



MEMO REPORT

To: **Mark Edwards** (805) 964-8981 Date: **10 Sept 2008**

From: **Bill Dohn** Pages: **9 total**

Subject: **Code-Related Exterior Noise Control Recommendations** (*Revised for City Planning*)
124 LOS AGUAJES, SANTA BARBARA
D+A Project 05-16-R2

Dear Mark:

This letter provides recommendations for exterior noise mitigation at the proposed Condominium project at 124 Los Aguajes, Santa Barbara to meet the requirements set forth in the City of Santa Barbara Noise Element. *The acoustical performance of planned demising wall or floor /ceiling assemblies between residential units has not been analyzed as part of this study / report and will not be the responsibility of Dohn and Associates, Inc.*

A. Project Description

The project includes a proposed condominium development between Los Aguajes Street and Mission Creek in West Beach, Santa Barbara. The project is in the vicinity of the Union Pacific Railroad (UPRR) and the 101 Freeway, both of which will contribute noise to the site.

B. City Noise Requirements

1. Exterior Noise Level Standards

Maximum 24-hour average exterior noise levels of 60 L_{dn} are recommended in the City Noise Element. Exterior noise limits are applicable to code-required "designated outdoor living spaces," including patios, decks, and private yards. L_{dn} is a 24 hour average noise level, using standard weightings for daytime and nighttime periods.

2. Interior Noise Level Standards

Maximum interior noise levels of 45 L_{dn} are recommended in the City Noise Element for interior spaces.

3. Maximum "Site" Noise Levels

Although the requirement has not been specifically stated in writing, concern has been raised as to whether or not noise levels anywhere on the site will be at or above 75 dBA L_{dn} . This requirement is related to basic land use compatibility and zoning, with implications for all properties in close proximity to the UPRR/101 corridor.

C. Site Noise Levels

1. Noise Sources

- a. **TRAFFIC:** The property will be impacted by noise from the 101 Freeway and local roadways. Noise data to quantify these sources of noise were collected on the site on 13 April 2005.
- b. **TRAINS:** The property will be impacted by noise from train activity on the Union Pacific Railway. Noise data to quantify this source of noise were collected on the site on 13 April 2005. Published noise data for the UPRR extrapolated from Appendix B of the Santa Barbara County Noise Element will also be utilized.

2. Measured / Calculated Existing Exterior Noise Levels

Noise levels due to traffic on the 101 Freeway, local roadways, and on the UPRR were measured at 5' above the ground near the northern edge of the property between 6 AM and 9 AM ("peak" rush hours) on 13 April, 2005, as follows.

- a. **TRAFFIC AND TRAIN NOISE COMBINED:** 15-minute averages of about 65 dBA including a passenger train and 74 dBA including a freight train. Peak hourly averages of about 64 dBA L_{eq} including a passenger train and 69 dBA L_{eq} including a freight train were calculated from the 15 minute data. Using the generally-accepted assumption that peak hourly L_{eq} is a reasonable estimate of the 24 hour L_{dn} , then 69 dBA L_{dn} should be a reasonable estimate for at the site. This estimate was verified using data for the rail line between Las Positas Road and the Santa Barbara Station from Appendix B of the Santa Barbara County Noise Element.
- b. **TRAFFIC NOISE ONLY:** 15-minute averages between about 60 and 63 dBA. Peak hourly averages of about 63 dBA were calculated from the 15 minute data.
- c. **MEASUREMENT EQUIPMENT:** Sound levels were measured using a regularly-calibrated Ono Sokki Type 2 integrating sound level meter and ½" free field microphone with windscreen.
- d. **MEASUREMENT LOCATION:** Attached Figure 1 shows the location of the microphone and sound level meter during noise measurements. This measurement location was chosen to represent "worst case" exposure to the primary noise sources.
- e. **MEASUREMENT PROTOCOL:** Noise measurements were performed in accordance with ASTM Standard E1014 Standard Guide for Measurement of Outdoor A-Weighted Sound Levels. No adverse atmospheric conditions (wind, inversion, etc. that would lead to noise measurement errors) were encountered during the hours of measurement.

3. Estimated Future (“Design-To”) Exterior Noise Levels

- a. **FOR USE IN DETERMINING NOISE MITIGATION AT DESIGNATED OUTDOOR LIVING SPACES:** Utilizing the measurements and calculations made above and published data for the UPRR, 72 dBA (L_{dn})* is recommended as the design-to 24-hour average exterior noise level for application to outdoor living spaces (on the second and third levels of the building). If one were concerned only with traffic noise, the recommended design-to noise level would be around 66 dBA.

* Existing site noise levels are estimated at 69 dBA Ldn, but the project must be designed to (or designed for) noise levels resulting from future increases in traffic and train volume along the 101/UPRR corridor. Allowing for a reasonable (twofold) increase in traffic and train volume in the future (resulting in a 3 dB increase in noise levels), 72 dBA L_{dn} is suggested as the “design-to” noise level for determining required mitigation in designated outdoor living spaces. Although the exterior noise measurements and calculations were made for the north end of the property (nearest the rail line and freeway), they are assumed for the sake of conservatism to apply over the entire site.

- b. **FOR USE IN DETERMINING REQUIRED BUILDING CONSTRUCTION/MITIGATION FOR INDOOR LIVING SPACES:** For conservatism, 75 dBA (L_{dn})* is recommended as the design-to 24-hour average exterior noise level for application to indoor living spaces on second and third levels of the building.

* An additional safety factor of 3 dB is suggested to further protect building occupants while indoors. This recommendation assumes that indoor activities (certainly sleeping) have more critical relationships to noise than outdoor activities.

- c. **MAXIMUM SITE NOISE LEVELS:** Based on the site noise measurements and noise data for the UPRR from the County Noise Element, it is estimated that noise levels on the site (including the outdoor open space nearest Mission Creek) will be below 75 dBA L_{dn} .

D. Exterior Noise Mitigation for Designated Outdoor Living Spaces

1. Designated Outdoor Living Space Locations

The designated outdoor living spaces (for code compliance) are assumed as follows:

- a. UNIT 1: Enclosed deck on third level as shown in Figure 3.
- b. UNIT 2: Enclosed deck on third level as shown in Figure 3.
- c. UNIT 3: Enclosed deck on second level as shown in Figure 2.

2. Noise Mitigation for Designated Outdoor Living Spaces

The proposed / recommended noise mitigation for designated outdoor living spaces (to achieve a maximum L_{dn} of 60) is as follows:

- a. UNIT 1: Minimum 6' high glass, wood, or metal barriers on East side of deck. The barrier materials (glass, wood, or metal) must weight at least 2 psf, and be constructed without gaps, vents, or through-drains.
- b. UNIT 2: Minimum 6' high glass, wood, or metal barrier on West and South sides of deck. The barrier materials (glass, wood, or metal) must weight at least 2 psf, and be constructed without gaps, vents, or through-drains.
- c. UNIT 3: Minimum 6' high glass, wood, or metal barriers on West and South sides of deck. The barrier materials (glass, wood, or metal) must weight at least 2 psf, and be constructed without gaps, vents, or through-drains.

E. Interior Noise Mitigation

1. Required Noise Level Reduction (NLR)

30 dB of building noise level reduction (NLR) will be required to achieve 45 L_{dn} in indoor living spaces.

2. Building Construction Recommendations

The following are recommendations for building construction to achieve a NLR of 30 dB on this project.

- a. GENERAL BUILDING VENTILATION: Air conditioning or a mechanical ventilation system is installed so that windows and doors may remain closed.
- b. EXTERIOR WALLS: Minimum 3.5" stud walls*, exterior stucco, two layers of interior ½" gypsum board*, and R-13 cavity insulation are recommended. If a product (or products) other than stucco are utilized on the exterior, the composite exterior wall material should weigh at least 10 psf (using Hardy products, necessary layers of plywood, gypsum board, backer board, etc.).

* 6" stud walls would be preferred. If practical (probably not in Kitchens or Bathrooms, however), resilient channels between interior gypsum layers and studs or the use of specially damped gypsum layers such as "Quietrock" by Quiet Solutions will improve control of low-frequency train noise.

- c. **ROOF / CEILING ASSEMBLIES:** Roofing over a substrate (plywood or concrete) weighing at least 4 psf*, minimum 10” joists, two layers of 1/2” gypsum board on the underside of joists*, and minimum R-19 insulation in the joist cavities are recommended. If the roof/ceiling assembly is constructed of roofing and concrete alone (with exposed joists and no ceiling), the concrete should weigh at least 30 psf.
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- * A heavier substrate would be preferred. If practical (probably not in Kitchens or Bathrooms, however), resilient channels between interior gypsum layers and joists or the use of specially damped gypsum layers such as “Quietrock” by Quiet Solutions will improve control of low-frequency train noise.
- d. **GLAZED WINDOWS AND SLIDING DOORS:** 1/8"-3/4" airspace-1/8" insulating glass (or similar) within assemblies carrying laboratory sound transmission class (STC) ratings* of at least 30.
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- * Window assemblies designed for maximum protection against air and water infiltration must be selected – including very high quality gasketing, weather-stripping, and seals. Provide heavier (3/16” or 1/4” thick) glazing (similar to glazed “curtain wall”) to improve control of low-frequency train noise.
- e. **EXTERIOR ENTRY DOORS:** Solid-core or glazed (per above) with full-perimeter, heavy-duty weatherstripping. Orient doors away from direct exposure to the railway as much as possible.
- f. **KITCHEN AND BATHROOM VENTILATION:** Kitchen and bathroom ventilation ducts should include at least two elbows.
- g. **OUTSIDE AIR INTAKES FOR HVAC SYSTEMS:** Air intake ducts should include 1"-thick acoustical lining and at least one elbow.
- h. **ATTIC VENTILATION:** Vents should be baffled with acoustically-lined sheet metal “boots” (so that line of sight between “ends” of boots is impossible).
- i. **GENERAL AIRTIGHTNESS:** The building exterior should be made as “airtight” as possible to minimize noise infiltration. Exterior and interior surfaces/sheeting should be caulked airtight at all joints and edges with appropriate sealants (at floors, door and window frames, electrical boxes, etc.). Sheet caulking (outlet box pads) should be provided at all electrical boxes in exterior walls and ceilings. ASTM E497 (Standard Practice for Installing Sound-Isolating Lightweight Partitions) and ASTM C919 (Practice for Use of Sealants in Acoustical Applications) should be referenced in the construction documents.
- j. **CHIMNEY / FIREPLACE CLOSURES:** Flue dampers and glass fireplace screens are recommended.

- k. SKYLIGHTS: Avoid skylights in living and sleeping areas, if possible – especially if they are exposed directly to the railway. Use double-glazed assemblies (per above) if skylights must be included as part of the design.
- l. SUGGESTED DISCLOSURE TO BUYERS: It is suggested that potential buyers of units on this project be advised of the possibility of annoyance (indoors, at designated outdoor living spaces, and at outdoor open spaces) due to train noise on the UPRR and (in lesser severity) due to vehicular noise on the 101 Freeway. Although the City has zoned the site for residential usage and established noise limits for 24-hour average indoor and outdoor noise levels, the following issues remain of concern:
 - 1) Instantaneous noise levels due to trains and vehicles can greatly exceed the hourly and 24-hourly average noise levels mentioned in this report.
 - 2) Train noise may occur at any time, often on no particular schedule, and during evening and early morning (typical sleeping) hours. Schedules and durations of train whistles are discretionary and most train noises (especially whistles) will be loud enough to annoy (and potentially startle) some building occupants.
 - 3) Vehicular noise emission standards are not enforced by the State of California or in most California counties and cities. Some vehicles (such as heavy trucks, “hog” or “competition” motorcycles, autos with “tuned” mufflers, etc.) can cause very high (and potentially annoying) noise levels as they travel along the 101 Freeway (and local roadways).

Please call with any questions or for clarification.

Sincerely,

Dohn and Associates, Inc.



Bill Dohn,
President and
Principal Consultant