



## **Borzym Acoustics**

*Consulting & Engineering*

**Jim X. Borzym**, PE, INCE  
303.541.0020  
Fax 303.541.0021  
acoustics@columbine.net  
2221 Columbine Avenue, Boulder CO 80302

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Dr. Gerd Hübler  
Chemical Sciences Division  
U.S. Department of Commerce  
NOAA Earth System Research Laboratory  
325 Broadway R/CSD 7  
Boulder, Colorado 80305

re: **Noise Assessment**  
**NOAA ESRL Chemical Sciences Division Machine Shops**  
**Boulder, Colorado**

Dr. Hübler,

You have requested measurements of noise levels due to operation of shop equipment in three staff machine shops, and assessment of possible issues with OSHA noise exposure limits (29 CFR 1910.95(a)).

### **Measurements**

On 20 August 2009 we measured sound pressure levels using a precision sound analyzer with current traceable calibration<sup>1</sup>. Levels were measured using the "slow" network, for equivalent (time-averaged) A-weighted sound pressures. This is the protocol used for OSHA evaluation (29 CFR 1910.95(a)).

Measurements were made in the vicinity of a machinist's head, while conducting relatively loud operations at the various machines. Levels will be lower further from the machines. While there could be operations that cause higher levels of noise, these would not be typical.

Ambient level measurements were made to determine if the ambient levels affected levels during machining operations: they did not.

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<sup>1</sup> Larson-Davis model 824, serial #1360; ANSI S1.4 Type I; +/- 0.1 dB; calibration 20 July 2007.

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NOAA CSD Machine Shops**

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Some machines were relatively quiet; others were fundamentally noisy. The following table shows measured levels.

<b>Shop</b>	<b>Machine</b>	<b>Operation</b>	<b>Level dBA</b>
<b>1A207</b>	<b>CSD Instrument Fabrication Laboratory</b>		
	Grinder	Apply wheel dresser to grinding wheel – not a frequent operation	<b>99</b>
	Grinder	Grind steel billet	82
	Band Saw	Cut 3" x 4" x 1/4" aluminum angle	<b>97</b>
	Lathe	Turn brass tube – not properly chucked	100
	Lathe	Turn brass tube properly chucked	75
	Lathe	Turn aluminum rod	67
	Lathe	Turn stainless steel rod	66
	Mill	Mill aluminum bar w/ end cutter	84
	Drill Press	Drill 1-1/8" hole in aluminum block with 7/16" pilot hole	80
<b>1A208</b>	<b>Vacuum Furnace Room</b>		
	Ultrasonic Cleaner	On	<b>93</b>
<b>GA501</b>	<b>Staff Shop</b>		
	Band Saw	Saw aluminum sheet	<b>99</b>
	Belt Sander	Sand aluminum sheet	<b>99</b>
	Drum Sander	Sand aluminum sheet	<b>97</b>
	Small Belt Sander	Sand aluminum sheet	<b>95</b>
	Mill	Run at maximum speed	83
	Portable Shop Vacuum	On	81
	Bench Grinder (brushes)	Brush steel angle	80
	Lathe	On	72
	Drill Press	On	72
<b>3A213</b>	<b>ARS Group Shop</b>		
	Belt Sander	Sand aluminum sheet	<b>95</b>
	Grinder	Grind steel angle	88
	Band Saw	Saw aluminum sheet	86

## Assessment

The U.S. Occupational Safety and Health Administration (OSHA) has established a daily noise dose maximum equivalent to 90 dBA for eight hours (29 CFR 1910.95(a)). For each increase in sound level of 5dBA up to 115 dBA the permitted duration is halved. For example, a sound level of 95 dBA is permitted for 4 hours, 100 dBA for 2 hours. OSHA also established a maximum instantaneous peak sound pressure limit of 140 dBA (29 CFR 1910.95(b)(2)).

No measured machine exceeded the peak level limit of 140 dBA.

The mills, lathes, drill presses, bench grinders with brushes and portable vacuum cleaners are quiet enough that there is no significant risk of hearing damage, and no imperative to use hearing protection while using them.

The sanders, band saws, grinders with stone wheels and the ultrasonic cleaner can produce levels between 95 and 100 dBA in the direct vicinity of these machines. Thus, it would be reasonable to limit a machinist's daily exposure to 2 hours maximum with no hearing protection. This does not mean a maximum of 2 hours total time in the shop, but a sum total of time operating a machine approaching 2 hours.

Use of hearing protection while using these machines would be prudent, and would allow a greater number of hours of use without exceeding the OSHA standard.

These shops are not used for production, where a single operator uses machines for many hours. Rather, operations are intermittent, and occasional. The likelihood of a machinist without hearing protection exceeding the OSHA limit seems very low.

## Summary

Some CSD shop equipment can produce levels between 95 and 100 dBA. It is reasonable to limit a machinist's daily exposure to 2 hours maximum if no hearing protection is used. Use of hearing protection while using these machines is prudent but not necessary.

We trust that you will find this report useful. Please do not hesitate to call if you have questions regarding this information. Thank you.

Jim X. Borzým, PE, INCE

