daylight or until adequate artificial light is provided; all holes charged on any one day shall be fired on the same day as far as practicable.
2. As far as practicable, shotfiring shall be carried out either between shifts or during the rest interval or at the end of work for the day.

During the approach and progress of an electric storm, the following precautions shall be taken:

- (a) Neither explosives nor detonators shall be handled;
- (b) If charging operations have been commenced, the work shall be discontinued until the storm has passed;
- (c) If the blast is to be fired electrically, all exposed wires shall be coiled up and, if possible, placed in the mouth of the holes or kept covered by something other than a metal plate,
- (d) All wires shall be removed from contact with the steel rails of a haulage track, so as to prevent the charge being exploded prematurely by a local strike of the lightning;
- (e) If the firing circuit has been set up before the thunderstorm came on, the persons at the site should withdraw at the earliest and the blast should be fired off immediately;
- (f) All persons shall be withdrawn from the danger zone.

ANNEXURE – IV

Procedure for Warning and Withdrawing of Persons from the Blasting Zone

1. The Quarry management should employ persons possessing statutory qualifications of Blaster's Certificate from Directorate General of Mines Safety (DGMS) to handle and use explosives. The Blaster will be in-charge of receipt, transport, use and return of unused explosives and accessories.
2. All blast site employees shall follow the instructions of the Blaster and they shall use and adhere to every precaution to ensure employee safety including, but not limited to, visual and audible warning signals, flags, etc.
3. The Blaster should possess the Exploder Key with him during the entire process of charging and firing and he should not hand over it to any other unauthorised person.
4. All shots will be fired by the Blaster himself.
5. The blaster shall keep an accurate, up-to-date record of explosives and blasting accessories used in each blast and shall keep an accurate running inventory of all explosives and blasting accessories in his custody.
6. The Quarry management will maintain an inventory of the explosives and accessories received, issued, used and returned in a bound paged notebook kept for the purpose. A competent person will be in-charge of these operations.
7. The storage and handling of explosives will be in accordance with the provisions of Explosive Rules.
8. No explosives or accessories shall be abandoned.
9. Smoking, firearms, sparks, open flame or heat producing devices (including cell phones and battery operated watches) will be prohibited where explosives are being stored, handled, transported or used.
10. Electric Detonators shall never be pulled, stretched, kinked, twisted, mashed or abused in any way which could cause the tube to break or otherwise malfunction.
11. Electric detonator connections and splices shall be competent and positive in accordance with the manufacturer's recommendations.
12. No blast will be fired if any person is present in the vicinity of the blasting area. If any person is present or any operations are being carried out, steps will be taken to withdraw such persons or suspend above operations completely.
13. The Quarry management will establish a code of blasting signals as noticed below and all blast site employees will be familiarized with them: It is obligatory on the part of every employer and other person in the blasting zone to adhere to the code and keep away from the blasting zone during the blasting operations.



- contain audible pre-blast and all clear signals
- contain an emergency method for guards, flagmen, or authorized employees to signal “do not fire”, and
- prohibit sounding of the all clear signal until the blaster has checked the blast site for misfires. The following table that would meet these requirements.

Signal	Meaning
WARNING SIGNAL	A one minute series of long hooter / siren / blasts 5 minutes prior to blast signal.
BLAST SIGNAL	A series of short hooter / siren / blasts one minute prior to the shot.
ALL CLEAR SIGNAL	A prolonged hooter / siren / blast following the inspection of blast area.

- Blasting flags (red flags) shall be displayed around the blasting zone before blasting to facilitate clearing of all persons from the blasting zone.
- Flagmen will be safely stationed on all sides of the blasting area so as to stop any inadvertent entry.
- In the event of any misfires, the blaster will determine the suitable method(s) to detect misfires and take preparatory steps (e.g., noting obvious indications of misfire, or other appropriate means). Misfires shall be handled in accordance with the requirements of Metalliferous Mines Regulations - 1961 (given in **Annexure-II**).
- All lines shall be carefully traced and a search made for unexploded charges before giving all clear signals.
- No drilling, or loading shall be permitted until all misfires have been cleared.
- The safety zone of 500 m is to be maintained at the time of blasting
- All blasting operations will be conducted between sun rise and sun set (during the daylight hours) and preferably during a specific period of time like 12.00 noon to 3.00 p.m.

*

ANNEXURE - V



The monitoring instrument (S5) is located at the distance of 282 m from the blasting site (B8)



The monitoring instrument (S5) is located at the distance of 282 m from the blasting site (B4)



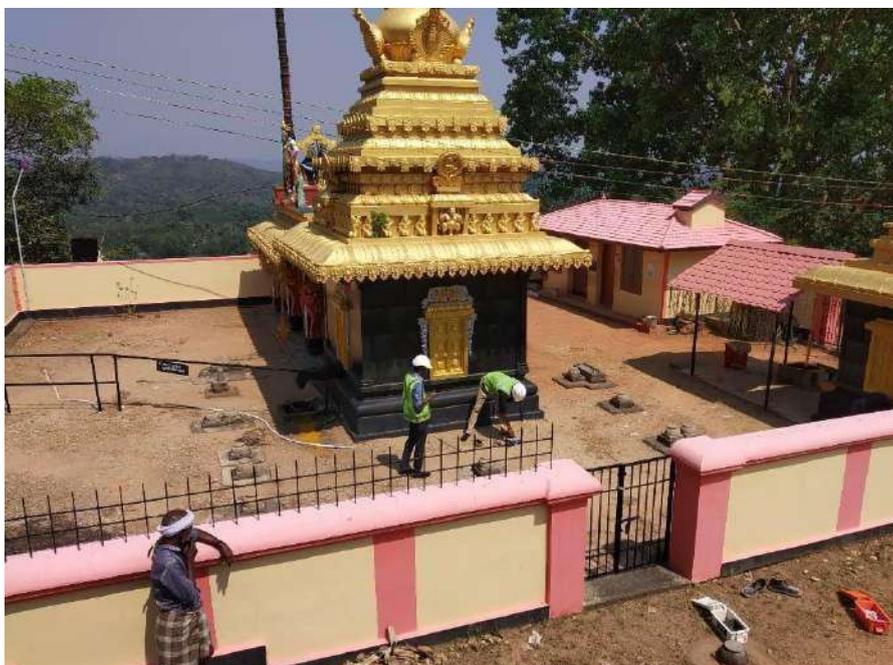
The monitoring instrument (S3) is located at the distance of 174 m from the blasting site (B6)



The vibration monitoring station (S1) is located at the distance of 297 m from the blasting site (B2)



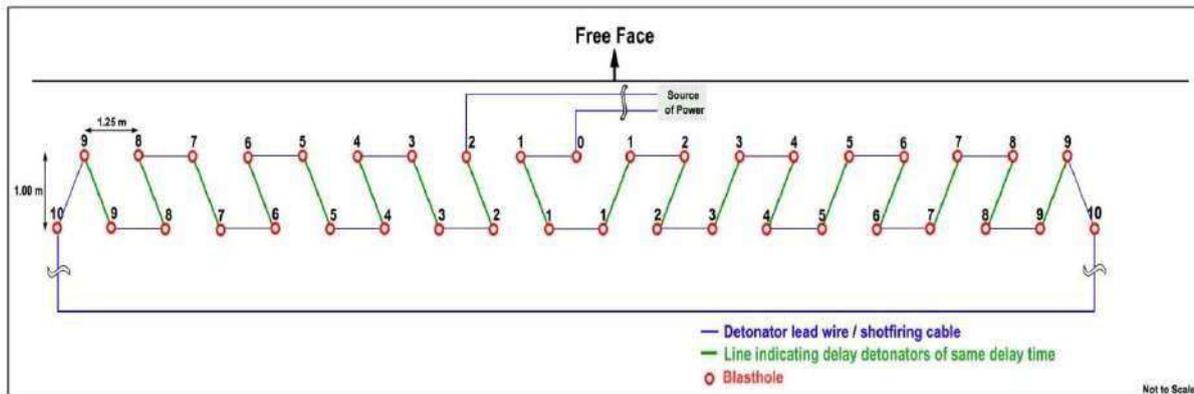
The monitoring instrument (S3) is located at the distance of 465 m from the blasting site (B4)



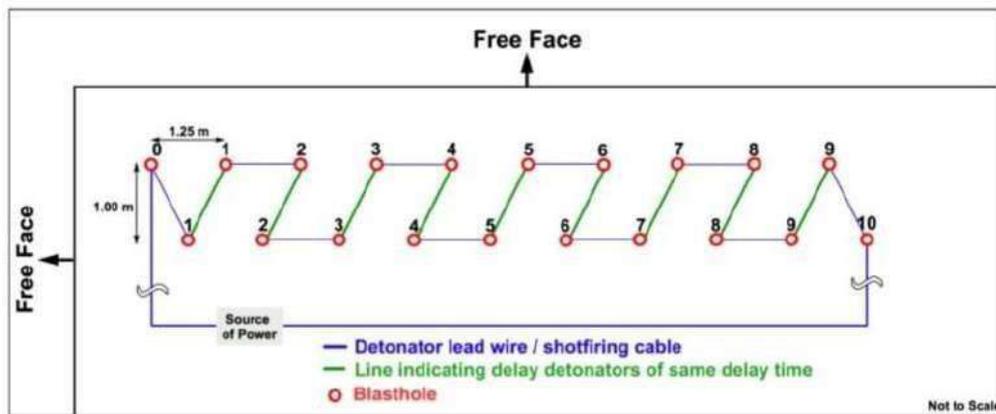
The vibration monitoring station inside the Temple near to Kadavila-1 Stone Quarry

ANNEXURE - VI

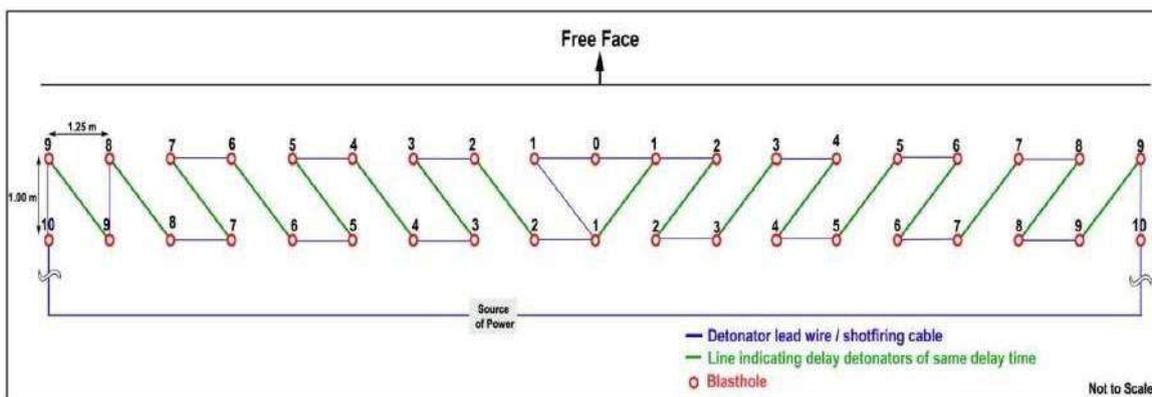
Suggested Blasthole Patterns & Initiation Sequences



Multi row Staggered blasthole pattern with “V” initiation sequence for benches with SINGLE free face



Multi row staggered blasthole pattern with “V” initiation sequence for benches with TWO free face



Multi row Square/rectangular blasthole pattern and initiation sequence for benches with ONE free face



കേരള ഗസറ്റ്
KERALA GAZETTE

ANNEXURE R-25

അസാധാരണം
EXTRAORDINARY

ആധികാരികമായി പ്രസിദ്ധപ്പെടുത്തുന്നത്
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GOVERNMENT OF KERALA

Industries (A) Department

NOTIFICATION

G. O. (P) No. 25/2017/ID.

Dated, Thiruvananthapuram, 22nd June, 2017
8th Mithunam, 1192.

S. R. O. No. 346/2017.—In exercise of powers conferred by sub-section (1) of section 15 of the Mines and Minerals (Development and Regulation) Act, 1957 (Central Act 67 of 1957), the Government of Kerala hereby make the following Rules further to amend the Kerala Minor Mineral Concession Rules, 2015 issued by notification under G. O. (P) No. 16/2015/ID dated 7th February, 2015 and published as S.R.O. No. 72/2015 in the Kerala Gazette Extraordinary No. 288 dated 7th February, 2015, namely:—

RULES

1. *Short title and commencement.*—(1) These Rules may be called the Kerala Minor Mineral Concession (Amendment) Rules, 2017.

(2) They shall come into force at once.

2. *Amendment of the Rules.*—In the Kerala Minor Mineral Concession Rules, 2015,—

in rule 2, in sub-rule (1),—

(i) after clause (ix), the following clause shall be inserted, namely:—

“(ix)(a) “Minor Mineral” means building stones, gravel, ordinary clay, ordinary sand other than sand used for prescribed purposes, ordinary earth and such other minerals declared as minor minerals by the Government of India”;

(ii) for clause (xv), the following clause shall be substituted, namely:—

“(xv) “Quarrying Permit” means a short term permit granted under these rules for a period not exceeding one year at a time to extract minerals specified in item numbers 1, 2, 3 and 5 of Schedule I”;

(iii) for clause (xvi), the following clause shall be substituted, namely:—

“(xvi) “Quarrying Lease” means a mining lease granted under these rules for extraction of minerals specified in item numbers 4, 5, 6, 7, 8 and 9 of Schedule I, for a period as specified in Rule 39”;

(2) in rule 3, in sub-rule (1), for the words “other than dimension stone,” the words “other than the minerals specified in item numbers 4, 6, 7, 8 and 9 of Schedule I” shall be substituted;

(3) in rule 7, the following proviso shall be inserted, namely:—

“Provided that in cases where extraction of minerals are from Revenue Puramboke lands or from lands possessed by other Government Departments or Local Self Governments, the person who extracts minerals

from such lands shall pay compensation or value of minerals, as the case may be, to the department concerned for the quantity of such extraction, as fixed by such departments from time to time."

(4) in rule 9,—

(i) in sub-rule (1), for the existing proviso, the following proviso shall be substituted, namely:—

"Provided that the approved mining plan shall not be insisted, for the grant and renewal of quarrying permits for ordinary earth, ordinary clay, and laterite (building stone), in cases where the depth of mining does not exceed 2 metres.";

(ii) in sub-rule (2), after the words "No Objection Certificate etc." the words "as the case may be" shall be inserted.

(5) in rule 10,—

(i) in clause (a), in the second proviso, the words, symbols and figures "The Regional Controller of Mines, Yeshwantpur, Bengaluru-560 022" shall be omitted.

(ii) for clause (f), the following clause shall be substituted, namely:—

"(f) the permit holder shall not carry on or allow to be carried on any quarrying operations at or to any points within a distance of 100 metres from any railway line except with the previous written permission of the Railway Administration concerned and any bridge on National Highway or 50 metres from any reservoir, tanks, canals, rivers, bridges, other public works, residential buildings, the boundary walls of places of worship, burial grounds, burning ghats or village roads or one kilometre from the boundaries of National Park or Wildlife Sanctuaries except with the previous permission of the authorities concerned or the Government or the competent authority.";

Provided that the Railway Administration or the State Government or any other authority in this behalf may in granting such permission impose other such conditions as may be found proper and necessary:

(6) in rule 13, for the words and figures "3 years", the words "five years" shall be substituted;

(7) in rule 14,—

(i) in sub-rule (2), for the existing provisos the following proviso shall be substituted, namely:—

“Provided that in cases where transportation of ordinary earth is required, the owner of the land shall obtain mineral transit passes for the quantity to be transported under the Kerala Minerals (Prevention of Illegal Mining, Storage and Transportation) Rules, 2015 after making payment of royalty, on an application submitted in this regard. Such application shall be accompanied by (1) valid building permit for construction of building obtained from the Local Self Government authorities concerned, (2) land development permit obtained from the Local Self Government authorities concerned in cases where the levelling of the land and extraction of ordinary earth is involved and (3) possession and enjoyment certificate of the land issued by the Village Officer concerned:

Provided further that in cases where levelling of land and extraction of ordinary earth is involved, the building permit shall be accompanied by an approved building plan obtained from the Local Self Government authorities concerned which shall contain the area of land to be developed for the construction of the building and the quantity of ordinary earth to be extracted for such construction.”;

(8) (ii) after sub-rule (2) the following sub-rules shall be inserted, namely:—

“(3) A person who applies for mineral transit passes for transportation of ordinary earth under this rule shall also submit along with the application a sworn affidavit in stamped paper to the effect that he will carry out the proposed construction as per the building plan and building permit and shall complete at least the construction of basement of the building within one year from the date of issuance of mineral transit passes and intimate the same to the competent authority.

(4) In the event of extraction of ordinary earth outside the permitted area, the permission granted for extraction and transportation shall be liable for cancellation and the offender shall be liable to pay an amount equal to five times the royalty of the ordinary earth extracted outside the area of permission as penalty.

(5) In the event of failure to complete at least the construction of basement of building within one year from the date of issuance of mineral transit passes the act of extraction of ordinary earth shall be treated as illegal and the offender shall be liable to pay an amount equal to five times the royalty of the ordinary earth extracted from the area, in addition to the amount already paid.”;

(9) in rule 18, in item (ii), before the words “all those group of rocks” the words “Granite (building stone) which includes” shall be inserted.

(10) in rule 32, after sub-rule (2), the following sub-rule shall be inserted, namely:—

“(3) In cases where extraction of minerals is from Revenue Puramboke lands or from lands possessed by other Government Departments or Local Self Governments, the person who extracts minerals from such lands shall be liable to pay compensation or value of minerals, as the case may be, to the department concerned for the quantity of such extraction, as fixed by such departments from time to time.”.

(11) in rule 37, in sub-rule (1), after the existing proviso, the following proviso shall be inserted, namely:—

“Provided further that in the case of silica sand, the restrictions in minimum area for grant and renewal of quarrying lease shall not be applicable.”;

(12) in rule 40, in sub-rule (1),—

(i) for clause (i), the following clause shall be substituted, namely:—

“(i) the lessee shall not carry on or allow to be carried on any quarrying operations at or to any points within a distance of 100 metres from any railway line except with the previous written

permission of the railway administration concerned and any bridge on National Highway or 50 metres from any reservoir, tanks, canals, rivers, bridges, public roads, other public works, residential buildings, the boundary walls of places of worship, burial grounds, burning ghats or one kilometre from the boundaries of National Park or Wildlife Sanctuaries except with the previous permission of the authorities concerned or the Government or competent authority:

Provided that the railway administration or the State Government or any other authority in this behalf may in granting such permission impose such other conditions as may be found proper and necessary.”;

(ii) item (ii) of clause (m) shall be omitted.

(13) after rule 45, the following rule shall be inserted, namely:—

“45A. *Amalgamation of quarrying leases.*—The State Government or the competent authority may, in the interest of quarry development, with reasons to be recorded in writing, permit amalgamation of two or more adjoining leases held by a lessee:

Provided that the period of amalgamated leases shall be co-terminus with the lease of which period will expire first:

Provided further that the leaseholds to be amalgamated shall be contiguous:

Provided also that along with the application for amalgamation of leases, copy of the survey map of the combined area for amalgamation attested by an officer not below the rank of a Tahsildar of the Department of Land Revenue or Assistant Director of the Department of Survey and Land Records shall be submitted:

Provided also that amalgamation of leases shall be subject to submission of approved mining plan for the entire leasehold and Environmental Clearance.”;

(14) after rule 65, the following rule shall be inserted, namely:—

“65A. The holder of a quarrying permit/a quarrying lease issued under these rules after the date of commencement of the Kerala District Mineral Foundation Rules, 2017, shall pay to the District Mineral Foundation of the district in which the mining operations are carried on, an amount equivalent to such percentage of the royalty/consolidated royalty paid, as may be prescribed in the Kerala District Mineral Foundation Rules, 2017 in addition to the royalty/consolidated royalty instead of quarry safety fund specified in rules 63, 64 and 65 of these rules.

Note:—Rules 63, 64 and 65 shall cease to operate from the date of commencement of the Kerala District Mineral Foundation Rules, 2017.”;

(15) in rule 66,—

(i) for sub-rule (1) the following sub-rule shall be substituted, namely:—

(1) “Where quarrying operations for minor minerals have been undertaken before 7th day of February, 2015 without an approved mining plan, the holder of such lease shall not be permitted to operate such quarry unless he submits a mining plan for the remaining period of lease to the competent authority in this behalf.”;

(ii) sub-rules (2) and (3) shall be omitted;

(16) in rule 89, after sub-rule (3), the following sub-rule shall be inserted, namely:—

“(4) In cases where the lessees who opted for registration of metal crusher units under sub-rule (1) for a financial year do not desire to opt for such registration in the succeeding year they shall pay royalty at the rates specified in Schedule I for removal and transport of balance quantity of granite aggregates stocked in the crusher units during the period of registration.”;

(17) for rule 95, the following rule shall be substituted, namely:—

“95. *Cancellation of registration.*—If a lessee operates any type of machine that is not included in the registration certificate or fails to comply with any of the conditions of registration, the competent authority shall, by an order in writing, rescind the registration granted to the metal crusher unit.”;

(18) for rule 104, the following rule shall be substituted, namely:—

“104. *Power to grant special permission to extract and remove minor minerals in special circumstances.*—In certain cases where extraction and removal of minor minerals is inevitable and in which the Government is of the opinion that the extraction is not for the purpose of winning the minerals and for reasons to be recorded in writing, the Government may by an order grant permission with conditions as they deem fit.”;

(19) in rule 108,—

(i) in sub-rule (2), in the first proviso, the words and symbols “limited to twice the royalty amount,” and “In such a case while calculating the amount of royalty and price payable, the amount already paid by the permit holder/lessee for obtaining permission shall be deducted” shall be omitted;

(ii) after the 2nd proviso, the following note shall be inserted, namely:—

“*Note:*—In this rule the price of the mineral shall be limited to two times the royalty.”;

(iii) after sub-rule (3), the following sub-rule shall be inserted, namely:—

“(4) whenever any person raises without any lawful authority any mineral from any land for the purpose of winning minerals and for that purpose brings on the land any tool, equipment, vehicle or any other thing, such mineral, tool, equipment, vehicle or any other thing shall be seized by an officer or authority specially empowered in this behalf by the Government.”;

(20) in the SCHEDULES,—

(i) in SCHEDULE I, for the entry against item number 5 in column (2), the following entry shall be substituted, namely:—

“Granite (building stone) and Laterite (building stone)”

(ii) after item number 5, and the entry against it in columns (2) and (3) the following items and entries shall respectively be inserted, namely:—

6. Laterite (used for industrial purposes)	95 (Ninety-five) per tonne
7. China clay/Kaolin including ball clay, white shale and white clay	
(i) Crude	(i) 50 (Fifty) per tonne
(ii) Processed/washed	(ii) 750 (Seven hundred and fifty) per tonne
8. Silica sand	250 (Two hundred and fifty) per tonne
9. Quartz	50 (Fifty) per tonne

(iii) for Schedule III, the following shall be substituted, namely:—

“SCHEDULE III
CONSOLIDATED ROYALTY
(See rule 89)”

Sl. No.	Description of Crusher	Annual Consolidated royalty per machine (in Rupees)
(1)	(2)	(3)
Secondary Jaw Crusher (in terms of area of feed opening)		
1	Up to 929.03 sq.cm.	2,00,000
2	Greater than 929.03 sq.cm. but less than or equal to 1548.38 sq.cm.	4,00,000
3	Greater than 1548.38 sq.cm.	6,00,000

(1)	(2)	(3)
Cone Crusher (in terms of 'Horse Power' of motor used)		
4	Up to 300	16,00,000
5	Greater than 300	26,00,000
Sand Making Units (in terms of 'Horse Power' of motor used) (for those who use sand making machine only)		
6	Up to 300	16,00,000
7	Greater than 300	26,00,000 .";

Exemption from payment of consolidated royalty is applicable to Vertical Shaft Impactor, Horizontal Shaft Impactor, Auto Sand Units which are fed by granite aggregates produced in the secondary jaw crushers or cone crushers for which the consolidated royalty has been paid and are located in the premises of those crusher units;

(iv) in Schedule IV,

(i) under the heading "A. Granite (Building stone)" for the entry against serial number 5 in column (3), the figures "7000" shall be substituted;

(ii) under the heading "B. laterite (Building Stone)" for the entry against serial number 5, in column (3), the figures "7000" shall be substituted;

(21) in Form D, the words "The Regional Controller of Mines, Yeshwantpur, Bengaluru-560 022" shall be omitted.

(22) in Form H, for condition No. 7, the following condition shall be substituted, namely:—

The lessee shall not carry on or allow to be carried on any quarrying operations at or to any points within a distance of 100 metres from any railway line except with the previous written permission of the railway administration concerned and any bridge on National Highway or 50 metres from any reservoir, tanks,

canals, rivers, bridges, public roads, other public works, residential buildings, the boundary walls of places of worship, burial grounds, burning ghats or one kilometre from the boundaries of National Park or Wildlife Sanctuaries except with the previous permission of the authorities concerned or the Government or competent authority:

Provided that the railway administration or the State Government or any other authority in this behalf may in granting such permission impose such other conditions as may be found proper and necessary.

By order of the Governor,

PAUL ANTONY,
Additional Chief Secretary to Government.

Explanatory Note

(This does not form part of the notification, but is intended to indicate its general purport.)

The Kerala Minor Mineral Concession Rules, 2015 were framed by the Government of Kerala to regulate extraction of minor minerals in the State. As per S.O. 423 (E) of Ministry of Mines dated 10th February, 2015, thirty-one minerals have been included in the category of minor minerals. Among these minerals mining leases were being granted to laterite used for industrial purpose, china clay, silica sand and quartz as per the provisions contained in the Mineral Concession Rules, 1960. As these minerals are now declared as minor minerals, these minerals are to be included in the Kerala Minor Mineral Concession Rules, 2015. When the minerals are extracted from the Government owned lands, the Government have to get compensation for the minerals extracted other than the mere payment of royalty and hence new provisions have been introduced in rules 7 and 32. The Regional Controller of Mines, Bengaluru is not the authority to deal with mining of minor minerals and hence there is no need to send Form 'D' of the rules to the said authority. In the Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016 for major minerals the distance criteria adopted for the mining activities were retained as stipulated earlier in the Mineral Concession Rules, 1960. Hence a different criterion cannot be adopted in

the case of minor minerals. In such circumstances, in order to make it in tune with the Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016, it is decided to incorporate the same distance criterion in Rules 10 and 40 as well as Form H. As per S.O. 141(E) dated 15-1-2016, environmental clearance has been exempted for digging of foundation for buildings which do not require prior environmental clearance and hence amendment is necessitated in rule 14. In Writ Petition (C) No. 29710/2014 and 23251/2016, the Honourable High Court of Kerala has observed that there is possibility of misuse of rule 14 in the guise of building permit issued by Local Self Government authorities and directed the Government to find ways to avoid such misuse. Hence an amendment to this extent is necessitated. Since mining plan has been introduced in the rules, it is impractical for the lessees who have obtained two or more leases adjacent to one another to leave, a buffer zone of 7.5 meter between two lease areas and hence a new rule, 'Amalgamation of quarrying leases' has to be introduced in the rules for practicing scientific mining. Since quarry safety related activities mentioned in rule 65 have been included as one of the permissible activities in Kerala District Mineral Foundation Rules, rules 63, 64 and 65 have to be amended. As per rule 66 mining plan is to be submitted by the existing lessees within a period of one year from 7th February, 2015. As per existing sub-rules (2) and (3) of rule 66, there is provision for extension of time for one year for those who cannot submit mining plan within such period. Now two years have been passed by and there is no need to give time extension. In order to rectify this, an amendment is necessitated. In order to clarify the price of the mineral to be realized while compounding offences, amendment is to be made in rule 108. Provision for seizure of tools, minerals and equipment as existed in the earlier rules is reintroduced by amending rule 108. Since there are different sizes of jaws as stipulated in Schedule III available, it is difficult to fix royalty for a jaw crusher which is not mentioned in Schedule III. Since the area of a feed opening of a jaw crusher is the basic criteria for determining the quantum of production of granite building stone aggregates, this can be included in Schedule III instead of sizes of jaws for easy determination of royalty for a different size of jaw crusher and hence this notification.

The notification is intended to achieve the above objects.
