

**GMEP Engineers**  
26439 Rancho Parkway S., Ste #120  
Lake Forest, CA 92630  
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**NOISE ASSESSMENT**  
**SHELL**  
**S.W. COR MENTONE BLVD**  
**@ CRAFTTON AVE**  
**MENTONE, CA**

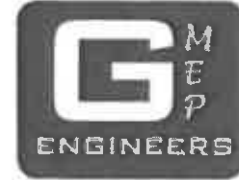
**Prepared for:**  
CJC Design, Inc  
22485 La Palma Ave, STE 202  
Yorba Linda, CA 92887

**Prepared by:**  
Gangyi Zhou, Ph.D., P.E  
GMEP Engineers.  
26439 Rancho PKWY S., STE 120  
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October 22, 2018

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### **GLOSSARY OF TERMS:**

**Sound Pressure Level (SPL):** Ratio of one sound pressure to a reference pressure ( $L_{ref}$ ) of 20  $\mu$ Pa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by  $20 \log (L/L_{ref})$ .

**A-weighted Sound Pressure Level (dBA):** Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

**Minimum Sound Level ( $L_{min}$ ):** Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

**Maximum Sound Level ( $L_{max}$ ):** Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

**Equivalent sound level ( $L_{eq}$ ):** the true equivalent sound level measured over the run time.  $L_{eq}$  is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

**Day Night Sound Level ( $L_{dn}$ ):** Representing the Day/Night sound level, this measurement is a 24-hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for night time noise. Typically,  $L_{dn}$ 's are measured using A weighting.

**Community Noise Exposure Level (CNEL):** The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

**Octave Band:** An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

**Third-Octave Band:** A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

**Response Time (F,S,I):** The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

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**EXECUTIVE SUMMARY:**

This noise study has been completed to determine the noise impacts associated with the planned car wash at the Intersection of Mentone BLVD and Craftton Ave., in order to confirm compliance with Noise Standard of local Municipal Code and General plan. The scope of the work is to develop a new Car Wash facility and the main noise resources are the blowers (MaxAir Standalone Dryer).

The **Noise generating Land Use** is Car Washes; while the **Noise sensitive land use** is residences. Therefore, the noise at the noise sensitive land must be controlled below 55CNEL (exterior noise requirement).

We approve the noise level in the neighbor is less than 55dBA, which is the exterior noise requirements in the noise zone 1 (residential properties per 9.32.040). We still recommend to install the "silence package" on the blowers to reduce another 10dBA.

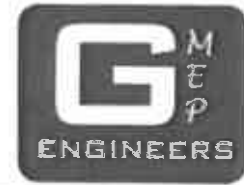
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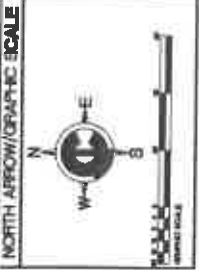
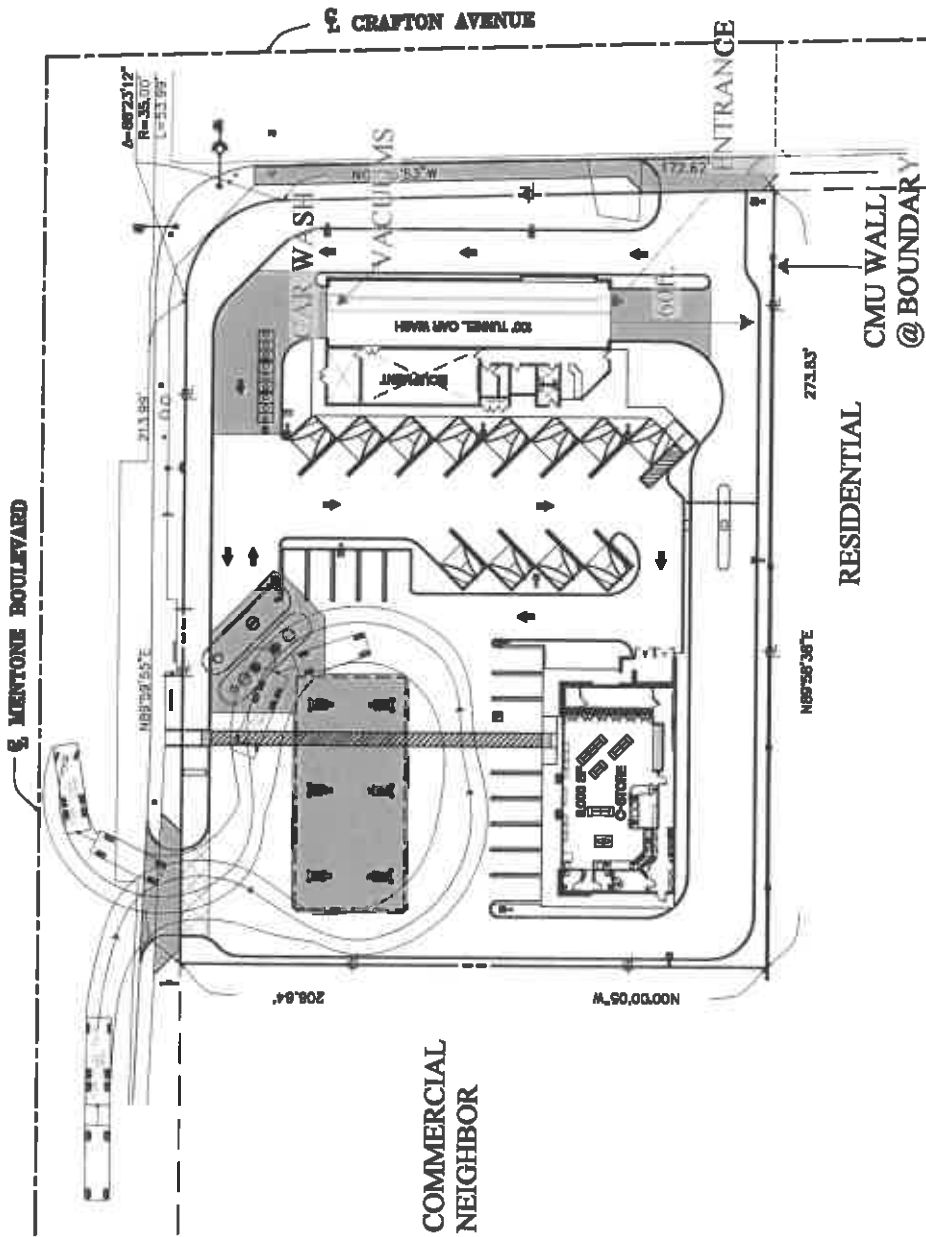
### **1.0 INTRODUCTION**

#### ***1.1 Environmental Settings and Existing Conditions:***

The subject site consists of a car wash tunnel, a convenience store and several fuel dispensers. The site is located at the intersection of Mentone BLVD, and Crafton Ave, in city of Mentone. The major noise source is the Blower.

The **Noise Generating Land use** is classified as car washers while the **Noise Sensitive Land use** is residential at the South which is about 60 feet from the entrance of car wash. There is an existing CMU wall on the property line, which separates the site and the neighbor residences. The site map is shown in Figure 1.1. The satellite picture of the site and its neighborhood is shown on Figure 1.2. The major noise source is the blower for car wash and the vacuum. Refer to site map on Figure 1.1. The noise will propagate freely to the property lines from the car wash to the South line. The noise on this edge must be controlled as directed by the local Municipal Code.

**Figure 1.1**



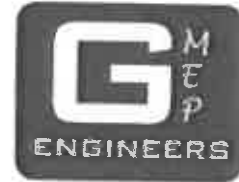
		2020 La Tijera Avenue, Suite 202, Redondo Beach, CA 90277 TEL: 310.591.8888 FAX: 310.591.8889 WWW.DAODESIGN.COM	PROJECT: 18070 DATE: 06/27/18 DRAWN BY: J. COOPER CHECKED BY: J. COOPER SCALE: AS SHOWN
		816 COR MENTONE BLVD. • CRAFTON AVE MENTONE, CA 92251 PROPOSED FLOOR PLAN	SHEET NO: 18070-01 TOTAL SHEETS: 01

**Figure 1.2**



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## **2.0 METHODOLOGY AND EQUIPMENT**

### ***2.1. Noise Calculations and Factors:***

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is based on the sensitivity of that individual, the type of noise that occurs and when the noise occurs.

Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as  $L_{eq}$  represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

figuration

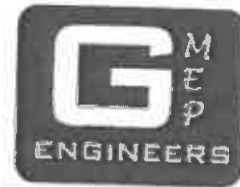
The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sound appears louder.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiate in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as it travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods may be required to reduce noise levels to an acceptable level.

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### **3.0 OPERATIONAL ACTIVITIES**

#### ***3.1 Guidelines for the Determination of Significance:***

The noise levels were evaluated against the local Municipal, which establish the following noise standards:

- A. The following noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

#### **Noise Standards**

<b>Noise Zone</b>	<b>Noise Level</b>	<b>Time Period</b>
1	55 dB(A) 50 dB(A)	7:00 a.m.—10:00 p.m. 10:00 p.m.—7:00 a.m.

- B. It is unlawful for any person at any location within the incorporated area of the city to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level, when measured on any other residential property either incorporated or unincorporated, to exceed:
1. The noise standard for a cumulative period of more than thirty minutes in any hour; or
  2. The noise standard plus five dB(A) for a cumulative period of more than fifteen minutes in any hour; or
  3. The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour; or
  4. The noise standard plus fifteen dB(A) for a cumulative period of more than one minute in any hour; or
  5. The noise standard plus twenty dB(A) for any period of time.
- C. In the event the ambient noise level exceeds any of the five noise limit categories set forth in subsection B1 through B5 of this section, the cumulative period applicable to the category shall be increased to reflect the ambient noise level. Furthermore, the maximum permissible noise level shall never exceed the maximum ambient noise level.



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- D. Each of the noise limits specified in subsection A shall be reduced by five dB(A) for impact or simple tone noises, or for noises consisting of speech or music. (Ord. 923 § 1(F), 1975; Ord. 880 § 5, 1973)

### ***3.2 Potential Operational Noise Impacts:***

This section exams the potential stationary noise source impacts associated with the operation of the car wash. The car wash is assumed to be only operate within the time period between 7:00am to 10:00pm, and the blower noise is the major source but does not "consist entire of impact noise, simple tone noise, speech, music, or combination thereof".

### ***3.3 The model to estimate the noise level for the blower:***

The design of the car wash includes a set of air blowers that dry vehicles as they exit the car wash structure. The noise due to the air blowers can be modeled as a vertical area noise source with dimensions equivalent to the bay dimension (9'Hx10'W) under the assumption that the bay door would remain open. Therefore, Rayleigh Integral can be used to calculate the sound pressure field<sup>[1]</sup>. From the site map, the car wash entrance is facing south. It is 60 feet away from the South property line. The car wash exit is 165 feet away from the South property line. The model was validated by comparing the predicted noise levels with the measured noise levels from one prospective equipment manufacturer's specifications (MAX Air model 1006107). The manufacture's specifications are provided in Appendix A. It was assumed that the entrance door would be left open during use. The result of the model are provided in Table 2 below. The CMU wall at the south property line will attenuate sound, which will provide 40dBA STC rating

**Table 2: Computation model validation**

		dBA AT DISTANCE AT CENTRAL LINE FROM DOOR OPENING			
		10'	20'	30'	40'
Door Open	Entrance	89.0	83.5	81.0	78.5
(Measured)	Exit	93.5	88.5	84.0	81.0
Door Open	Entrance	85.0	84.5	82.3	80.3

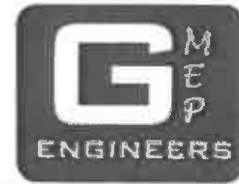
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(Predicted)	Exit	88.7	88.2	86.0	84.0
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By comparing the predicted results and the measured results, it shows in far field (above) the predicted results is higher than the measured results. This is reasonable since we didn't include the acoustic reduction phenomenon for the environment, such as absorption and reflection. Therefore, the predicted value is always higher than the real numbers.

### **3.4 The noise level at property lines:**

Based on the model, the unmitigated noise level at the property boundary due to the car wash is listed in the following table.

**Table 3: Sound level at property lines**

	South (60feet)
Noise level(dBA)	71.12dBA
After 6"CMU wall	31.5dBA

So, at the south boundary adjacent to the residences, the noise level satisfies the city requirements after the 6" CMU wall. However, we still recommend to install the **Silencer Package** on the blowers, which will reduce the noise about 10dBA (Appendix B).

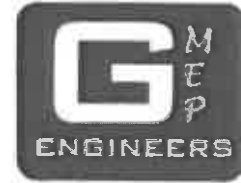
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### **4.0 RECOMMENDATION**

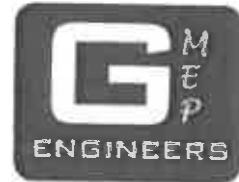
Based on the analysis, the noise level at the property boundary adjacent to the residential area is less than 55dBA, which is required by the local municipal code. The CMU wall is a major factor to attenuate the noise. The engineer still recommend to install "Silence Package" at the blower to further reduce the noise for another 10dBA.

### **5.0 REFERENCES:**

[1]Osama A. B. Hassan, "Building Acoustics and Vibration, Theory and Practice", 2009, pp263

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**6.0 CERTIFICATIONS**

The contents of this report represent an accurate acoustic recommendation for selection of blower for car wash to satisfy the municipal code of the city of Riverside. The report was prepared by Gangyi Zhou, Ph.D., P.E..



Gangyi (Gary) Zhou, Ph.D., P.E.

October 19, 2018

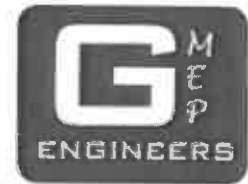
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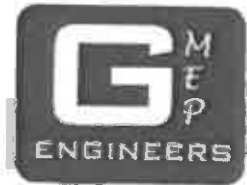


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**Appendix A**  
**Manufacture's specifications**

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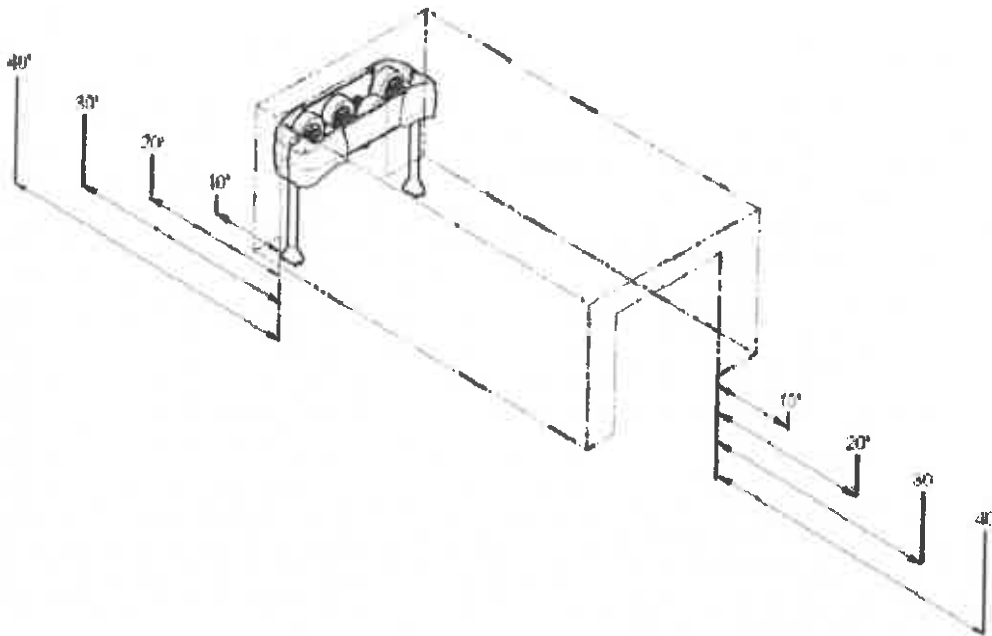
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**Decibel Readings:**

**Test Site Details**

Bay Dimensions: 12'H x 15'W with image package.



**Figure 23 Decibel Readings.**

**Note:** The actual sound level will vary depending on factors including but not limited to the location of the carwash site, type of building, materials used for the site, and size of the building.

DOOR OPEN/CLOSED	ENTRANCE / EXIT	dBA AT DISTANCE FROM DOOR OPENING				
		0'	10'	20'	30'	40'
DOOR OPEN	ENTRANCE	95.5	89.0	83.5	81.0	78.5
	EXIT	101.0	93.5	88.5	84.0	81.0
DOOR CLOSED	ENTRANCE	84.5	74.5	70.0	67.0	64.0
	EXIT	86.5	78.5	71.5	68.5	64.5

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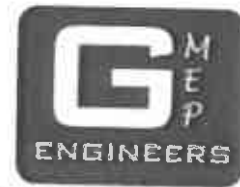
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**Appendix B**  
**Sample Silencer package (Proto-Vestz)**

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## Silencer Package

### GENERAL DESCRIPTION

The Proto-Vest "Silencer Package" was developed to enable our dryers to meet OSHA, federal, state and local noise reduction standards. The OSHA permissible noise exposure is 85 dB for an 8-hour shift. By reducing noise levels into the 70 dB to 80 dB range, you can be assured of a pleasant environment for both your employees and customers. The Silencing Package is a standard feature on all Unouchable dryers, while the Stripper and Windshear driving systems can be equipped with the Silencing Package as an option. Using state-of-the-art materials, which require virtually no maintenance, Proto-Vest has designed three components to comprise the Silencer Package.

- **Blower Inlet:** reduces the noise generated by rapidly moving air being drawn into the blower assembly.
- **Blower-motor Cover:** houses the blower and motor completely to absorb noise emitted from the motor and impeller while providing the assembly additional protection.
- **Riser Can:** absorbs the noise created by the blower, impeller and the movement of the air as it leaves the blower by advancing through the dryer's plenum.

The Silencer Package reduces decibel levels on Proto-Vest dryers on an average of 10 decibels making them approximately 10 times quieter than the un-silenced models!

### DECIBEL LEVEL READINGS

**With Silencer (WS)**      **Without Silencer (WOS)**

#### Windshear InBay - (2) 25hp Dryer:

WS: 10 ft-88 dBA;      WOS: 10 ft-94 dBA  
 WS: 20 ft-82 dBA;      WOS: 20 ft-88 dBA  
 WS: 30 ft-78.4 dBA;      WOS: 30 ft-84.5 dBA  
 WS: 40 ft-76 dBA;      WOS: 40 ft-82 dBA  
 WS: 50 ft-74 dBA;      WOS: 50 ft-80 dBA  
 WS: 60 ft-72.4 dBA;      WOS: 60 ft-78.4 dBA

#### Windshear - 30hp Dryer:

WS: 10 ft-76.9 dBA;      WOS: 10 ft-91 dBA  
 WS: 20 ft-70.9 dBA;      WOS: 20 ft-84.9 dBA  
 WS: 30 ft-67.4 dBA;      WOS: 30 ft-81.4 dBA  
 WS: 40 ft-64.9 dBA;      WOS: 40 ft-78.9 dBA  
 WS: 50 ft-63 dBA;      WOS: 50 ft-77 dBA

#### Windshear II - (2) 30hp Dryer:

WS: 10 ft-88 dBA;      WOS: 10 ft-99 dBA  
 WS: 20 ft-81.9 dBA;      WOS: 20 ft-92.9 dBA  
 WS: 30 ft-78.4 dBA;      WOS: 30 ft-89.4 dBA  
 WS: 40 ft-75.4 dBA;      WOS: 40 ft-86.9 dBA  
 WS: 50 ft-74 dBA;      WOS: 30 ft-85 dBA

#### TopShot - 30hp Dryer:

WS: 10 ft-76.9 dBA;      WOS: 10 ft-91 dBA  
 WS: 20 ft-70.9 dBA;      WOS: 20 ft-84.9 dBA  
 WS: 30 ft-67.4 dBA;      WOS: 30 ft-81.4 dBA  
 WS: 40 ft-64.9 dBA;      WOS: 40 ft-78.9 dBA  
 WS: 50 ft-63 dBA;      WOS: 50 ft-77 dBA

#### TopShot II - (2) 30hp Dryer:

WS: 10 ft-88 dBA;      WOS: 10 ft-99 dBA  
 WS: 20 ft-81.9 dBA;      WOS: 20 ft-92.9 dBA  
 WS: 30 ft-78.4 dBA;      WOS: 30 ft-89.4 dBA  
 WS: 40 ft-75.4 dBA;      WOS: 40 ft-86.9 dBA  
 WS: 50 ft-74 dBA;      WOS: 30 ft-85 dBA

#### TailWind - (1) 25hp Dryer:

WS: 10 ft-85 dBA;      WOS: 10 ft-91 dBA  
 WS: 20 ft-79 dBA;      WOS: 20 ft-85 dBA  
 WS: 30 ft-75.3 dBA;      WOS: 30 ft-81.5 dBA  
 WS: 40 ft-73 dBA;      WOS: 40 ft-79 dBA  
 WS: 50 ft-71 dBA;      WOS: 30 ft-77 dBA

#### SideShot - 15hp Dryer:

WS: 10 ft-74.3 dBA;      WOS: 10 ft-82.9 dBA  
 WS: 20 ft-68.5 dBA;      WOS: 20 ft-76.9 dBA  
 WS: 30 ft-64.9 dBA;      WOS: 30 ft-73.4 dBA  
 WS: 40 ft-62.4 dBA;      WOS: 40 ft-70.9 dBA  
 WS: 50 ft-60.5 dBA;      WOS: 50 ft-69 dBA

#### SideShot II - 30hp Dryer:

WS: 10 ft-76.9 dBA;      WOS: 10 ft-91 dBA  
 WS: 20 ft-70.9 dBA;      WOS: 20 ft-84.9 dBA  
 WS: 30 ft-67.4 dBA;      WOS: 30 ft-81.4 dBA  
 WS: 40 ft-64.9 dBA;      WOS: 40 ft-78.9 dBA  
 WS: 50 ft-63 dBA;      WOS: 50 ft-77 dBA

#### 90N/90XS - 15hp Dryers:

WS: 10 ft-74.5 dBA;      WOS: 10 ft-82.9 dBA  
 WS: 20 ft-68.5 dBA;      WOS: 20 ft-76.9 dBA  
 WS: 30 ft-64.9 dBA;      WOS: 30 ft-73.4 dBA  
 WS: 40 ft-62.4 dBA;      WOS: 40 ft-70.9 dBA  
 WS: 50 ft-60.5 dBA;      WOS: 50 ft-69 dBA

#### IP230 - 30hp Dryer:

WS: 10 ft-76.9 dBA;      WOS: 10 ft-91 dBA  
 WS: 20 ft-70.9 dBA;      WOS: 20 ft-84.9 dBA  
 WS: 30 ft-67.4 dBA;      WOS: 30 ft-81.4 dBA  
 WS: 40 ft-64.9 dBA;      WOS: 40 ft-78.9 dBA  
 WS: 50 ft-63 dBA;      WOS: 50 ft-77 dBA  
 (Proto-Vest's Silencing Package is standard on all of the Unouchable series.)

#### IP345 - 45hp Dryers:

WS: 10 ft-76.9 dBA;      WOS: 10 ft-91 dBA  
 WS: 20 ft-70.9 dBA;      WOS: 20 ft-84.9 dBA  
 WS: 30 ft-67.4 dBA;      WOS: 30 ft-81.4 dBA  
 WS: 40 ft-64.9 dBA;      WOS: 40 ft-78.9 dBA  
 WS: 50 ft-63 dBA;      WOS: 50 ft-77 dBA  
 (Proto-Vest's Silencing Package is standard on all of the Unouchable series.)

\*Specifications subject to change without notice.  
 NOTE: Proto-Vest dryer's dimensions will vary with the Silencer Package.

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 Fax: 623-872-6150  
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Proto-Vest