



ABD Engineering & Design

Architectural Acoustics • AV Design • Noise & Vibration

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Re: L&M Fabrication – Noise Compliance Testing – 6 Month

Introduction

ABD Engineering & Design, Inc. (ABD) was asked to perform noise compliance testing of the L&M steel fabrication facility in Tangent, OR (shown in Figure 1). The testing was performed to determine compliance with the DEQ noise codes. This report summarizes the results of ABD's study for the Month 6 testing conducted in July 2021.



Figure 1. Site location

Background

Following noise complaints by neighbors, L&M Industrial Fabrication commissioned a noise study to determine potential mitigation measures to reduce noise levels at nearby residential properties. It was determined that a noise berm and several noise barrier walls would be sufficient to reduce noise levels to an acceptable level. L&M has completed the construction of these noise barriers, as shown in Figure 2 below.

The City of Tangent has stipulated noise verification testing of the L&M facility in the operating permit for the site.

Professional Acoustical Verification. The City shall provide its contracted acoustic engineer to evaluate the applicant's acoustical testing results required to verify that plant operations are within DEQ maximum noise levels and consistent with these conditions.

Per the City's requirements, this compliance testing is to occur at 1 month, 3 months, 6 months, and 1 year following the construction. This report contains the acoustical testing results for the Month 6 period.

Compliance testing results for the Month 1 period can be found in ABD report *P3365 L&M – Noise Compliance Testing Month 1 – 210319*, dated March 19, 2021. Results for the Month 3 period can be found in ABD report *P3365 L&M – Noise Compliance Testing Month 3 – 210507*, dated May 7, 2021.

Noise Regulations

There are several noise regulations that are applicable to the site. The following sections describe the terminology used in the codes, as well as the various requirements and limits given in the regulations.

Terminology

Since noise tends to fluctuate over time, especially for environmental measurements, statistical levels (also called percentile levels or L_n) are used to describe the time-varying characteristics of the sound. The relevant statistical metrics for this project are the hourly L_1 , L_{10} , and L_{50} levels, which represent the sound level exceeded for 1% (36 seconds), 10% (6 minutes), and 50% (30 minutes) of an hour. For instance, if the hourly L_{10} of a measurement is 55 dBA, this means that the sound level during the measurement hour was 55 dBA or louder for a total of 6 minutes (usually spread out over the hour), and quieter than 55 dBA for the remaining 54 minutes. L_1 generally corresponds to short-term noise events such as loud vehicles, horns, or planes, L_{10} gives an idea of louder noises that are more frequent, and L_{50} represents more continuous noise.

In addition to the statistical noise levels, the other relevant noise level metric is the impulse sound level. This level represents the maximum instantaneous pressure that is measured with an unweighted peak response and applies to a single pressure peak or single burst lasting shorter than 1 second, such as the impact sound as a piece of metal is set down.

Oregon Administrative Rules – DEQ

The L&M industrial site would be considered an existing noise source under the DEQ regulations. The regulation for an existing noise source stipulates that noise radiating from

the source is regulated by what is commonly referred to as the “maximum allowable noise rule” [OAR 340-035-0035(1)(a)].

The maximum allowable noise rule prohibits the generation of hourly statistical noise levels (as measured at an appropriate measurement point) exceeding the levels shown in Table 1.

Table 1. Maximum allowable received statistical noise levels generated by an existing industrial or commercial noise source (OAR 340-035-0035, Table 7)

Hourly Statistical Noise Level	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
L ₅₀	55 dBA	50 dBA
L ₁₀	60 dBA	55 dBA
L ₁	75 dBA	60 dBA

In addition to the hourly statistical limits, the DEQ regulations also impose a limit on impulse sound [OAR 340-035-0035(1)(d)(B)], which is defined as “either a single pressure peak or a single burst (multiple pressure peaks) for a duration of less than one second.” The limits are shown in Table 2.

Table 2. Maximum allowable received impulse noise levels generated by any source

	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Maximum Allowable Impulse Sound	100 dB, peak	80 dB, peak

The full text of the DEQ Noise Control Regulations is included as an appendix to ABD’s *Noise Compliance Testing Month 1* report (March 2021).

Tangent Municipal Code

The Tangent Municipal Code (TMC) includes a nuisance provision. TMC Section 7.20.050(2) specifies that frequent, loud, or annoying noise may not unreasonably disturb neighboring properties, and cites the limitations provided in OAR 340-035 for proof of violations. The full text of the TMC 7.20 regulation is included as an appendix to ABD’s *Noise Compliance Testing Month 1* report (March 2021).

Sound Level Measurements and Results

Measurement Discussion

ABD performed sound level compliance measurements from Tuesday afternoon to Wednesday morning, July 6 – 7, 2021. Measurements were made at three primary locations, shown as M1 through M3 in Figure 2 below.

Location M1 is in the backyard of the house owned by Mr. Nofziger, and the measurement location was noted by him as the loudest point on the property. Locations M2 and M3 are along the driveway of the Harmony Acres community. All three measurement locations were 25 feet away from a residence, which is the required measurement point given in the DEQ regulations.

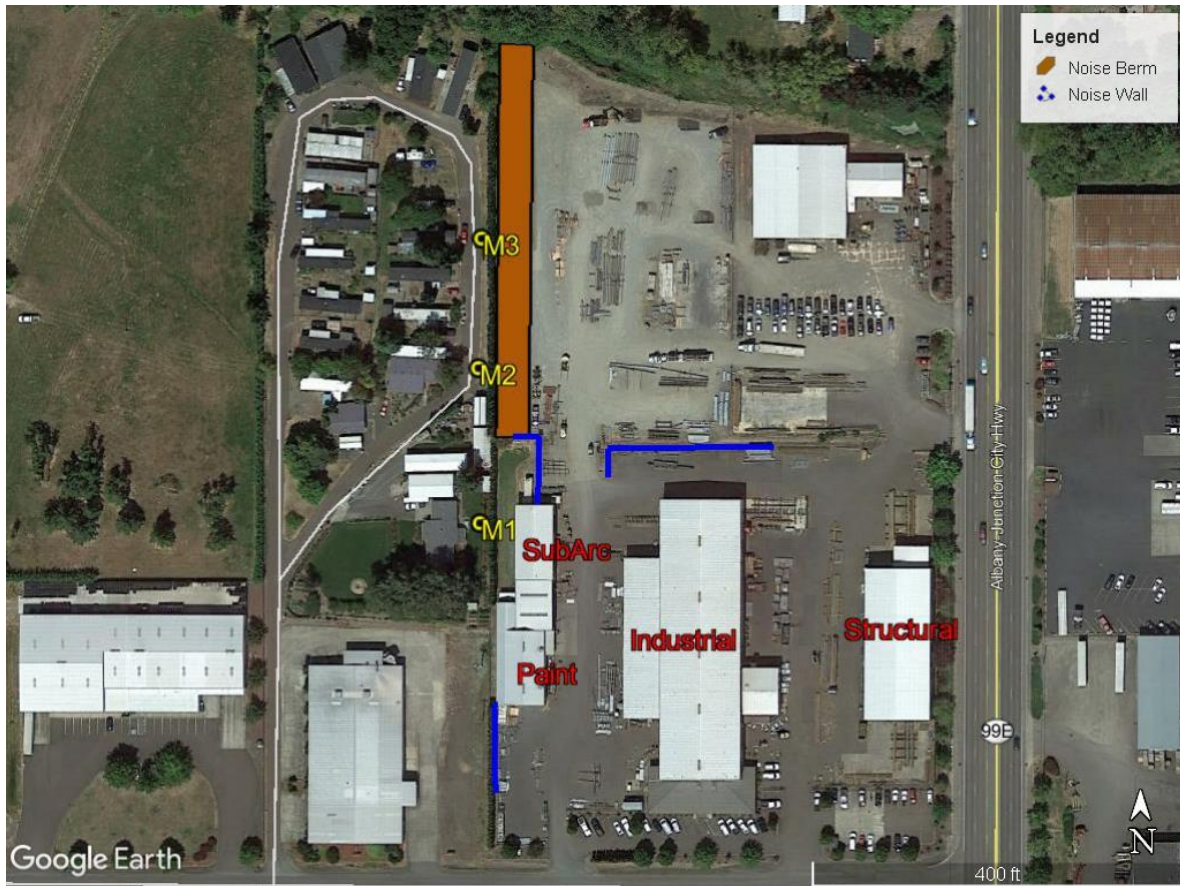


Figure 2. Location of noise measurements

Measurements were conducted with multiple sound level meters. All the meters reported sound levels every 1 second and calculated the statistical and impulse noise metrics.

- A Larson Davis Model 831C meter (ANSI/IEC Type 1 compliant) was set up as a continuous monitor at M1 (backyard of Nofziger residence) and ran from 1:15 p.m. to 9:15 a.m.
- Soft dB Piccolo II meters (ANSI/IEC Type 2 compliant) were set up as continuous monitors at M2 and M3 (along driveway) and ran from 1:00 p.m. to 9:00 a.m.
- A Larson Davis Model 831 meter (ANSI/IEC Type 1 compliant) was used for short-term attended noise measurements.

In addition to reporting sound levels, the 831C (M1) and 831 (short-term) meters also saved sound recordings for later review.

Attended measurements were made during the afternoon of 7/6 and after midnight on 7/7:

- M1 – 13:20-13:40, 02:15-02:50
- M2 – 13:40-14:05, 02:00-02:10, 02:55-03:25
- M3 – 14:05-14:25, 01:40-02:00

The site was fully operational and was run in a typical manner during the compliance measurements. A listing of the operations occurring onsite during the testing is given in Appendix A.

Figure 3 below shows weather data as measured by the nearest weather station (KORALBAN132, approximately 2 miles north of the site).

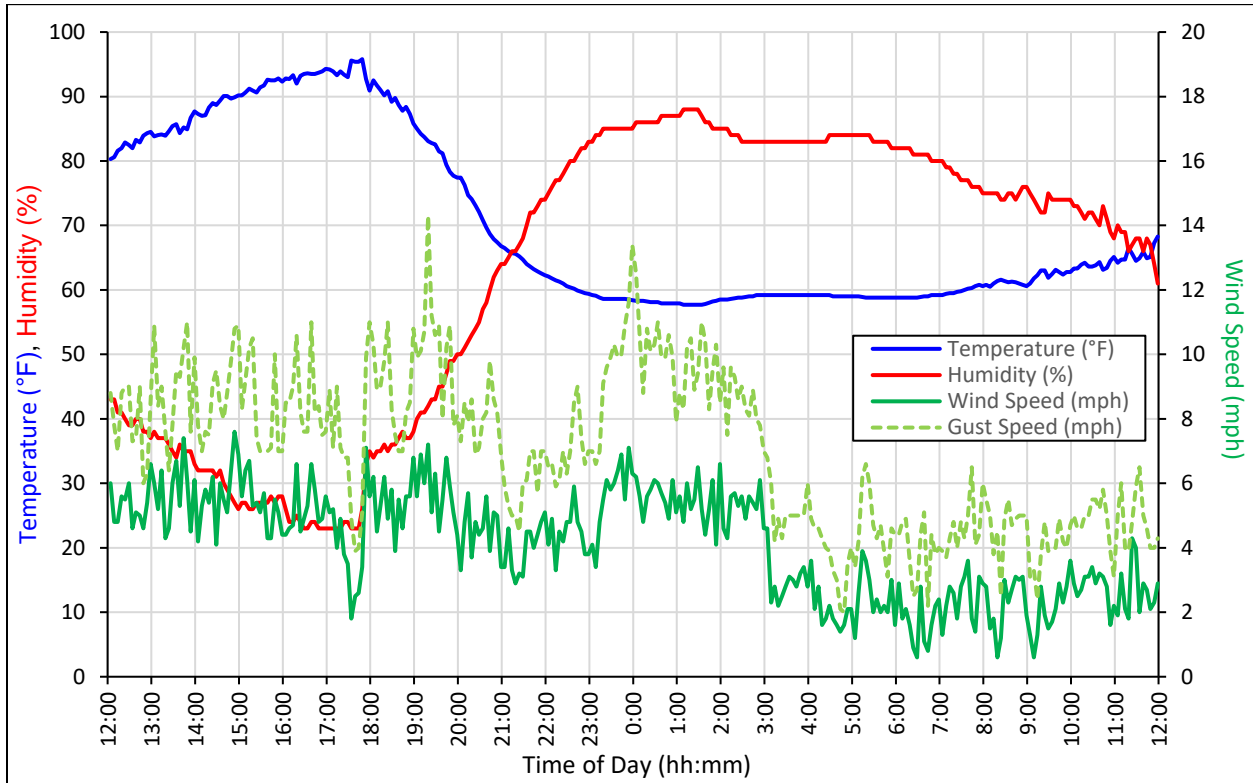


Figure 3. Weather data

Measured Noise Levels at Receivers

As noted in the Noise Regulations section above, the L&M site is required to meet both the statistical noise limits and the impulse noise limits. Because these limits represent different types of noise, they are discussed separately below.

Statistical Noise Level Compliance

While measurements were conducted continuously at locations M1, M2, and M3, it was found that these data were heavily influenced by extraneous noise sources. At M1, a sprinkler was running from 1:00 p.m. to 3:00 p.m., and a box fan was running in the window from 9:00 p.m. to 8:00 a.m., both of which raised the background noise levels at the meter. At M2, a heat pump was noted at the nearest residence which cycled on and off from the beginning of the measurements until 4:00 a.m., which raised the statistical noise levels by 0-3 dB. Also, the morning rush hour traffic started around 5:00 a.m. which raised the noise levels at all measurement locations.

The measured hourly statistical noise levels are shown in Table 3. These data include influences from multiple noise sources, not just the L&M facility. All of the data is

influenced by traffic noise to some degree. Some data is significantly influenced by other sources such as house fans or heat pumps, as noted by the superscripts in the table. These influences were confirmed by reviewing sound recordings and by direct observation.

It is noted that it is not feasible to remove the influence of local mechanical and traffic noise from the data. At locations M2 and M3, traffic is by far the dominant noise source, although the heat pump is also loud at M2. At location M1, irrigation and fan noise from the house was extremely dominant over most of the measurement period, with traffic noise as the other primary source during the evening and late morning.

It is noted that no data is available for the 6:00 a.m. or 7:00 a.m. hours for location M1 – this was due to an issue with the meter which caused the data to not be saved.

Table 3. Measured statistical noise levels

Date	Time (hour beginning)	Measured L ₁ (dBA)				Measured L ₁₀ (dBA)				Measured L ₅₀ (dBA)			
		M1	M2	M3	Limit	M1	M2	M3	Limit	M1	M2	M3	Limit
7-6-21	13:00	59	61	56	75	55 ^s	51 ^h	48	60	51 ^s	46 ^h	45	55
	14:00	61	57	54		55 ^s	50 ^h	47		52 ^s	46 ^h	44	
	15:00	59	56	50		54	51 ^h	46		51	47 ^h	44	
	16:00	59	60	59		54	50 ^h	47		50	48 ^h	44	
	17:00	59	58	58		55	50 ^h	48		51	48 ^h	45	
	18:00	60	61	62		55	50 ^h	51		51	48 ^h	46	
	19:00	61	73	71		55	56	50		51	50	47	
	20:00	59 ^t	76 ^t	73 ^t		55	59	55		51	48	47	
	21:00	56	52	51		53 ^f	49	48		51 ^f	46	46	
	22:00	56	54	52		53 ^f	51	49		51 ^f	48	46	
23:00	54	53	51	52 ^f	50	48	50 ^f	46	45				
7-7-21	00:00	53	51	49	60	51 ^f	46	45	55	49 ^f	42	42	50
	01:00	53	51	48		50 ^f	47 ^h	44		48 ^f	44 ^h	40	
	02:00	51	48	46		49 ^f	47 ^h	42		48 ^f	45 ^h	37	
	03:00	52	51	49		50 ^f	46 ^h	43		48 ^f	39 ^h	38	
	04:00	52	48	48		50 ^f	45	44		49 ^f	40	40	
	05:00	56	49	56		52 ^f	46	52		50 ^f	43	44	
	06:00	-- ^m	51	50		-- ^m	48	47		-- ^m	45	45	
	07:00	-- ^m	54	52		-- ^m	49	49		-- ^m	47	46	
08:00	58	56	54	75	52	48	48	60	48	45	45	55	

Nighttime hours (10:00 p.m. to 7:00 a.m.) are shaded in grey.

Note *f*: Measurement influenced by fan at nearby residence.

Note *h*: Measurement influenced by heat pump at nearby residence.

Note *s*: Measurement influenced by sprinkler at nearby residence.

Note *t*: Measurement influenced by noise from significant traffic noise.

Note *m*: No data available due to meter error.

As can be seen in the tables, the levels are within the code limits with two exceptions. The 8:00 p.m. hour at location M2 was found to be affected by a train pass-by, and the 10:00 p.m. hour at location M1 was found to be affected by noise from a fan at the residence. Neither of these levels were due to noise from the L&M site, therefore these influenced levels do not constitute an exceedance by L&M. During the morning time period, continuous noise from L&M from metalwork, forklifts, and trucks was well below the traffic noise, around 45-50 dBA at all measurement locations.

Therefore, based on measurement results with extraneous noise sources removed (those not associated with L&M) and observations made onsite, L&M is in compliance with all hourly statistical noise metrics.

Impulse Noise Level Compliance

Impulse noise at the L&M facility is typically generated by metal falling or crashing together (such as large beams being set down), or by squeals from metal scraping together (such as forklift tines scraping against metal during handling). Per the DEQ standards, impulse noise is measured using the unweighted peak sound level. Apart from the L&M facility, it is noted that other sources can generate high peak noise levels – these include nearby vehicle traffic, train horns, birds, and wind (for comparison, measured peak levels from these sources were measured at 106 dB, 100 dB, 105 dB, and 114 dB, respectively). Therefore, ABD used observation notes and recordings to pinpoint various impulse noises that can be directly attributed to the L&M site. Table 4 presents the measured sound level from these impulse sources.

Table 4. Measured impulse noise levels from the L&M site

Time Period	Noise Source	Measured LZpk (dB)			
		M1	M2	M3	Limit
Afternoon	Metal drop	95-100*	75-81	69-71	100
	Forklift or beamline squeal	<100*	78-81	69-71	
Night	Metal drop	71	67	68	80
	Metal movement	75-80*	71-73	69-80*	
	Beamline squeal	78	75	70	
	Hammering	74-80*	72-76	66-73	
Morning	Metal drop	76-90	73-82	74-81	100
	Metal movement	79-84	77-82	75-80	
	Forklift or beamline squeal	74-83	75-81	75-80	
	Hammering	74-77	74-78	73-79	

Note *: Measurements were heavily influenced by local noise sources during these periods. The actual noise levels are likely quieter than shown, but the exact value cannot be determined.

Several sources in the table above have levels that are shown as close to the limit, and are marked with a star. In these instances, it was noted that the background noise levels shortly before or after the noise event were as loud or louder than the event itself. This suggests that the measured noise level during the event was contaminated by the background noise (such as a wind gust or other local noise source). Figure 4 provides an example of this effect,

showing a 1-minute time segment at night. The two marked events were heard to be nearly identical (likely hammer strikes in the Structural building), but the background noise during the second event significantly adds to the measured levels – it is similar in level and shape to the wind noise measured at 0:24:50 (also note wind gusts of 11 mph around 00:30 as shown in Figure 3). Even though the measured peak noise level is higher than the limit during this event, this is caused by wind noise and thus does not constitute an exceedance by L&M.

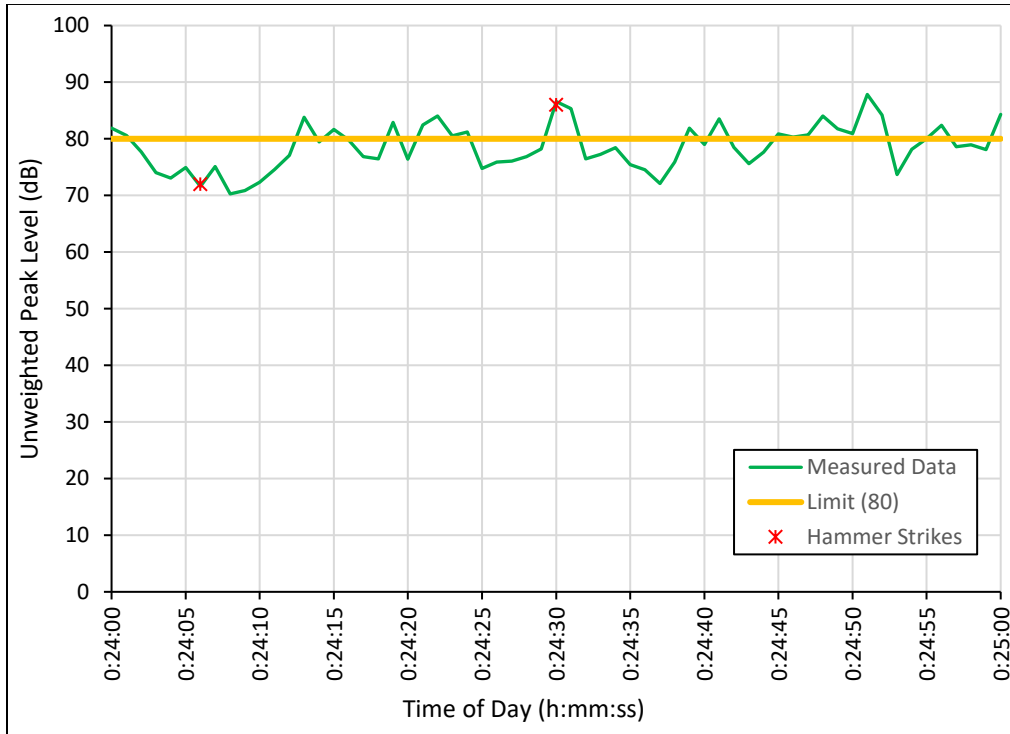


Figure 4. Example data showing ambient noise contamination

Therefore, once ambient noise effects are removed, all impulse noise from the L&M site is below the DEQ limits as shown in the table.

Conclusions

As shown in the tables and discussion above, based on the measurements on July 6-7, the L&M industrial facility is operating in compliance with the DEQ noise standards.

If you have any questions, please contact us.

Sincerely,

ABD Engineering & Design, Inc.

Per:



Benjamin Wolf, INCE Bd. Cert.

Senior Acoustical Consultant

cc: Melinda Miller, Marci Boks – ABD

Appendix A Operations

Operations noted by L&M staff
7/6/21 – 7/7/21

Site Operations – July 6-7, 2021

Locations are shown in Figure A1 for reference

Main Industrial Building – Day shift worked 05:30 to 16:00. No night shift.

Processing Shop – Day shift worked from 05:30 to 16:00. Night shift (2 people, standard) worked from 16:00 to 04:30.

Miscellaneous Shop – Day shift worked from 05:30 to 16:00. Night shift worked from 16:00 to 04:30.

Subarc Building – Day shift worked 07:00 to 17:30. No night shift.

Paint Shop – Day shift worked 07:00 to 17:30. Night shift worked from 17:30 to 23:00.

Structural Building – Day shift worked 05:30 to 16:00. Night shift (about 10 people) worked from 16:00 to 04:30.

Full crews present on day shifts (Tuesday and Wednesday) and night shift.

Voortman line (north end of Industrial building) does not run after 18:00.

Beamline (north end of Structural building) may be loaded by forklift until 22:00. After this time, the Beamline may only be run with material that is already loaded.

Doors are closed from 19:00 to 07:00. From 19:00 – 22:00, doors may be opened briefly to move material in and out. Due to high temperatures during the day on July 6, it is possible that doors on the structural building and on the east side of the industrial building may have been slightly open for ventilation.



Figure A1. Location of buildings and area