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525 N Capitol Ave Apartments

CCR Title 24 and CalGreen Noise Study Report

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WI Project 23-080

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Introduction

This report presents an acoustical evaluation of the exterior noise and exterior to interior sound isolation requirements for the 5-story, affordable housing building to be constructed at 525 N Capitol Ave in San Jose, CA. The proposed project will be a new build consisting of meeting rooms, offices, lobby, computer lab, personal enrichment space, community room, bike storage, and garage parking on the ground floor. Laundry rooms and residential units will be located on the second through fifth floor. An area map for the project is presented in Figure 1.

The purpose of this noise study is to assess the exterior noise environment of the subject property and to provide recommendations on the control of interior noise due to exterior sources with respect to the requirements of Title 24 (including the 2019 California Building Code Section 1206 - Sound Transmission Control), the California Green Building Standard Code (CalGreen) Non-Residential Section 5.507.4 – Acoustical Control, and the Envision San Jose 2040 General Plan.

This report also includes a vibration study to assess the existing vibration environment of the subject property in order to provide recommendations on the control of interior vibration with respect to the requirements of the Envision San Jose 2040 General Plan.

This report provides a description of the environmental noise and vibration survey methods, a discussion of applicable standards, survey results, future noise level projections, and exterior-to-interior noise mitigation recommendations. The current study is based on the 525 N Capitol Ave Backgrounds documents dated 2/2/2024 by David Baker Architects.

NOISE

1 Applicable Noise Standards – Noise Study Criteria

1.1 Interior Noise due to Exterior Sources

The CCR Title 24 requires that the building be designed to provide such degree of isolation that, with all exterior doors and windows in the closed position, the interior noise level attributable to exterior sources shall not exceed an annual L_{dn} of 45 in any habitable room.

The state of California has enacted a Green Building Standards Code (CalGreen) which prescribes a performance criterion whereby interior noise levels due to exterior sources may not exceed an hourly average level of 50 dBA (50 dBA L_{eq},1 hr.) for non-residential uses [CBC, Title 24, Part 11]. This interior noise limit is applicable to occupied, non-residential areas during normal hours of operation, including building offices and community rooms. The Envision San Jose 2040 General Plan complies with the CCR Title 24 requirements for interior noise levels.

1.2 Exterior Noise

The Envision San Jose 2040 General Plan specifies a 60 dBA L_{dn} exterior noise limit in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways.

The City also requires new developments to minimize noise impacts on land uses sensitive to increased noise levels in EC-1.2. Noise generated by the Project would be subject to these criteria at adjacent residences. An increase of 5 dBA L_{dn} or more at sensitive receivers is considered a significant

noise impact even if the noise levels remain within "Normally Acceptable" range (60 dBA L_{dn} for residential receivers). Noise increases at sensitive receivers are limited to 3 dBA L_{dn} where noise levels equal or exceed the "Normally Acceptable" level. See Table 1 for exterior noise guidelines. The calculations necessary to determine compliance with this standard are not possible until the mechanical systems are designed and sound power levels of equipment are provided.

Table 1: Land Use Compatibility Guidelines for Community Noise in San Jose

Land Use Category	Description	Normally Acceptable Level (Ldn)	Conditionally Acceptable Level (Ldn)	Unacceptable Level (Ldn)
1	Residential, Hotels and Motels, Hospitals and Residential Care	< 60 dBA	60-75 dBA	> 75 dBA
2	Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds	< 65 dBA	65-80 dBA	> 80 dBA
3	Schools, Libraries, Museums, Meeting Halls, Churches	< 60 dBA	60-75 dBA	> 75 dBA
4	Office Buildings, Business Commercial, and Professional Offices	< 70 dBA	70-80 dBA	> 80 dBA
5	Sports Arena, Outdoor Spectator Sports	< 70 dBA	70-80 dBA	> 80 dBA
6	Public and Quasi-Public Auditoriums, Concert Halls, Amphitheaters	< 50 dBA	50-70 dBA	> 70 dBA

Source: Envision San Jose 2040 General Plan

1.3 Ventilation Requirements

For areas of the Project where the exterior noise exposure exceeds 60 L_{dn}, the windows in habitable spaces should be closed to provide the required isolation from noise; hence these spaces may require an additional means of ventilation. The local interpretation for required mechanical or passive ventilation varies.

2 Environmental Noise Survey Methodology

The Environmental Noise Survey consisted of long-term noise measurements at one location on N Capitol Ave and a short-term noise measurement at one location toward the back of the property along Beechnut Dr. Table 2 summarizes the noise measurement locations and the types of measurements performed at each. Figure 1 shows the relative position of measurement locations for this noise study on a site plan of the project parcel.

2.1 Long-Term Noise Measurements

Long-term, statistical noise levels were measured at the site by means of one precision, calibrated, Type I logging sound level meters left unattended for over 6 days. A long-term meter (LT-1) and a short-term meter (ST-1) were placed at the locations indicated in Table 2 and Figure 1. The long-term meter was secured to trees and a utility pole at a height of approximately 12 ft above grade and monitored noise levels continuously for several 24-hour periods, providing information on hourly-averaged and statistical noise levels throughout the survey duration. The short-term meter was mounted on a tripod and monitored noise levels for a period of 1 hour to provide additional noise data for analysis at the back of the property. Hourly equivalent noise data (L_{eq}) from the long-term measurements were subsequently used to calculate the daily and typical Day-Night Levels (L_{dn}) at this location, as required by the CCR Title 24, and to establish the hourly noise exposure for the CalGreen assessment. Maximum instantaneous noise level information was used to assess the appropriateness of the building shell noise isolation with respect to the San Jose General Plan EC-1.9 requirements.

Label	Measurement Type*	Location Description
LT-1	Long-Term – 12 ft microphone height	N Capitol Ave, on tree ~60' from N Capitol Ave centerline
ST-1	Short-Term – 7 ft microphone height	Back of lot, on tripod ~200' from N Capitol Ave centerline
***See descriptions of measurement types above**		

Table 2: Environmental Noise Survey Measurement Locations

3 Environmental Noise Survey Results

Existing noise levels were determined by analyzing the long-term data obtained at the site; future noise levels were extrapolated from existing noise levels based on proposed building configurations and assumed future increases or changes in street traffic. Exterior-to-interior noise isolation requirements were determined by evaluating the existing and projected future noise levels at the project site.

3.1 Measured Existing Noise Levels

The results of the environmental noise survey reveal that the existing noise level at the N Capitol Ave street-facing project facade is approximately 71 L_{dn}. Figure 2 presents the long-term data in terms of hourly L_{eq} sound levels for each full 24-hour period measured. The calculated L_{dn} value for each complete 24-hour period is also included.

3.2 Projected Future Noise Levels

Future noise levels were extrapolated from existing noise levels based on predicted increased traffic operations on local streets. Future noise levels around the project are shown in Table 3.

In terms of noise level increases due to increased traffic, a 1 dB increase in the daily L_{dn} can be expected if traffic volumes increase 30% on any local thoroughfare, assuming vehicle speeds and free-flow conditions remain the same. Typical traffic volume increases in developed urban areas such as this neighborhood are on the order of 1% per year, therefore net increases of less than 1 dB can

be expected in the next 10 years. This assumes that there will be no significant improvements in tire, pavement, and/or engine technologies which would serve to reduce the overall noise emission from vehicular traffic, as has been the case in the past.

Additional local trips created by this project, or an adjacent redevelopment are not expected to contribute to future L_{dn} noise level increases significantly.

3.3 Summary of Current and Predicted Future Noise Levels

Based upon measured existing noise levels and projected future changes, approximate L_{dn} noise levels have been determined for the project site. Table 3 summarizes the existing and projected future noise level results for the project.

Day	Location LT-1 N Capitol Ave
Saturday, August 5th 2023	70
Sunday, August 6th 2023	70
Monday, August 7th 2023	71
Tuesday, August 8th 2023	70
Wednesday, August 9th 2023	70
Existing Measured / Setback Adjusted L_{dn}	70
Future Levels / Setback Adjusted L_{dn}	71

Table 3: Measured Current and Predicted Future Day-Night Noise Levels (L_{dn}) by Location

VIBRATION

4 Applicable Vibration Standards – Vibration Study Criteria

The Envision San Jose 2040 General Plan requires new development within 100 feet of rail lines to demonstrate that vibration experienced by residents would not exceed the vibration impact guidelines provided by the Federal Transit Administration. Section EC-2.1 of the General Plan states the following:

> *Near light and heavy rail lines or other sources of ground-borne vibration, minimize vibration impacts on people, residences, and business through the use of setbacks and/or structural design features that reduce vibration to levels at or below the guidelines of the Federal Transit Administration. Require new development within 100 feet of rail lines to demonstrate prior to project approval that vibration experienced by residents and vibration sensitive uses would not exceed these guidelines.*

The Federal Transit Administration (FTA) Manual provides vibration impact criteria for transit projects. Vibration criteria is applicable inside buildings, so outdoor land uses are not considered to be sensitive. Ground-borne vibration criteria are based on land use and event frequency. The FTA ground-borne vibration impact criteria for frequent events (more than 70 events per day) at residential land use is 72 VdB. The ground-borne noise impact criteria for frequent events at residential land use is 35 dBA.

5 Environmental Vibration Survey Methodology

The Environmental Vibration Survey consisted of short-term vibration measurements at eight locations on the project parcel. Table 4 summarizes the vibration measurement locations and Figure 3 shows the positions of the vibration sensors on a site plan of the project parcel.

5.1 Short-Term Vibration Measurements

Short-term vibration levels were measured at the site by means of eight *Mark Products* vibration sensor geophones and two *RION DA-20* 4-channel instrumentation grade Data Recorders. The measurements took place over a period of approximately three hours on August 4, 2023. The geophones were placed at the locations indicated in Table 4 and Figure 3 to measure the vibration levels created by streetcar activity on the Mountain View – Alum Rock VTA line operating in the center of N Capitol Ave. Geophone V-5 was affixed to the sidewalk using beeswax and the remaining geophones were coupled to the ground using spikes. The vibration data were used to characterize the vibration levels created by streetcar passbys.

Label	Measurement Type*	Project North/South Position	Project East/West position
V-1	Short-Term – Vibration	6’ from sidewalk	35’ from W property line
V-2	Short-Term – Vibration	33’ from sidewalk	35’ from W property line
V-3	Short-Term – Vibration	80’ from sidewalk	35’ from W property line
V-4	Short-Term – Vibration	140’ from sidewalk	35’ from W property line
V-5	Short-Term – Vibration	On N property line/sidewalk	35’ from E property line
V-6	Short-Term – Vibration	33’ from sidewalk	35’ from E property line
V-7	Short-Term – Vibration	80’ from sidewalk	35’ from E property line
V-8	Short-Term – Vibration	140’ from sidewalk	35’ from E property line
***See descriptions of measurement types above**			

Table 4: Environmental Vibration Survey Measurement Locations

6 Vibration Survey Results

Existing vibration levels were determined by analyzing the short-term vibration data obtained at the site. Existing vibration levels due to individual streetcar passbys are well below the FTA criteria for frequent events, 72 VdB. Calculated ground-borne noise levels are also below the FTA criteria of 35 dBA.

6.1 Measured Existing Vibration Levels

The results of the existing vibration survey show that typical vibration created by streetcar activity at the N Capitol Ave edge of the parcel is approximately 57-59 VdB. To obtain a representative vibration level due to streetcar activity, the highest 1-second vibration level (L_{max}) was recorded during each passby. The passbys were separated by direction, as the eastbound track is closer to the property and produced slightly higher vibration at some sensors. These maxima were then averaged to establish typical vibration levels at each sensor. Figure ***4*** shows the average passby maxima for streetcars as well as the Standard Deviation from such average and compares it with the maximum recommended FTA criteria curve of 72 VdB and with the typical level of ambient vibration when no streetcars are active in the area.

Ground-borne noise (GBN) is calculated from measured ground-borne vibration with adjustments based on floor of the building and frequency content of the vibration.

6.2 Summary of Current Vibration Levels

Based upon measured existing vibration, vibration levels have been determined for different locations on the project site. The ground-borne noise transmitted to the second floor of the project is calculated from the ground-borne vibration. Table 4 summarizes the existing vibration level results for the project.

Label	Location description	Passby maxima, vibration velocity level		Second-floor ground-borne noise level	
		Eastbound passbys	Westbound passbys	Eastbound passbys	Westbound passbys
V-1	West side 6’ from sidewalk	56 VdB	50 VdB	12 dBA	6 dBA
V-2	West side 33’ from sidewalk	53 VdB	49 VdB	9 dBA	5 dBA
V-3	West side 80’ from sidewalk	49 VdB	47 VdB	5 dBA	3 dBA
V-4	West side 140’ from sidewalk	44 VdB	43 VdB	0 dBA	0 dBA

Table 5: Environmental Vibration Survey Measurement and Calculation results

MITIGATION

7 Noise Abatement Recommendations

For residential units with direct, line-of-sight exposure to noise from adjacent roadways, it is not practical or aesthetically desirable to provide mitigating features such as sound barrier walls to reduce noise levels at the project facade due to space limitations, building height, restriction of views, fresh air, and light. Specifying acoustical designs for glazing and window types, exterior walls, exterior entrances, and supplemental ventilation systems can provide the mitigation necessary to achieve a code-compliant interior noise environment.

7.1 Windows and Exterior Doors

The acoustical ratings provided below are based on the following assumptions and apply to exterior doors with glazing panels as well as window assemblies. Please note that these apply to the glazing assemblies as a whole, not just the glazing elements in the windows and doors. These are the minimum acoustic ratings required to meet the Title 24 interior noise requirements. Acoustic performance ratings are presented in terms of Outdoor-Indoor Transmission Class (OITC) and Sound Transmission Class (STC), both of which should be met by the window/door manufacturer by providing laboratory test data for the specific window or door assembly types submitted for this project, as indicated below and shown in Figure 5.

Glazing assembly recommendations for residential spaces are based on the assumption that all habitable spaces will be furnished with generally acoustically reflective walls and ceiling with carpet flooring. Recommendations for non-residential spaces are based on the assumption of hard, reflective walls, carpet flooring, and acoustically absorptive ceilings typical of office spaces.

All other façade sections where no specific OITC/STC recommendations are given do not require acoustically-rated glazing as it is assumed that thermally insulating, dual pane glazing assemblies will be used. See Figure 5.

Glazing assembly recommendations are based on the current glazing assembly extents. If the windows are to increase or decrease in size, then the acoustic ratings will need to be reassessed.

Acoustical ratings for exterior glazing assemblies based on Title 24 are to be as noted below.

- **Class I: OITC-26, STC-31**
- **Class II: OITC-23, STC-28**

7.2 Exterior Walls

The 525 N Capitol Ave 50% DD documents by David Baker Architects show several exterior wall types. The following is the framed exterior wall assembly used to develop acoustical ratings for Title 24.

- From the exterior: 7/8" cement plaster, 1-layer gypsum board, 6" wood studs 16" o.c., minimum 3.5" thick batt insulation in the stud cavity, 1 layer of 5/8" type X gypsum. This assembly has an approximate OITC 42 rating.

7.3 Courtyards and Exterior Noise

All of Courtyard B and the majority of Courtyard A are predicted to have noise levels at or below 60 Ldn, hence the Noise Element requirement for outdoor use areas will be met without the need for mitigation measures. A 60 dBA Ldn contour line is provided in Figure 7 to indicate the boundary between Code compliant and non-compliant areas. Acoustic shielding arising from the building massing will provide the required reduction in noise level at the Courtyards.

7.4 Roof

A typical wood or metal framed roof/ceiling design is satisfactory to meet the Title 24 requirements for exterior to interior noise reduction. The current drawing set does not include a roof/ceiling assembly design, however, given the low level of noise expected at the roof level due to the significant shielding of street noise to be provided by the parapet, then any typical design will provide sufficient isolation to meet the exterior-to-interior environmental noise control requirements covered by this report.

7.5 Ventilation

Mitigation requirements are primarily based on observed noise levels of 71 L_{dn} along the N Capitol Avenue project façades. A typical bedroom/living room window will allow for a reduction of approximately 15 decibels when partially open. Therefore, given the exterior noise exposures, the

units will not meet the interior noise requirement of 45 L_{dn} with any open exterior windows at those areas exceeding 60 L_{dn} exposure, as any partially open window will provide, at most, only 15 decibels of reduction in noise. Supplemental ventilation will need to be provided at all rooms for which acoustically-rated glazing assemblies are recommended in this report. The acoustical performance of the ventilation system should be equal or higher to the STC/OITC rating required for a specific unit's exterior glazing, as shown in Figure 5 and Figure 6.

Supplemental ventilation can be provided in several forms:

- A ducted fresh air system could be incorporated by means of a rooftop-mounted Make-up unit (MAU) feeding into the HVAC system or a separate register in each unit.
- Instead of serving unit stacks with vertical ducts, air could also be drawn from individual exterior louvers using inline fans and ducts running through the floor-ceiling assembly to a register in the ceiling. In either system, ducts should be acoustically lined through the first 10 feet in length away from the exterior opening and incorporate one or more 90-degree bends between openings, so as to not compromise the noise insulating performance of the residential unit's exterior envelope. We will gladly review and comment on designs provided by the project's architect or mechanical engineer.
- PTAC units with a minimum 31 STC rating could also be used. If that is the preferred method, then a copy of a laboratory test per ASTM E-90 indicating the OITC/STC rating of the proposed device must be provided to the Architect and Acoustical Consultant for review and approval.
- Another means of providing fresh air ventilation without compromising the degree of acoustical isolation is to incorporate a "Z-duct" fresh air intake device in the building façade and extracting the unit's air through the kitchen and bathroom exhaust fans or a central rooftop fan. If a Z-duct method is chosen to provide outside air intake at individual units, the vertical duct should be at least 5 ft in length and lined with 1/2" or 1" thick acoustical liner. These requirements are essential to make the Z-duct provide adequate noise insulation and not compromise the noise insulating performance of the window and wall assemblies. Commercially available units include:
    - the Vibro-Acoustics model CT silencer (http://www.vibro-acoustics.com)
    - Ruskin Model L air vent silencers (www.ruskinsound.com)
    - Commercial Acoustics Transfer Silencers Model 'L' (www.mfmca.com)

7.6 Electrical Outlets in Exterior Walls

Apply outlet box pads and caulk to all electrical boxes in exterior walls, as one would in all corridor, party, and other sound rated interior partitions (including floor-ceiling assemblies). Thoroughly caulk around all edges of electrical outlet boxes and other penetrations with non-hardening acoustical sealant. See schematic detail in Figure 8.

8 Vibration Isolation Requirements

The results of the environmental survey and later calculations indicate that specialized vibration isolation will not be necessary for the project. Existing levels are well below the FTA criteria for frequent events.

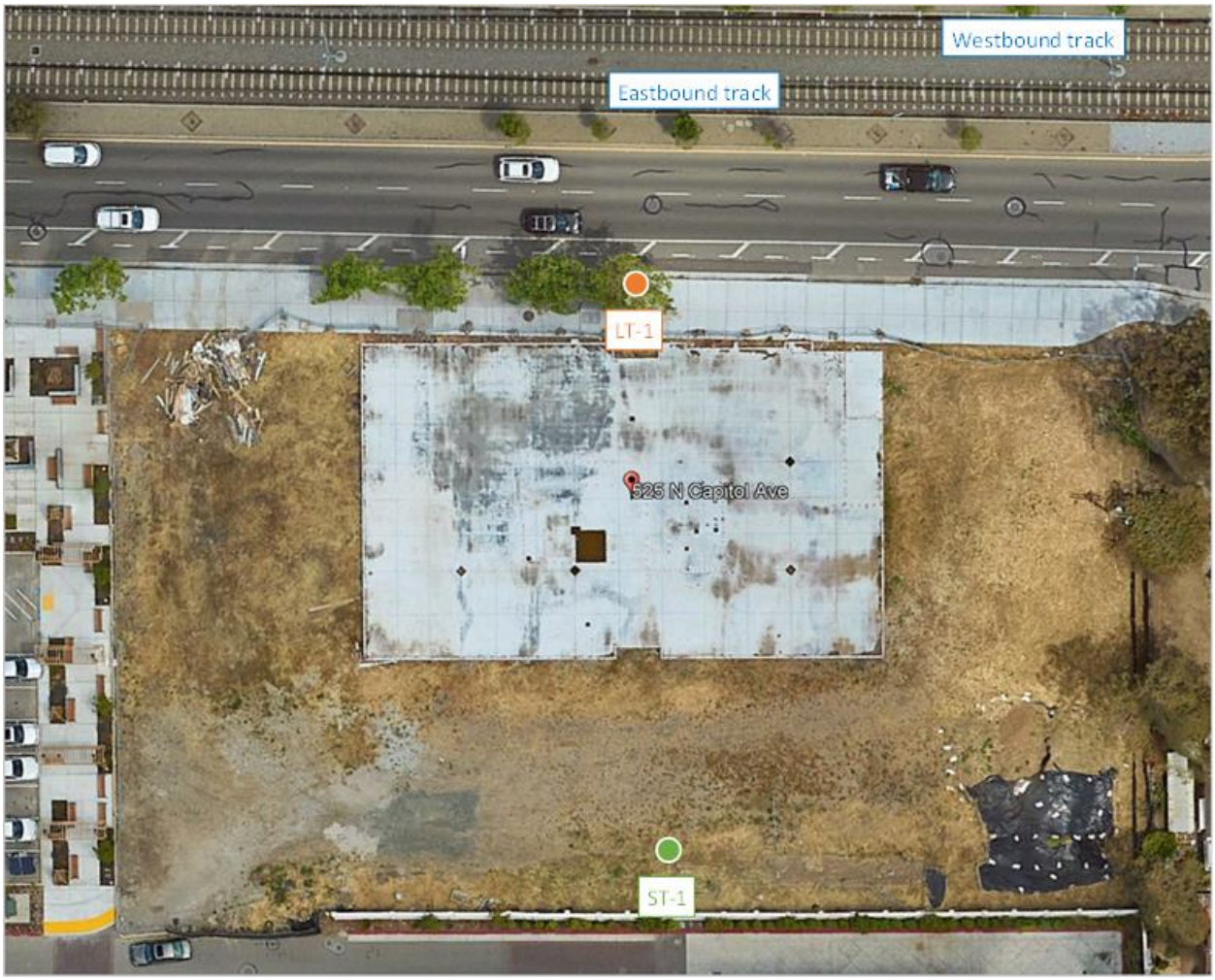

Figure 1: Project area map with long-term noise meter (LT-1) and short-term noise meter, ST-1) measurement locations

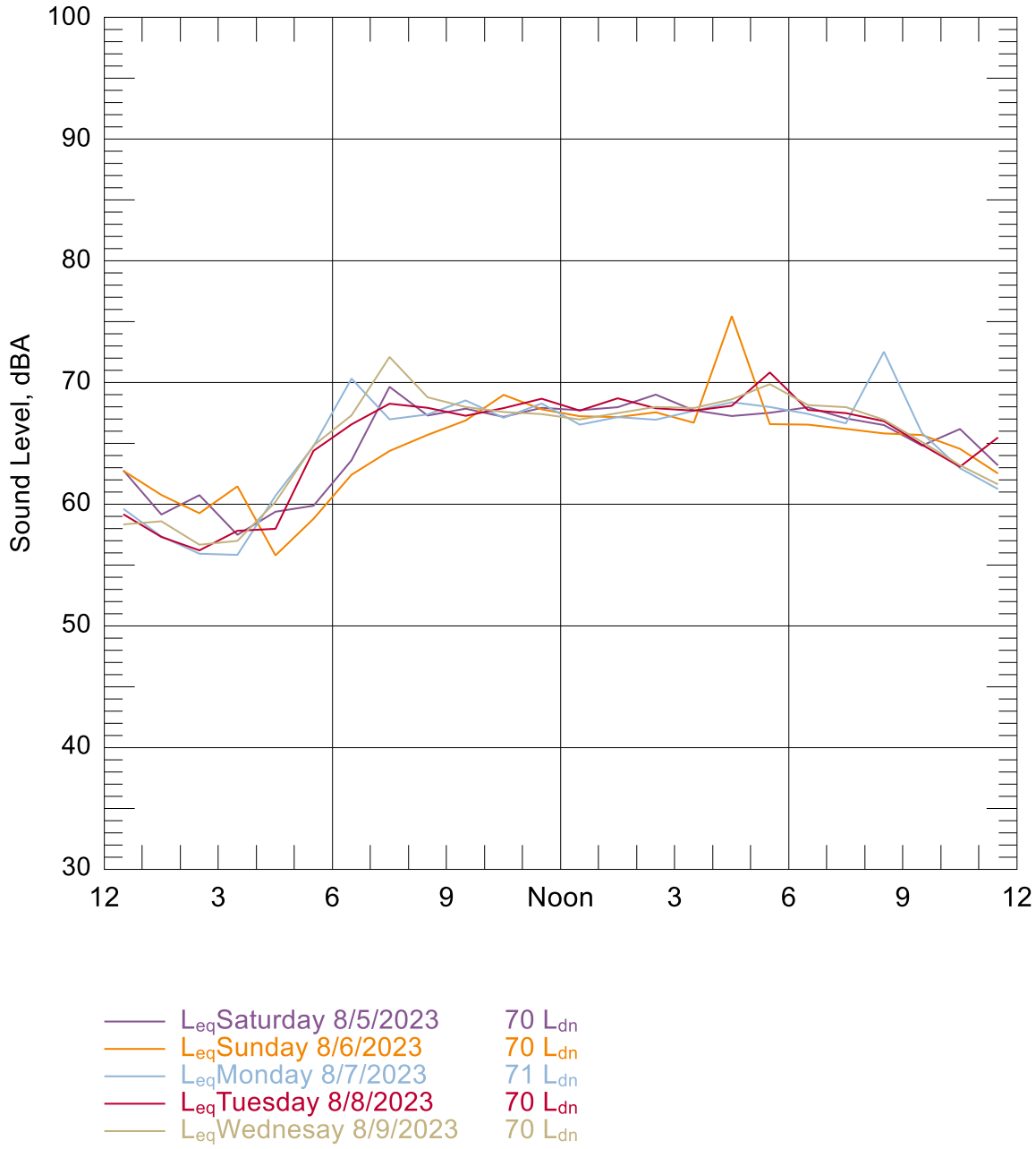

***Figure 2:** Hourly equivalent noise levels (Leq) and corresponding day-night levels measured at location LT-1, on N Capitol Ave.*

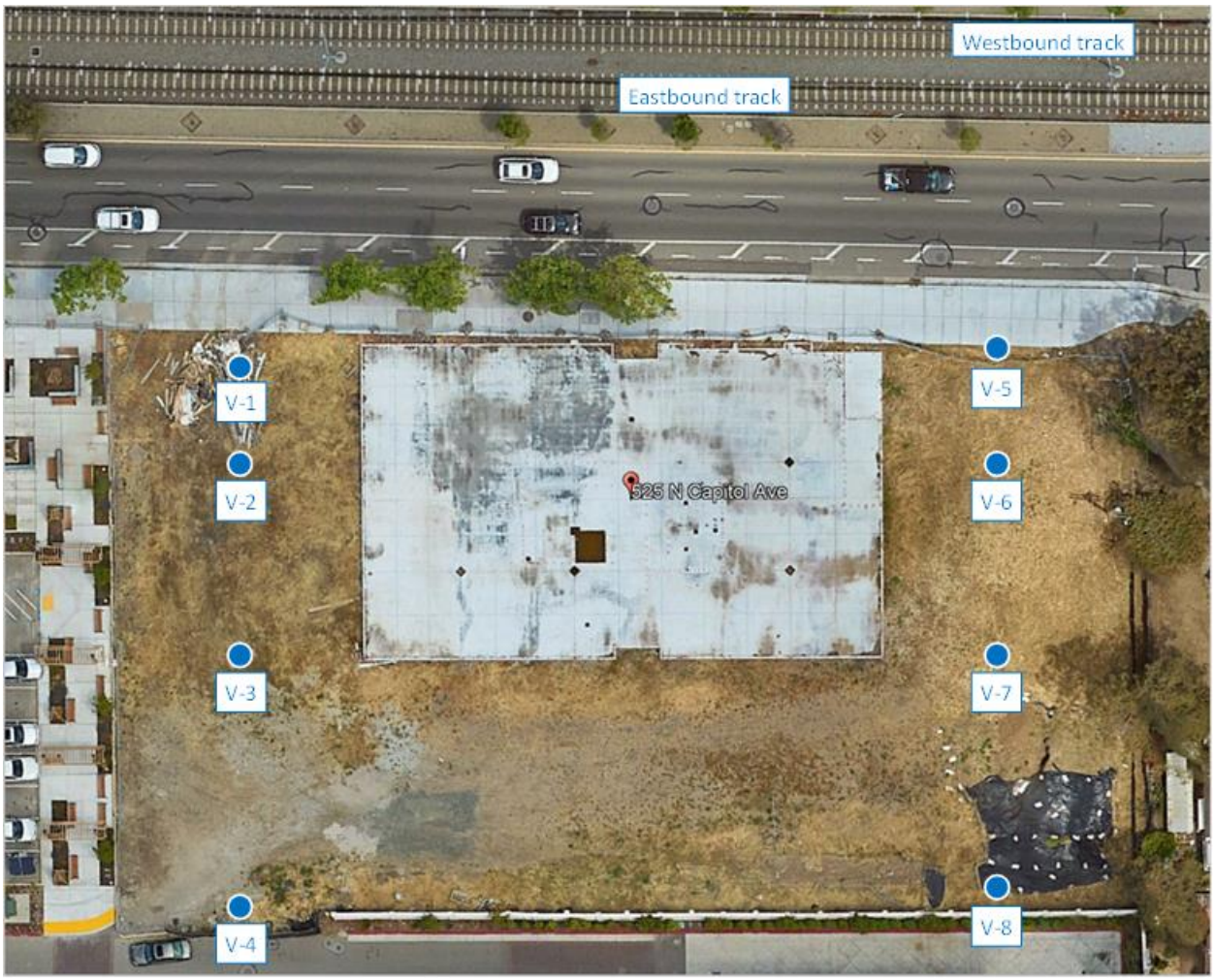

Figure 3: Project area map with vibration measurement locations

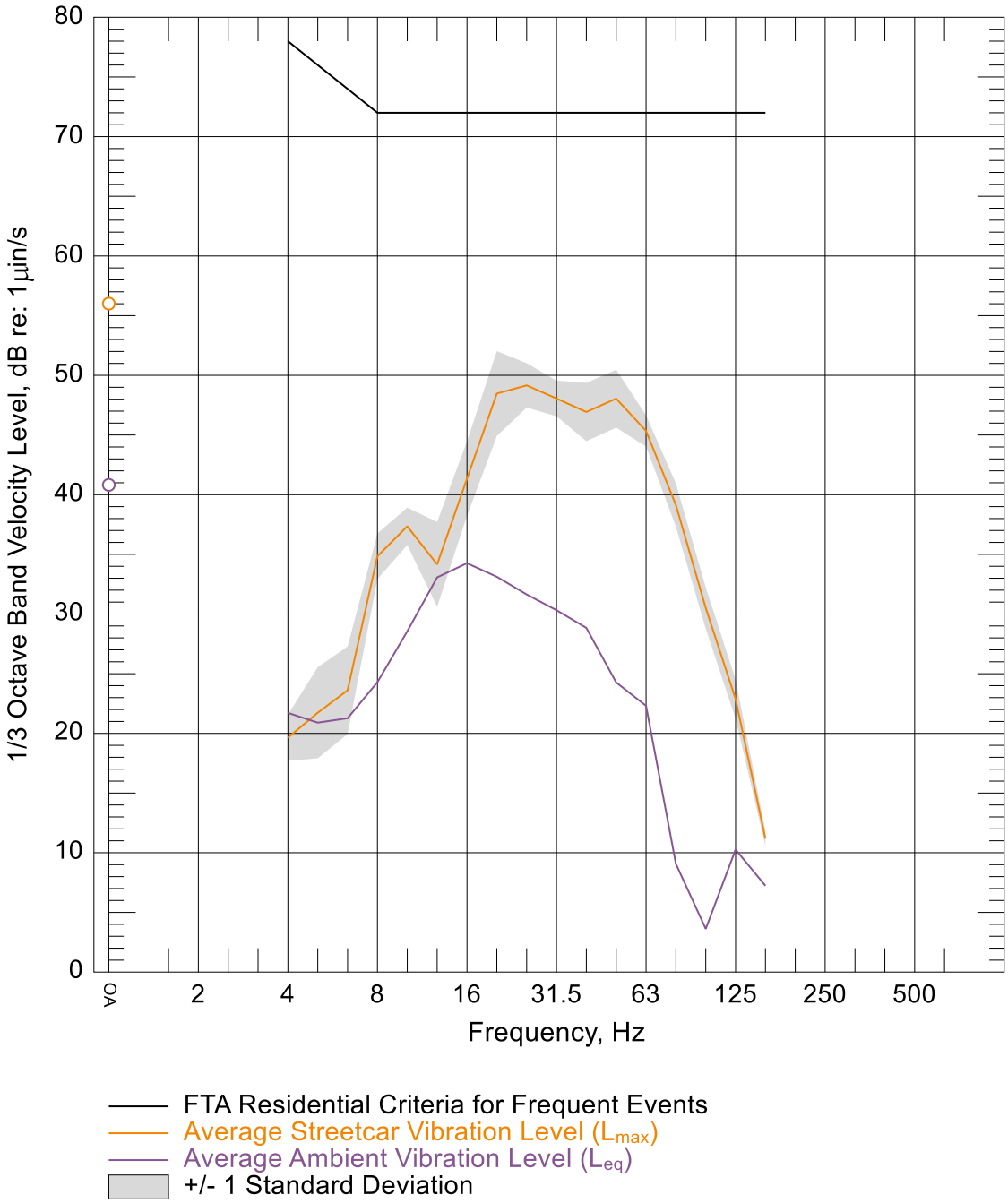

***Figure** 4: 1/3 Octave Band vertical ground vibration velocity levels at the approximate building setback, west side of property. Average of 5 eastbound VTA streetcar passbys.*

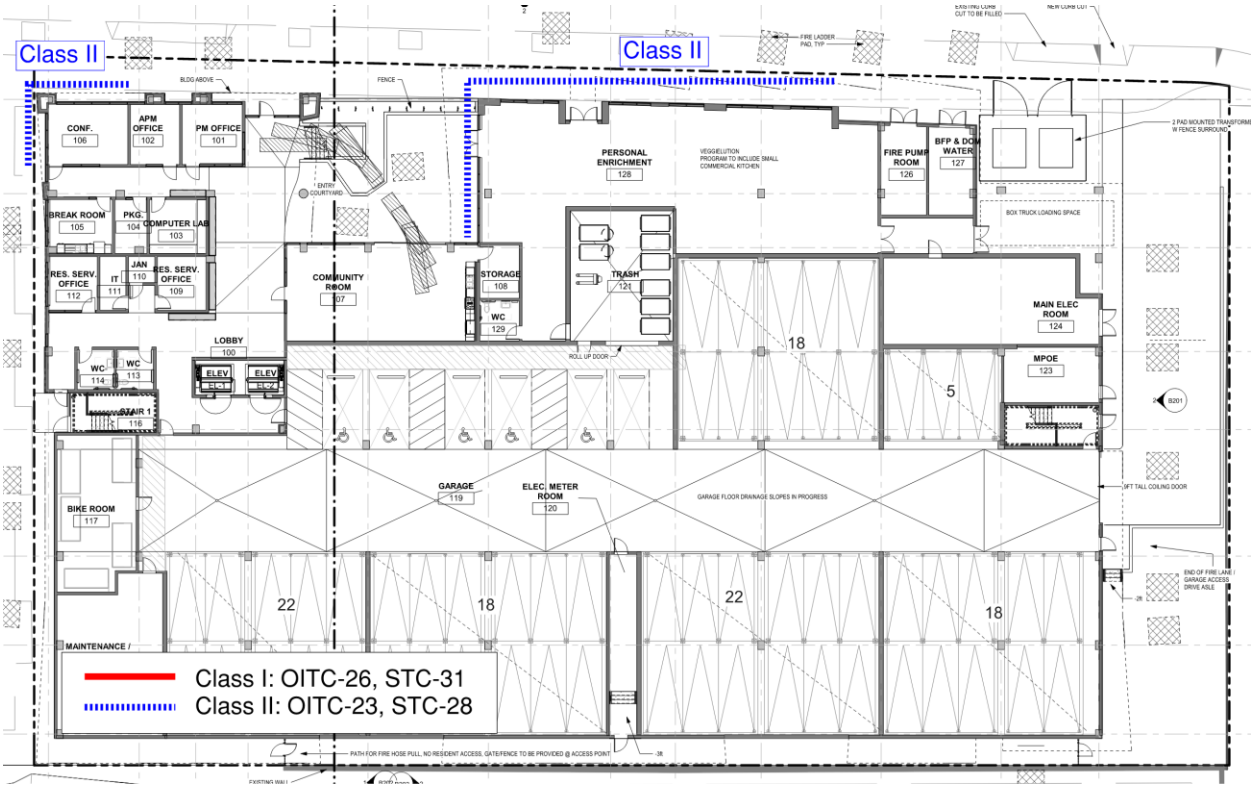

Figure 5: First floor glazing assemblies acoustical rating recommendations to satisfy CalGreen requirements. Windows of units not labeled are not required to possess acoustical rating.

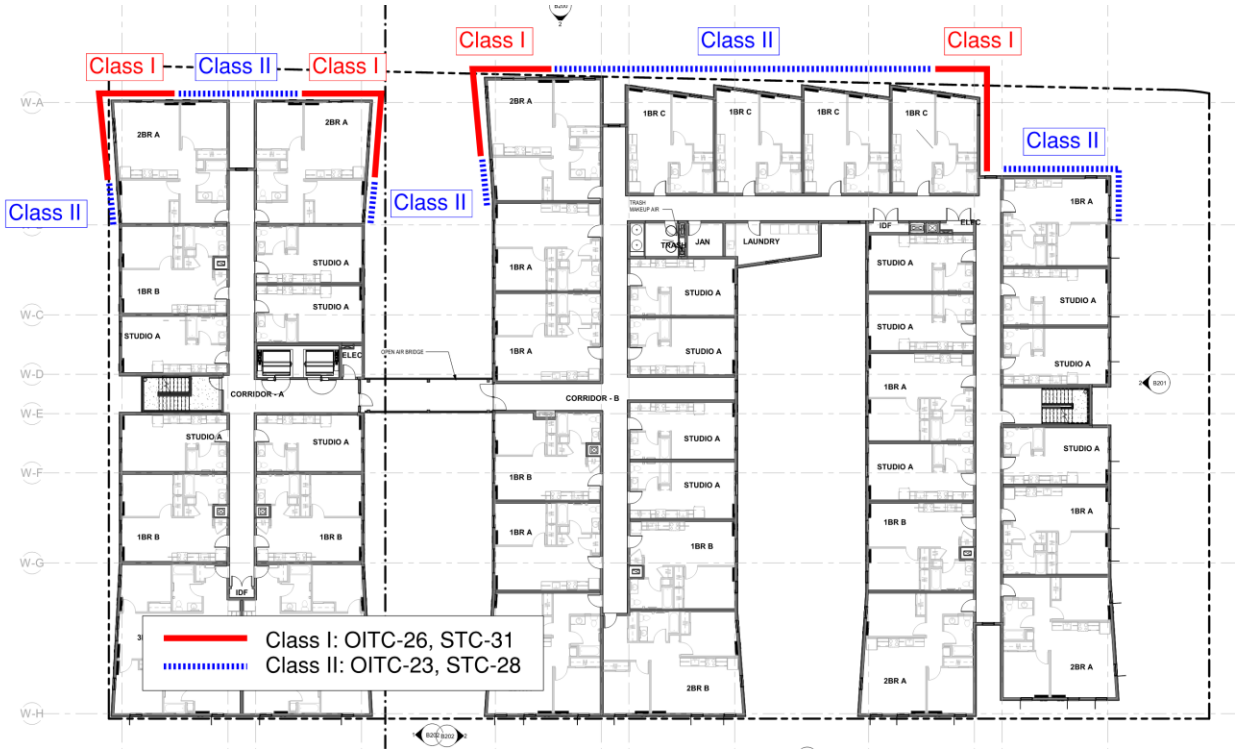

Figure 6: Second through Fifth floor glazing assemblies acoustical rating recommendations to satisfy CCR Title 24 requirements. Windows of units not labeled are not required to possess acoustical rating.

Figure 7: Floor plan showing second floor exterior courtyards. Green zones indicate areas of the courtyards calculated to have an Ldn of less than 60 dBA based on shielding calculations. A contour line for 60 dBA Ldn is shown at the north end of Courtyard A, denoting parts of the courtyard that are above the City criteria for outdoor spaces.

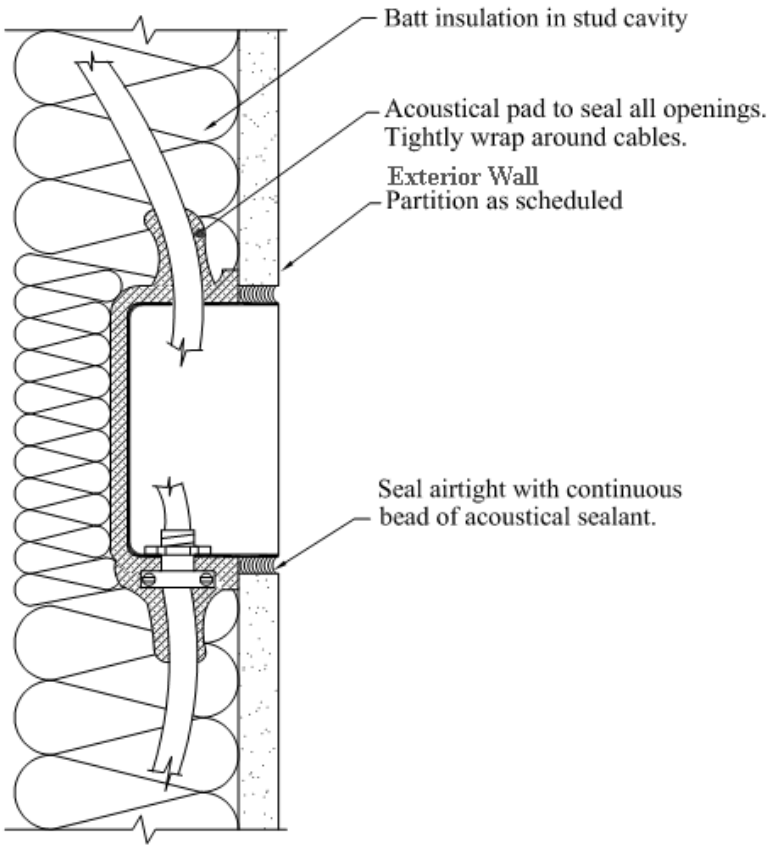

Figure 8: Acoustical isolation of electrical boxes and other recessed elements at exterior walls.

Acceptable products or approved equivalent:

Acoustical pads:
a. Nelson Fire Rated FSP Putty Pads manufactured by EGS Electrical (www.nelsonfirestop.com)
b. BioStop Fire Rated Putty Pads (www.biofireshield.com)
c. SpecSeal Putty Pads (www.stifirestop.com)
d. IsoBacker Outlet Backer Pad by Kinetics Noise Control (www.kineticsnoise.com)

General drywall caulking:
a. Sheetrock Acoustical Sealant manufactured by USG (www.usg.com)

Caulking of fire-rated openings:
a. 3M Fire Barrier Sealant CP 25WB+ (www.3M.com)
b. FS-ONE by Hilti (www.hilti.com)

Appendix A – Glossary of Acoustical Terms

A-Weighted Sound Level (dBA):

The sound pressure level in decibels as measured on a sound level meter using the internationally standardized A-weighting filter or as computed from sound spectral data to which A-weighting adjustments have been made. A-weighting de-emphasizes the low and very high frequency components of the sound in a manner similar to the response of the average human ear. A-weighted sound levels correlate well with subjective reactions of people to noise and are universally used for community noise evaluations.

Airborne Sound:

Sound that travels through the air, as opposed to structure-borne sound.

Ambient Noise:

The prevailing general noise existing at a location or in a space, which usually consists of a composite of sounds from many sources near and far.

Community Noise Equivalent Level (CNEL):

The L_{eq} of the A-weighted noise level over a 24-hour period with a 5 dB penalty applied to noise levels between 7 p.m. and 10 p.m. and a 10 dB penalty applied to noise levels between 10 p.m. and 7 a.m.

Day-Night Sound Level (L_{dn}):

The L_{eq} of the A-weighted noise level over a 24-hour period with a 10 dB penalty applied to noise levels between 10 p.m. and 7 a.m.

Decibel (dB):

The decibel is a measure on a logarithmic scale of the magnitude of a particular quantity (such as sound pressure, sound power, sound intensity) with respect to a reference quantity.

Energy Equivalent Level (L_{eq}):

The level of a steady noise which would have the same energy as the fluctuating noise level integrated over the time period of interest. L_{eq} is widely used as a single-number descriptor of environmental noise. L_{eq} is based on the logarithmic or energy summation and it places more emphasis on high noise level periods than does L50 or a straight arithmetic average of noise level over time. This energy average is not the same as the average sound pressure levels over the period of interest, but must be computed by a procedure involving summation or mathematical integration.

Frequency (Hz):

The number of oscillations per second of a periodic noise (or vibration) expressed in Hertz (abbreviated Hz). Frequency in Hertz is the same as cycles per second.

Ground-borne Noise (GBN):

Noise due to vibration that travels through the ground involving oscillations at high enough frequencies (or pitch) and at sufficiently high level (or amplitude) so as to become audible; typically with a rumble-type character. Ground-borne noise is common on sites and buildings located immediately above subway tunnels and, less commonly but equally possible inside buildings very close to tracks with fast and/or heavy rail vehicles.

Outdoor-Indoor Transmission Class (OITC):

A single number classification, specified by the American Society for Testing and Materials (ASTM E 1332 issued 1994), that establishes the A-weighted sound level reduction provided by building facade components (walls, doors, windows, and combinations thereof), based upon a reference sound spectra that is an average of typical air, road, and rail transportation sources. The OITC is the preferred rating when exterior facade components are exposed to a noise environment dominated by transportation sources.

Octave Band - 1/3 Octave Band:

One octave is an interval between two sound frequencies that have a ratio of two. For example, the frequency range of 200 Hz to 400 Hz is one octave, as is the frequency range of 2000 Hz to 4000 Hz. An octave band is a frequency range that is one octave wide. A standard series of octaves is used in acoustics, and they are specified by their center frequencies. In acoustics, to increase resolution, the frequency content of a sound or vibration is often analyzed in terms of 1/3 octave bands, where each octave is divided into three 1/3 octave bands.

Sound Pressure Level (SPL):

The sound pressure level of sound in decibels is 20 times the logarithm to the base of 10 of the ratio of the RMS value of the sound pressure to the RMS value of a reference sound pressure. The standard reference sound pressure is 20 micro-pascals as indicated in ANSI S1.8-1969, "Preferred Reference Quantities for Acoustical Levels".

Sound Transmission Class (STC):

STC is a single number rating, specified by the American Society for Testing and Materials, which can be used to measure, in decibels, the sound insulation properties of interior building partitions for noise sources such as speech, radio, and television. It is used extensively for rating sound insulation characteristics of building materials and products.

Structure-Borne Sound:

Sound propagating through building structure. Rapidly fluctuating elastic waves in gypsum board, joists, studs, etc.

Statistical Distribution Terms:

L_{99} and L_{90} are descriptors of the typical minimum or "residual" background noise (or vibration) levels observed during a measurement period, normally made up of the summation of a large number of sound sources distant from the measurement position and not usually recognizable as individual noise sources. Generally, the prevalent source of this residual noise is distant street traffic. L90 and

L_{99} are not strongly influenced by occasional local motor vehicle passbys. However, they can be influenced by stationary sources such as air conditioning equipment.

L_{50} represents a long-term statistical median noise level over the measurement period and does reveal the long-term influence of local traffic.

L_{10} describes typical or average levels for the maximum noise levels occurring, for example, during nearby passbys of trains, trucks, buses, and automobiles, when there is relatively steady traffic. Thus, while L10 does not necessarily describe the typical maximum noise levels observed at a point, it is strongly influenced by the momentary maximum noise level occurring during vehicle passbys at most locations.

L_1, the noise level exceeded for 1% of the time is representative of the occasional, isolated maximum or peak level which occurs in an area. L1 is usually strongly influenced by the maximum short-duration noise level events which occur during the measurement time period and are often determined by aircraft or large vehicle passbys.

Vibration Velocity Level (Lv / VdB):

The decibel scale used to describe vibration. The reference velocity in the United States is one micro-inch per second. The threshold of perception for humans is approximately 65 VdB.