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To: Sadiya Kazi-Koya
1147 Holly Street
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Cc: Alexandra Odabachian

Date: July 25, 2018

Re: Acoustics Study for Swings and Wings
2307 Blanding Avenue, Alameda

1. Introduction

The study subject is a proposed Tenant improvement project for suites E and F of an existing commercial building. The study objective is to assess sound transmission through demising walls to adjacent spaces and recommend corrective actions as needed to minimize noise intrusion into adjacent commercial spaces. The study is based on a review of project plans and a site inspection, including sound insulation tests, done on July 16, 2018.

2. Noise Insulation Ratings

Single-number airborne noise insulation ratings for partitions (walls or floor-ceiling assemblies) are based on the Noise Reduction or difference between sound levels in two rooms when a loud noise source is placed in one room. The following systems are used to rate airborne noise insulation; higher values indicate better performance.

STC Sound Transmission Class is the basic rating system for a specimen of a wall or floor-ceiling assembly when tested between two otherwise well-isolated rooms in a laboratory. STC ratings are used to prescribe sound isolation details for new and retrofit construction, based on prior lab tests of similar designs.

FSTC Field Sound Transmission Class is an alternate rating for a partition when tested as installed in a real building. FSTC values are typically about 5 rating points lower than STC ratings, due to flanking paths (air leaks and structural ties) not found in lab tests.

NIC Noise Insulation Class is the same as FSTC rating except for small corrections made to compensate for non-standard room conditions. It is commonly used as a basis for code compliance assessment and sometimes reported as field STC.

3. Noise Insulation Standards

The California Building Code (CBC) does not specify allowable limits for noise insulation between adjacent spaces with commercial use. Where noise-sensitive uses such as private offices or meeting rooms occur, it is reasonable to assume that the limits for residential use provide an appropriate basis for noise insulation design.

Interior noise insulation standards for residential occupancy are set by the CBC in Title 24 Part 2 of the California Code of Regulations, Section 1207 - Sound Transmission. The code requires the following noise separation between normally occupied rooms of adjacent units in a common building, and between occupied units and common areas such as hallways.

> Walls and floor-ceiling partition assemblies must have an airborne noise insulation rating of at least STC 50 in lab tests, to achieve NIC 45 as installed in a real building.

Building code compliance does not necessarily mean assurance of acoustical privacy or occupant satisfaction. The expectation of acoustic privacy may not be realized by just meeting the code minimum allowable ratings. Noise insulation field test ratings of NIC 50 or 55 are recommended by acoustics professionals as a design goal for good or very good sound insulation.

4. Noise Insulation Tests

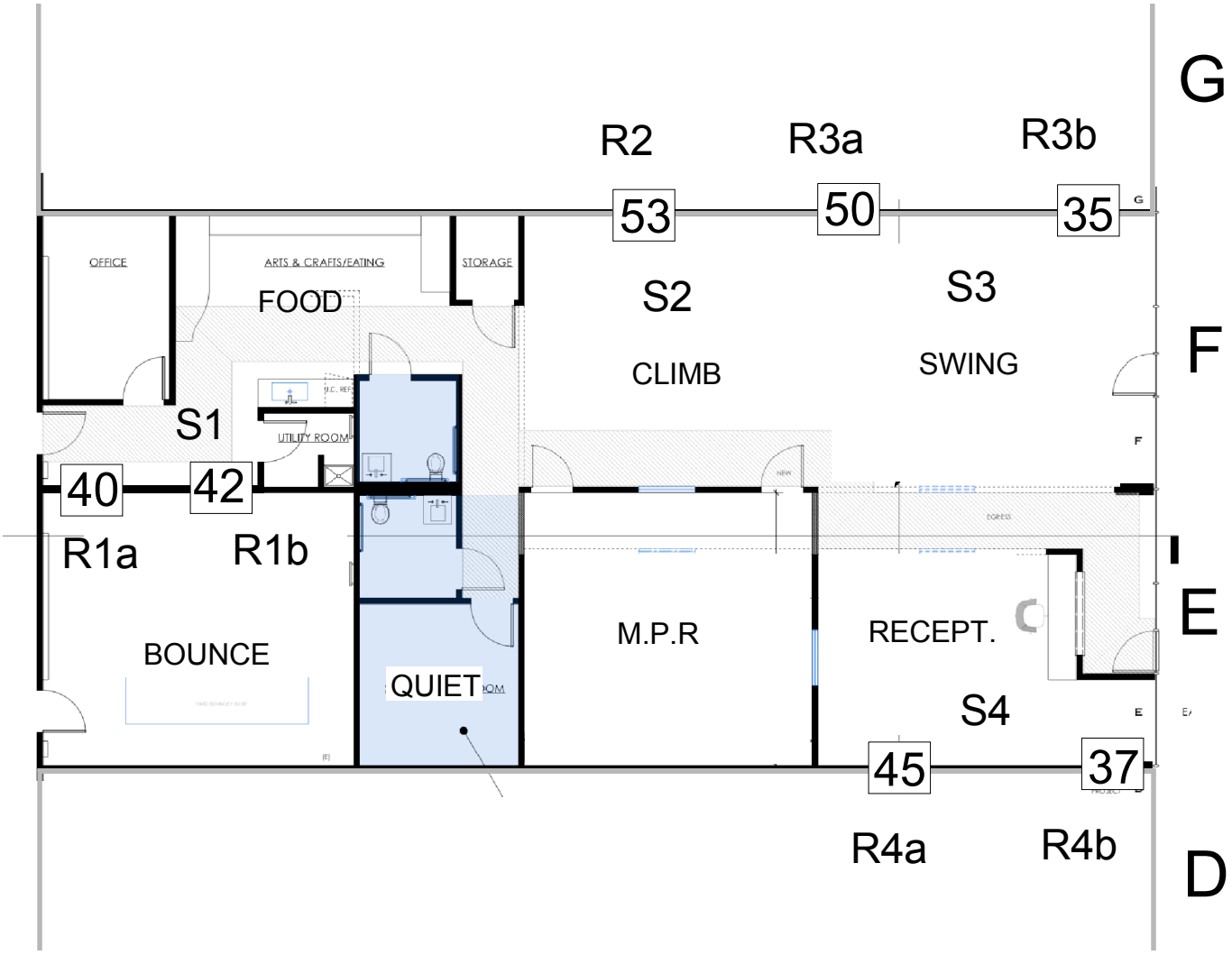
The method used to assess sound insulation between adjacent rooms by field tests is based on ASTM Procedure E-336. The test uses a steady broadband (pink) noise source in one room, measures the sound levels in both rooms, and finds the difference or Noise Reduction (NR) between the two sides. The single-number rating Noise Insulation Class (NIC) is derived by matching the field test data to a reference spectrum contour using ASTM Procedure E-413.

Figure 1 shows a partial floor plan with test Source and Receiver locations and test results; source rooms were in subject Suites E-F and receiver rooms were in adjacent Suites D and G. Test data was averaged by sweeping the microphone through the local area for about one-half minute. Table 1 lists the results of the noise tests.

Table 1
Noise Test Results

Source	Receiver	NIC
S1	R1a	40
	R1b	42
S2	R2	53
S3	R3a	50
	R3b	35
S4	R4a	45
	R4b	37

Figure 1
Noise Insulation Survey
Proposed Floor Plan



Test 1 was done to determine the NIC rating of a "typical" demising wall portion, as found between Suites E and F. There are visible gaps where the building steel frame meets both the demising wall and the building exterior rear wall; the data shows the effect of sound leakage through these gaps.

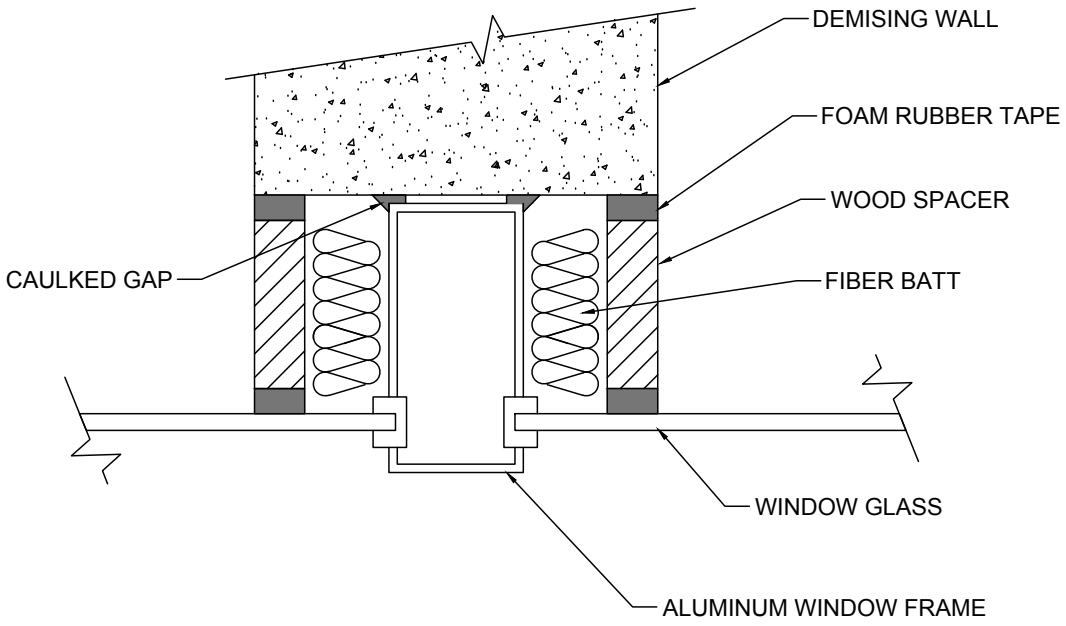
Tests 3 and 4 showed similar results at the front of the building; the most notable sound leaks occurred where the demising walls meet the aluminum frames of the window glass.

Test 2 found NIC ratings of 50 to 53 for central portions of the demising walls away from the front and rear walls. This indicates that the basic wall construction provides adequate noise insulation and no modifications are needed, except where the demising walls meet the building exterior walls.

5. Recommended Gap Treatment

The connection between demising walls and the glass front of the building is the only deficiency found in the investigation. Figure 2 shows the basic arrangement of this connection, along with details of a recommended upgrade treatment.

Figure 2
Demising Wall Gap Detail



The first step of the treatment is to seal both sides of the existing air gaps between the demising walls and the aluminum channels of the window frames. Recommended seal is to use plasticine modeling clay. Warm and soften the clay by manual kneading and then roll it into long rods of about 1/4" diameter; firmly press the clay into the gap and insure that all holes are filled. Alternate seal is to use "non-hardening" or "permanently flexible" caulk from a tube; this may be less effective at gap penetration and also more difficult to clean up excess caulk after application.

The second step is to pack the space between the wall and the window glass with fiber batt material (such as strips of R-13 thermal insulation) and to seal it behind wood spacers with closed cell (black) rubber foam weather strip tape attached to the edges. Nominal material specification is 3/4" thick wood and 3/4" x 3/8" weather strip tape. The wood spacer is cut to a width such that it fits snugly into the available space without excessive distortion of the foam tape.

The treatment should extend all the way from the floor to the top of the windows, even if this goes above the top of the suspended ceilings of the suites.

6. Facility Room Usage - General

The facility will be used by children from age six months to six years. All activities will be done with direct parental supervision and participation; this suggests that excessively loud vocal outbursts from the children will be discouraged and can be readily controlled by the parents. The focus of the programs is to provide developmental or therapeutic activities, to enhance motor skills, coordination, and orientation of the child. This is quieter than the ambience found at a playground where energetic activities often result in loud noise levels.

Proposed room usage for the facility is also shown in Figure 1. Ancillary room uses are for front desk reception and staff office, food preparation and eating, and a Multi-Purpose Room for unspecified activities; the M.P.R. may also be used on weekends for parties or other groups.

Play structures for climbing and swinging will be free-standing (i.e. not attached to the walls) to prevent mechanical transmission of impulsive noises to the structure. Activities will be arranged to preclude balls or other toys being thrown against the walls. Areas where jumping or falling to the floor is likely will be provided with resilient rubber mat floor coverings to reduce impact noise and prevent injuries.

7. Facility Room Usage - Bounce House

The jumping room will be the location of either a trampoline or an inflatable "bounce house" play structure. This presents two potentially significant noise sources.

One source is yells, shrieks or other vocalizations from the children when engaged in energetic activity. This is likely unavoidable, so any noise leak from this room to the rear portion of adjacent Suite D is potentially problematic. Any visible gaps between the demising wall and the building steel frame, or between the demising wall and the building exterior wall should be sealed airtight with plasticine clay or non-hardening caulk. This should include the connection between the top of the demising wall and the steel building frame member.

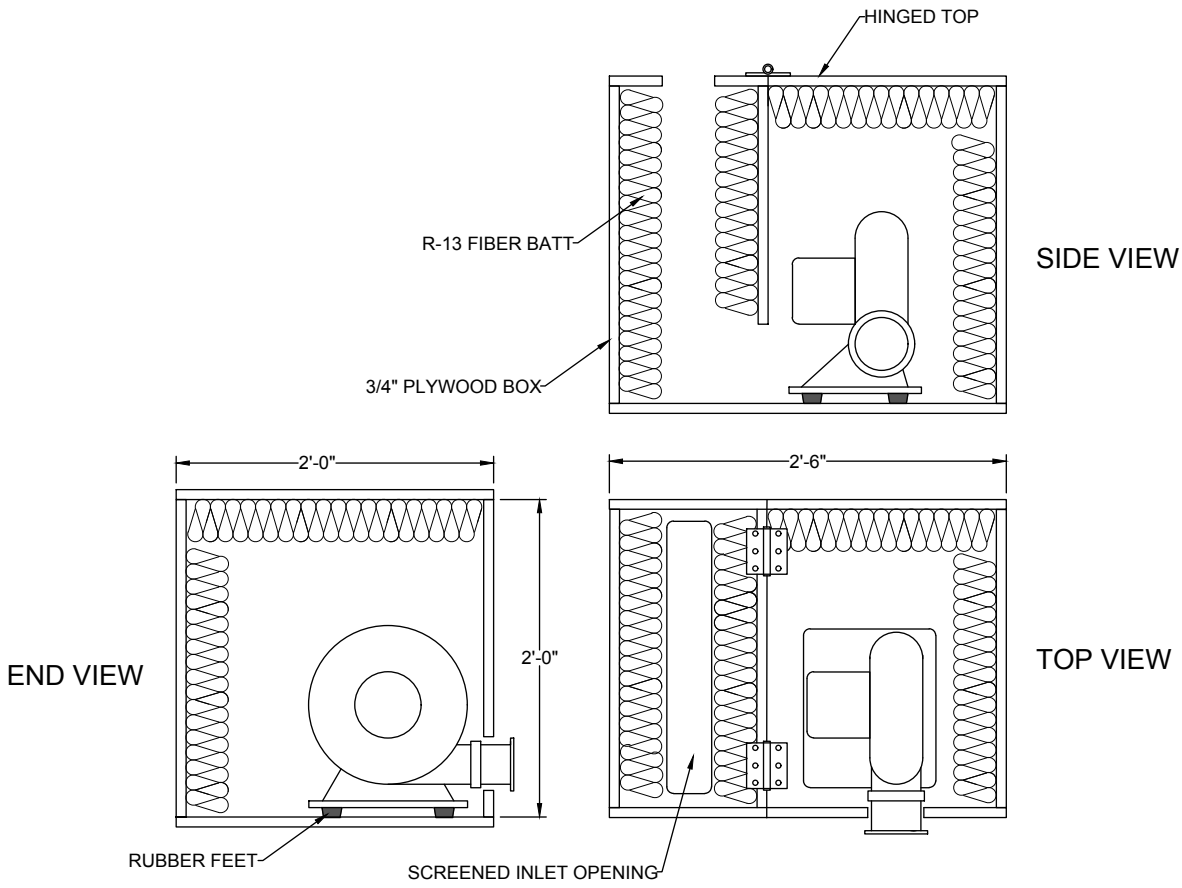
If a bounce house is used, it will require a 1/2 to 1 HP centrifugal fan for inflation; the fan will likely be too loud unless treated for noise reduction. Suggested treatment is to provide a muffler to reduce the fan discharge noise and an enclosure to reduce the fan inlet noise. A possible location for the fan and silencer is on the existing HVAC equipment platform above the bathroom.

The fan discharge silencer consists of a length of 4" diameter flexible plastic air duct with a layer of 1" fiber batt insulation. This core is installed inside a length of a 6" sheet metal duct , with a 6" x 4" sheet metal reducer at each end. Required silencer length depends on the actual fan noise, but is estimated to be 5 to 8 feet. A flexible connection is used between the fan and the muffler to prevent excitation by machine vibrations.

8. Bounce House Fan Enclosure

Figures 3 shows basic features of the fan enclosure, a box that can be assembled from one sheet of 3/4" plywood. The box is lined with 3-1/2" thick fiber batt sound absorption material (thermal type R-13) stapled to the plywood. The box has an air inlet opening with a metal screen to prevent debris ingestion, a lined baffle to confine noise, and a hinged top for access to the fan. Rubber feet are used to minimize excitation of the box by machine vibrations; if needed, the box itself can also be isolated from the structure by rubber feet or pads.

Figure 3
Fan Enclosure



This report was prepared by:

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