Edition #92 January 2025

NVSAGE

Newsletter on Noise and Vibration Engineering

www.nvdynamics.com
services@nvdynamics.com | +91 7760381818

NV DYNAMICS
VIBRATION. ACOUSTICS. BEYOND

FOREWORD

By Krishna Balamurali, Principal Engineer

I am delighted to share the completion of noise enclosure mock trials for a leading international airport terminal in India; this project is about addressing the reported noise issues in the immigration area being caused by some of the luggage handling operations on the floors located directly above.

The results are very encouraging and we have the go ahead for implementing the solutions to other identified noise sources; this is a large size special noise control task involving initial tests, designing of acoustic solutions and implementing them at site.

The highlight of this project is to accomplish good reduction of perceived noise levels at the passenger floor space and to improve on the overall experience at the duty free and immigration zones.

Our team has begun the actions to design the acoustic solutions and have set hard timelines to deliver/complete the project within the given schedule. I will be sharing the overall journey of this project in the next edition of this newsletter.

For many years now, NV Dynamics is working with TATA steel on various assignments; many of these are complex noise and vibration investigation tasks involving intense involvement to determine the root cause and to propose solutions that are credible and implementable.

This month, we were assigned the task of conducting tests and analysis on a large size EOT crane; the reported problem of higher vibrations / oscillations on the operator cabin are being investigated. The solution approach includes using tools of Operational Deflection Shapes (ODS) and limited TPA (Transfer Path Analysis) that help find the root cause of the reported problem.

We have multiple queries for Metro rails and are looking forward to close the FY with a good bang !!

MEASUREMENT OF STRUCTURE BORNE NOISE & VIBRATION FOR MUMBAI METRO LINE-3

By Ajith Krishna - Lead - Technical Services

BACKGROUND

Mumbai Metro Line 3, the Colaba-Bandra-SEEPZ line, is one of the most ambitious infrastructure projects in Mumbai's transport network. With a total length of 33.5 kilometres, it will be entirely underground, making it one of the largest underground metro projects in India. The line will consist of 27 stations, spanning from Colaba in the south to SEEPZ (near Andheri) in the north, with major interchanges at key locations like Bandra and Andheri, which will further integrate it with other metro lines and local rail networks. The line is expected to be fully operational by 2026, although certain segments of the alignment has been commissioned and is currently operational.

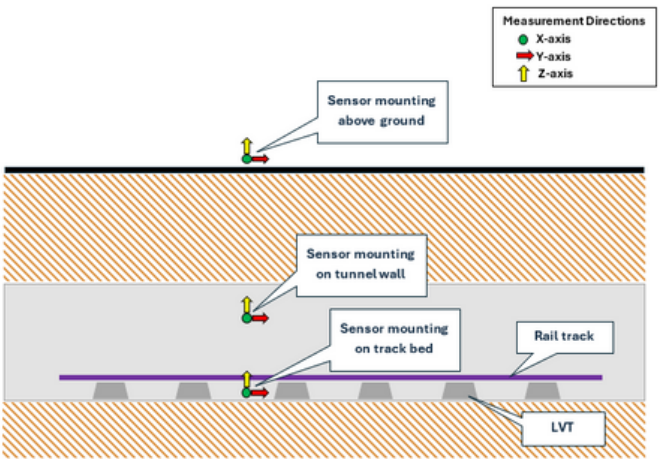
TASK TAKEAWAY

After extensive testing and analysis of data, a transfer function between the vibration levels recorded in the tunnel sections and at grade locations was established which further assisted in assessing corelated train pass data with the perceived vibrations above ground. Airborne noise levels were estimated from the measured vibration levels at grade. Both the structure borne and airborne noise levels arising from train passes were found to be within the acceptable limits of RDSO.

SITE ACTIVITIES

The entire track includes a specialized LVT type vibration mitigation system which is first of its kind to be implemented in India. The effectiveness of the vibration mitigation system had to be validated and NV Dynamics was retained to conduct these assessments. In the operational sections of the Line-3, five (5) critical locations were selected in mutual agreement with the client. The selected locations for testing included curved track sections, cross-overs, cut & cover areas with vibration sensitive buildings directly located above the metro tunnel.

At each of the selected locations, ultra-low frequency, seismic grade vibration transducers were configured simultaneously on the track bed, tunnel wall and at grade locations. With the metro train in loaded condition, vibration data from multiple train passes were recorded for further analysis.



ASTC ASSESSMENT TO EVALUATE SOUND INSULATION OF ROOM PARTITION WALL

By Guru Kiran - Senior Engineer - Technical Services

BACKGROUND

Apparent Sound Transmission Class (ASTC) is a standardized measurement used to evaluate the sound insulation performance of building elements, particularly in environments where acoustic privacy is essential. ASTC specifically measures the transmission of airborne sound through structures such as walls, floors, ceilings, windows., etc, which indicates how well a material or assembly reduces sound transmission from one space to another. The higher the ASTC rating, the better the material is at preventing sound from passing through.

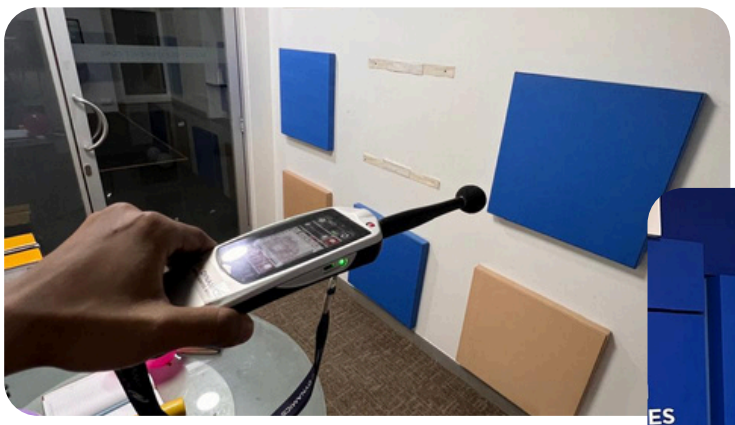
Saint Gobain Research India (SGRI) has developed an acoustic toolkit for measuring and calculating ASTC. This toolkit aims to validate the performance of SGRI's acoustic solutions across various project sites throughout India. To compare the results of the newly developed toolkit, SGRI engaged NVD to perform ASTC assessments on 3 partition walls using the ASTM E336 standard at their facility in IIT Madras campus.

TASK TAKEAWAY

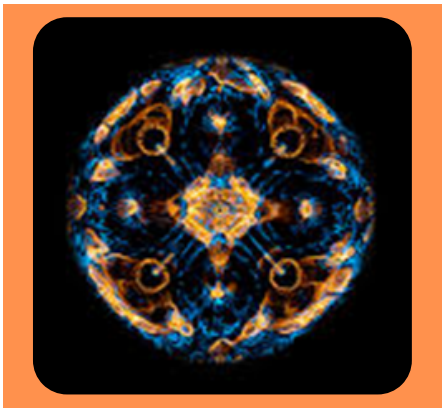
The ASTC assessment was successfully completed, considering various sound transmission paths in accordance with the ASTM E-336 standard guidelines and leveraging NV Dynamics' extensive experience in similar projects. Statistical calculations were conducted and the ASTC values for the partition walls were derived using the curve fitting method prescribed in the standard. The results were shared with the SGRI for comparison against their own acoustic toolkit's results.

SITE ACTIVITIES

The source and receiver rooms were identified in line with the guidelines of the ASTM E-336 standard. A qualified 10-inch speaker was mounted on a rigid tripod to avoid structural excitation and placed in a corner of the source room and directed away from the partition wall under consideration. Pink noise was played through the speaker to generate a uniform reverberant sound field within the source room. Noise level within the source room was measured using a calibrated sound level meter. The measurements were made with the considerations of reflecting planes, node/ anti-node points and distance from the sound source. With the speaker still in the source room, multi-point noise measurements were made in the receiver room to obtain a spatial averaged value. Further, reverberation measurements using noise impulse methods were carried out within the receiver room to determine the room characteristics such as noise decay time. Similarly, ATL values of the other partitions were determined and the ASTC values of all partitions were derived.



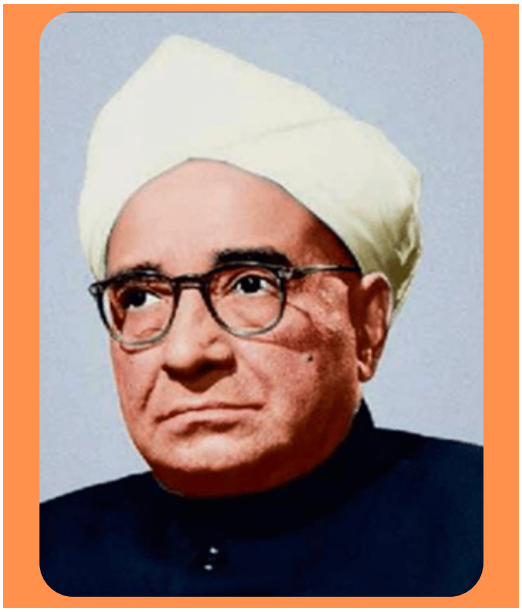
PHYSICS TO KNOW



Cymatics is the study of visible sound vibrations, where sound waves are made visible through the interaction with a medium like sand, water, or liquid. By using frequencies, intricate patterns and shape forms reveal the hidden beauty of sound. Cymatics not only explores the relationship between sound and matter but also offers a fascinating glimpse into how vibrations influence the physical world, with applications in art, science, and education.

GREAT MINDS & THEIR CONTRIBUTION TO THE WORLD OF SCIENCE

K.S. Krishnan was a pioneering Indian physicist known for his groundbreaking contributions to the fields of magnetism, crystallography, and condensed matter physics. He played a crucial role in the discovery of the phenomenon of ferro-magnetism and made significant advancements in the understanding of the magnetic properties of materials. Krishnan's research on the behaviour of crystals and the study of their internal structure helped establish foundational principles in solid-state physics. He was instrumental in the development of the concept of Para magnetism and diamagnetism in solid materials. Krishnan's work in collaboration with renowned scientists, such as C.V. Raman, further advanced the field of physics. As a prominent academic, he contributed to the establishment of research institutes in India and inspired countless students and researchers with his innovative approaches to scientific inquiry and exploration



CERTIFICATIONS

CLIENTELE