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Sound Advice in a World Full of Noise

November 16, 2023

Mr. Robert Landa
Studio Meng Strazzara
2001 Western Ave, STE 200
Seattle, WA 98121

Re: Puyallup High School Portables – Site Noise Study (#P23085)

Dear Mr. Landa:

A site noise study was conducted for a proposed portable classroom building site at Puyallup High School located in Puyallup, Washington. The purpose of the noise study was to characterize existing on-site sound levels from exterior sources and evaluate the measured levels with respect to noise limits contained in the Washington Administrative Code and development requirements contained in the Pierce County Code. This report summarizes measured sound levels, evaluation of noise code compliance, and noise control recommendations.

Applicable Noise Regulations

Washington Administrative Code

For exterior noise, Washington Administrative Code (WAC) 246-366-030 *Site Approval* contains hourly noise limits of 55 dBA (L_{eq}) and hourly maximum noise limits of 75 dBA (L_{max}) during the time of day that school is in session. For sites where these noise levels are exceeded, a plan for sound reduction must be included in the new construction proposal with the health officer holding approval authority.

For interior noise, Washington Administrative Code (WAC) 246-366-110 *Sound Control* specifies allowable background sound levels at interior classroom student locations of 45 dBA (L_{eq-x}) and 70 dB (L_{eq-x}) (unweighted scale) where x is thirty seconds or more and when with the ventilation system and the ventilation system's noise generating components (e.g., condenser, heat pump, etc.) are in operation.

Measured Sound Levels

Sound levels were measured from 8:00 a.m. to 3:00 p.m. on Wednesday, November 1, 2023 to characterize noise levels on the Puyallup High School project site during a typical school day. The measurement location L1, shown in Figure , was near the proposed new portable classroom buildings location, shown in Figure 2.

Figure 1: Project Site Aerial and Sound Measurement Location (not to scale)
Source: Pierce County Public GIS

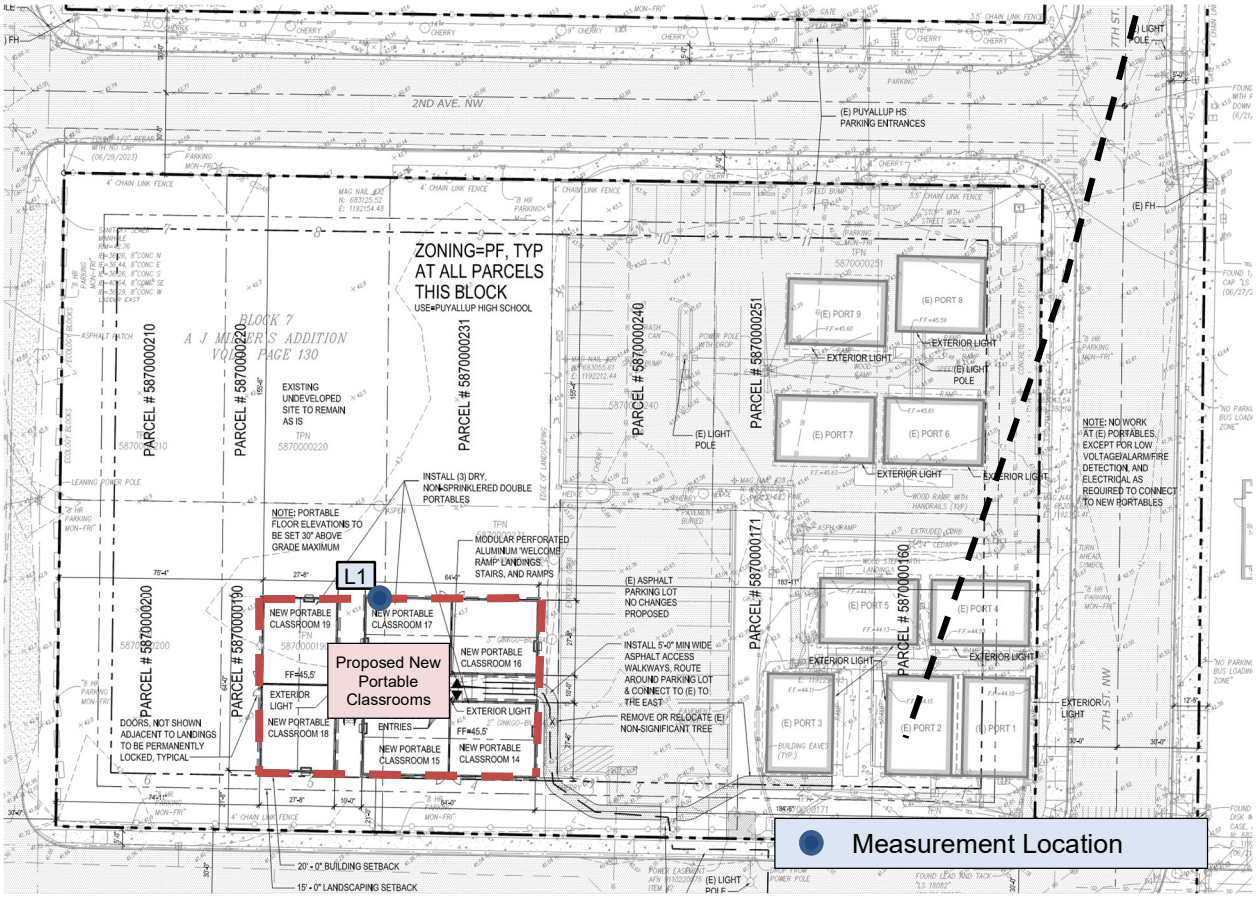

Figure 2: Project Site Plan and Sound Measurement Location L1 (not to scale)

Sound levels were measured continuously at Location L1 and results are summarized in Table 1.

Table 1: Exterior Noise Level Measurement Results

Measurement Location	Time Interval	L_{eq}	L_{max}	L_{max} Noise Source
L1	8:00 AM to 9:00 AM	60 dBA	87 dBA	Train Crossing (Amtrak)
	9:00 AM to 10:00 AM	52 dBA	69 dBA	Aircraft
	10:00 AM to 11:00 AM	60 dBA	88 dBA	Train Crossing (Freight)
	11:00 AM to Noon	58 dBA	84 dBA	Train Crossing (Freight)
	Noon to 1:00 PM	55 dBA	82 dBA	Train Crossing (Freight)
	1:00 PM to 2:00 PM	60 dBA	84 dBA	Train Crossing (Freight)
	2:00 PM to 3:00 PM	53 dBA	77 dBA	Train Crossing (Amtrak)
Exterior Noise Limit (WAC) 246-366-030 *Site Approval*		**55 dBA**	**75 dBA**	

As shown in Table 1, measured L_{eq} sound levels were 52-60 dBA and measured L_{max} sound levels were 69-88 dBA.

The equipment used for sound level measurements conforms to ANSI S1.4 specifications for Type 1 sound level meters, were calibrated within the last 12 months, and are described in
Table 2 below.

Table 2: Noise Measurement Equipment Details

Equipment Type	Manufacturer	Model No.	Equipment Quantity
Sound Level Meter	Larson Davis	831C	1
Pre-amplifier	PCB	PRM831	1
Microphone	PCB	377B20	1
Calibrator	Larson Davis	CAL200	1

Evaluation

Washington Administrative Code

As shown in Table 1, measured exterior sound levels exceed the WAC 246-366-030 requirements for exterior L_{eq} noise levels during four of the seven measurement hours and L_{max} noise levels during six of the seven measurement hours. As noted in Table 1, exceedance noise levels were mostly attributed to nearby train track activity, including both passenger Amtrak trains and freight trains.

Recommendations

From construction drawings for the planned portable classroom buildings, the exterior façade construction consists of the following:

- Roof / Ceiling – fiberglass composite shingles, 7/16” OSB sheathing, R-42 cellulose insulation, and suspended acoustical tile ceiling; approximately 825 s.f. per classroom.
- Exterior Wall – 2x6 wood studs at 16” o.c., 15/32” T1-11 siding, R-21 fiberglass batt insulation, and 5/8” gypsum board; approximately 595 s.f. per classroom.
- Exterior Windows – dual tempered glass with vinyl frames; approximately 96 s.f. per classroom.
- Exterior Doors – hollow metal door with hollow metal frame; approximately 21 s.f. per classroom.

Based on the measured exterior sound levels and estimated acoustical performance of the portable classroom buildings, the following building element upgrades are recommended.

1. Roof / Ceiling – no changes needed.
2. Exterior Wall – addition of one layer of 5/8” gypsum board or other equivalent density material to the existing wall assembly.
3. Exterior Windows – addition of a storm window assembly (minimum 1/4" glass pane) or replace existing windows with an STC 35-36 rated window.
4. Exterior Doors – replace or repair perimeter door seals to ensure an airtight seal is achieved when the door is in the closed position.

Action Plan

Prior to implementing the noise reduction recommendations outlined above and after the portable classroom buildings are installed on the Puyallup High School site, interior sound level measurements will be conducted within a classroom space to determine if the exterior-to-interior noise reduction performance provided by the portable classroom buildings is sufficient.

Measured interior sound levels will be evaluated with respect to WAC 246-366-110 noise level requirements of 45 dBA ($L_{eq\text{-}x}$) and 70 dB ($L_{eq\text{-}x}$) (unweighted scale) where x is thirty seconds or more. If measured interior sound levels exceed the noise level requirements, noise reduction measures will be implemented by the Puyallup School District to achieve the required interior noise levels within the portable classroom spaces.

Please let us know if you have any questions or require additional information.

Best Regards,

Jeanette Hesedahl, P.E., INCE Bd. Cert.
Senior Project Manager
CENSEO AV+Acoustics LLC
A Member Firm of NCAC and AVIXA