

# PPI



## **MRC noise reduction project RPDA.213**

### **1998**

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**MEAT & LIVESTOCK**  
A U S T R A L I A

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## INTRODUCTION

The OHS Best Practice project, funded by the Meat Research Corporation (MRS) has identified that occupational noise is a priority area for research. A range of legislation in Australia requires employers to demonstrate their duty of care to employees by controlling their exposure to occupational noise.

Due to a range of factors, reduction of the noise levels in abattoirs has been difficult to achieve. As a result, most meat workers are required to wear hearing protection whilst performing their jobs. While the wearing of hearing protection may be seen as being a convenient solution, the legislation views such use as being an interim measure only.

The legislation requires employers to either eliminate the noise at source, or isolate it from the meat workers in preference to requiring the workers to wear hearing protection.

With the legislation in mind, this project was targeted at three noise sources identified by previous research (MRC:Noise Control for Abattoirs (1995)). These were noise from:-

1. Air powered knives
2. Impact onto stainless steel benches
3. Impact of hooks and rails

In consultation with suppliers of noise reducing initiatives, and a sample of 6 abattoirs across Australia, a variety of noise reduction devices were evaluated.

These initiatives have been subjected to laboratory evaluation, and to limited field evaluations. Further evaluations in abattoirs will be required to ensure that the initiatives are not only good for noise reduction but are also acceptable from other perspectives. These include issues such as:-

- durability
- cleaning properties
- impact on productivity
- maintenance requirements

These items would be part of a longer evaluation study. Two additional noise sources were also identified during the course of this study. These were:-

- impact noise in bone chutes
- air release from vacuum sealing machines

This should be included as any further studies on noise in abattoirs.

## OBJECTIVES

1. To measure the current noise levels in abattoirs for the three targeted issues. These were:-
  - air powered knives
  - impact on stainless steel
  - hook and rail noise
2. To identify engineering controls that could assist in reducing the noise at source.
3. To redesign or adapt the engineering controls to meet the needs of the meat industry.
4. To evaluate the noise levels produced once the engineering controls are in place.
5. To conduct validation trials of the noise controls in a sample of abattoirs.
6. To consult with operators and supervisors to determine their feedback on the proposed controls.

# METHODOLOGY

## 1. Initial Noise Measurements

- 1.1 Initial measurements of the target areas were conducted at abattoirs in Victoria, NSW and Queensland.
- 1.2 Measurements were compared with:-
- Victorian OH & S (Noise) Regulations 1992
  - NSW OH & S (Noise) Regulations 1996
  - Queensland Workplace Health & Safety (Noise) Compliance Standard (1995)
  - AS1269:11998 Occupational Noise Management Part 1: Measurement and assessment of noise emission and exposure.
- 1.3 All measurements were taken at positions equivalent to the ear level of the operator.
- 1.4 Equipment used to assess the noise was :-
- A CEL-593C1 Type 1 Real Time Sound Level Analyser. This meter was NATA calibrated by Testronix (Aust) Pty Ltd on 9<sup>th</sup> March 1998.
  - Field calibration was conducted by a CEL-284/2 Type One calibrator. This was calibrated by Testronix (Aust) Pty Ltd on 23<sup>rd</sup> November 1997.

## 2. Noise Control Trials

Different types of noise control equipment which may have suitable noise reduction properties for these trials were identified in Australia, New Zealand, Italy, the United States and Sweden. The suppliers and products were:-

ISSUE	SUPPLIERS	INTRODUCED PRODUCTS
Air Exhaust Noise Trial – Noise Reducing Nozzles	Silvent AB, Sweden [Spray Nozzle Engineering Pty Ltd (03) 9583 2368]	705 Blowing Nozzle attached to Jarvis and Bettcher knives either by specially made 45° elbow adaptors or by a stand-mounted 3 meter long hose.
Air Exhaust Noise Trial – Mufflers	Allied Witan Company, USA [Q Air Pty Limited (03) 9706 6155]	MO2 and MO5 Mufflers attached to the different hoses.
Air Exhaust Noise Trial – Fittings	CEJN, Sweden [J & B Sales Pty Ltd (03) 9583 0177]	320 Series fittings used to attach knives to the different hoses.
Air Exhaust Noise Trial – Hoses	Ragno, Italy [Q Air Pty Limited]	Ragno PU flexible polyurethane hose.
Surface Impact Noise Trial	DG Latimer & Associates (Aust) Pty Ltd [(03) 9318 1011]	ACOUSTOP Vibradamp CLD Tiles affixed to the underside of a specially made boning table top.

The Air Exhaust Noise Trials compared the noise levels generated by the two different air knives;

- with no muffler attached
- with a manufacturer supplied muffler attached, and
- with one or other of the different modification combinations attached.

The Surface Impact Noise Trial compared the noise levels generated by the same four sets of bones dropping from different heights firstly onto the dampened boning table top, and then onto the normal boning table top.

The Hook and Rail Noise Trial investigated the noise levels of modifications already in place at various abattoirs.

# RESULTS

## SECTION ONE: Air Knives

### 1.1 Jarvis Dehider



Figure 1: Jarvis dehider knife in use.

## Jarvis Noise Levels – before noise modifications

Table 1 summarises the noise measurements taken of the Jarvis Dehider at various abattoirs across Australia.

Abattoir	Beef/Sheep/Pig Line & Position	L <sub>Aeq</sub> dB(A)	SPLF Max – dB(A)	dB(Lin)
Abattoir (A)	Sheep – 2 knives, 6 carcasses	93.4	102.2	114.0
	Beef – on dehiding platform, 6 carcasses	93.9	104.0	115.9
	Beef – second leg	93.2	101.3	113.2
	Beef – first leg elevated platform	90.8	99.0	110.5
Abattoir (B)	Beef – flanking	95.6	101.4	114.8
	Beef – dehider platform	91.5	101.0	115.7
Abattoir (C)	Running no load microphone 10cm from exhaust port	99.2	100.5	117.6
	Beef – rump	96.4	101.7	115.1
	Beef – flank between 2 knives	94.1	100.0	114.5
	Beef – second leg	92.3	97.1	112.2
	Beef – dehider lift platform	97.5	100.9	113.3
	Beef – dehider platform	93.7	102.7	118.7
Note: Unless stated otherwise, these measurements were taken near the ear position of the Jarvis knife users.				

Table One: Summary of noise measurements from Jarvis knife before modifications.



## Jarvis Dehider – noise readings after modifications

Table 2 summarises the results of trials undertaken after various modifications were implemented. The following photographs show how the modifications differ from the current tool.

Figure 2: Jarvis Dehider with manufacturer supplied Allied Witan end flow muffler.

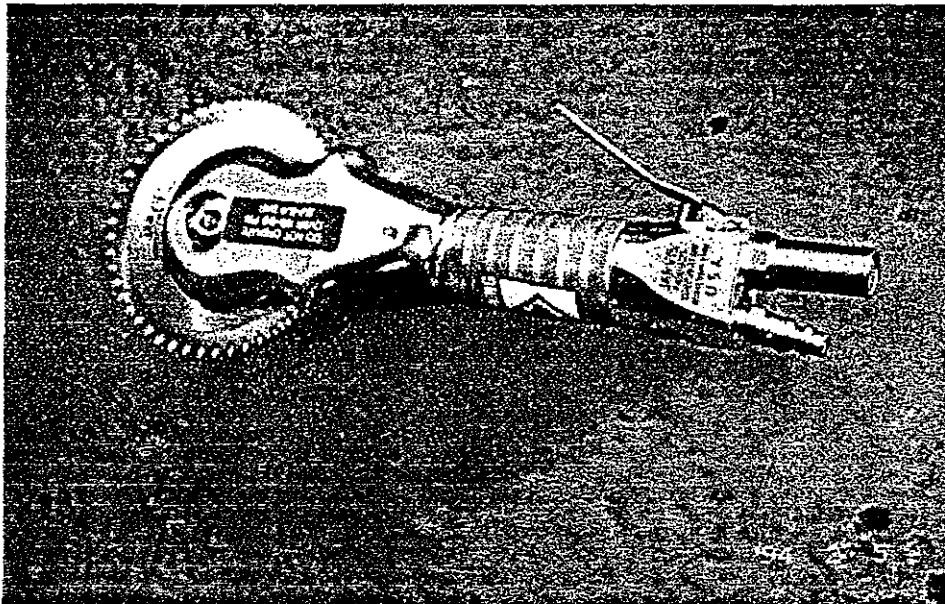


Figure 3: Jarvis dehider with 45° elbow mounted Silvent 705 muffler and CEJN320 inlet fitting.

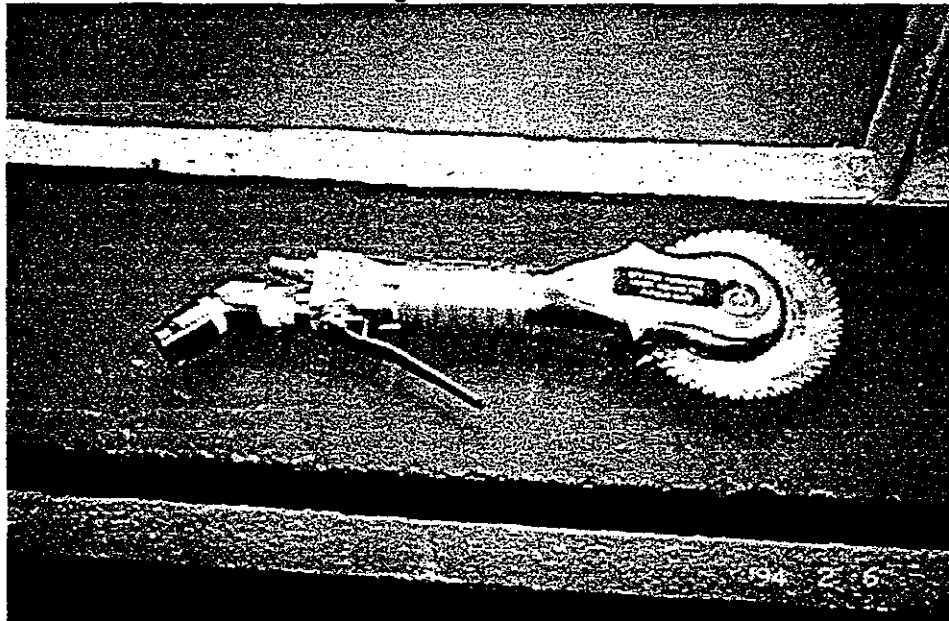


Figure 4: The Allied Witan M02 and M05 mufflers. The M02 is smaller.

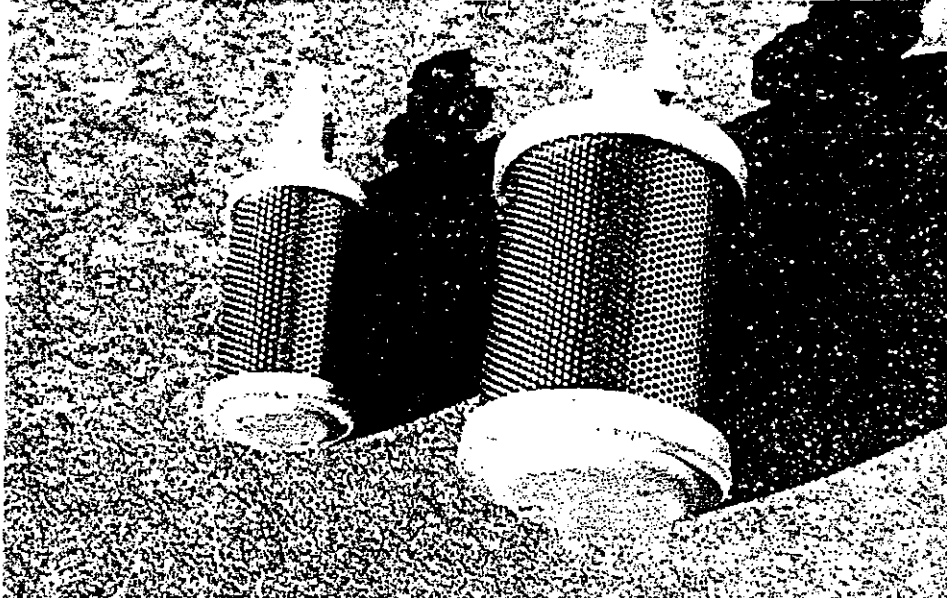
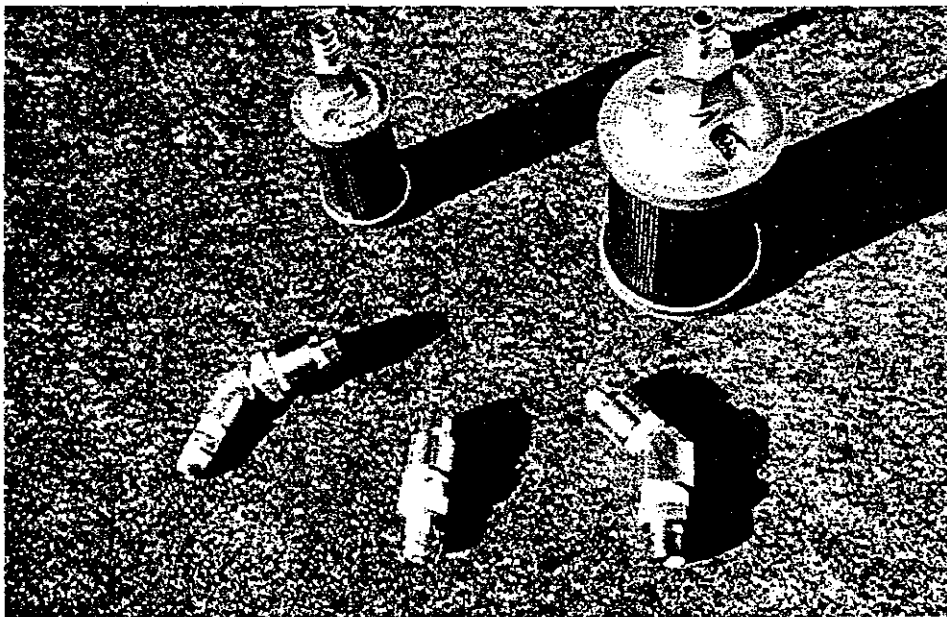


Figure 5: All five muffler types. Allied Witan units at top. 3 Silvent 705 variants below.



**Tool: Jarvis Dehider JC111A**

Hose and Fittings details: Except where noted, CEJN-320 series fittings (as used at Mid Coast). 7.2mm inside diameter.  
10mm inside diameter Ragno PU flexible polyurethane hose.

Measurement Type	Oscillations per minute	Pressure (p.s.i.)	Leq dB(A)	SPLF Max dB(A)	Linear Peak dB(Lin)
No muffler attached	6600	50	94.5	100.1	104.0
Manufacturer's muffler	6500	50	87.1	90.6	102.1
Silvent 705 on short attachment	6500	50	83.2	86.3	98.5
Allied Witan MO2 three meter hose	5800	50	80.0	82.3	84.1
Allied Witan MO5 three meter hose	6100	50	80.3	81.7	84.1
Silvent 705 three meter hose	5500	50	80.0	80.7	84.1
Other Hansen fitting	6350	50	81.7	82.3	84.1

Table 2: Results of modifications to Jarvis Dehider in laboratory trials.

Other data:

1. Note background noise level during these measurements was 54.2 dB(A).
2. The blades seem to have an inherent noise level floor of @ 80.0 dB(A) during no load operation.
3. The reduction noted between the two Silvent measurements is due to the air flow restricting narrowness of the three meter hose used for the second measurement.

### Jarvis Dehider – Abattoirs validation trial

The following noise readings were taken at an abattoir where 17 Jarvis Dehiders are operated. The readings were taken whilst the units were operated at 82 p.s.i, as measured by a Norgren Regulator.

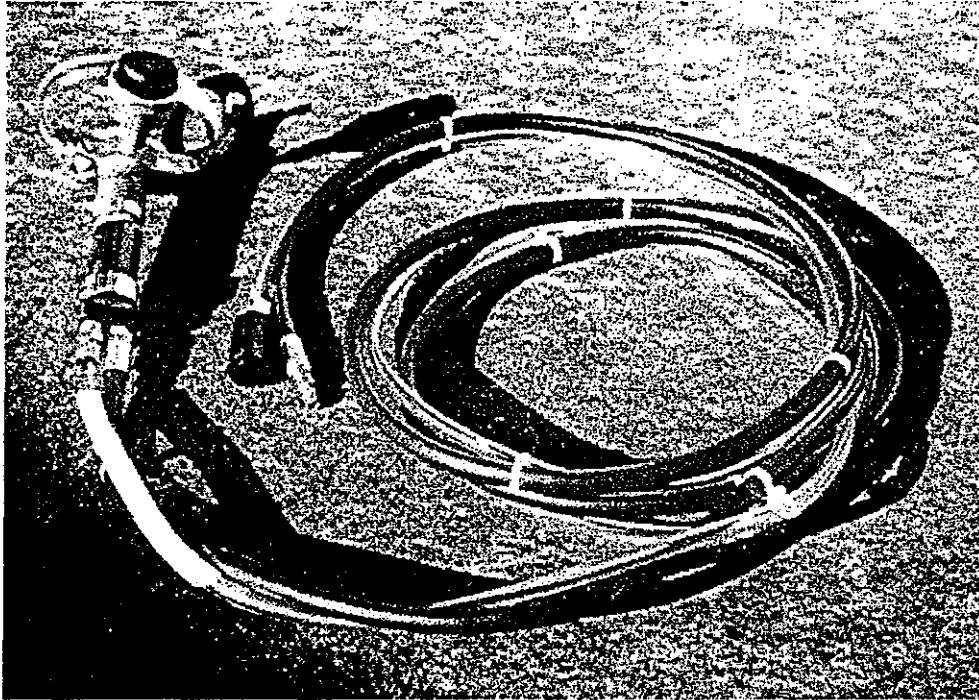
<b>TRIAL</b>	<b>LEQ</b>	<b>SPLF Max</b>	<b>Linear Peak</b>
No Muffler	103.8	108.5	116.7
Jarvis Muffler	95.2	97.0	110.3
Silvent 705 muffler	94.1	95.1	111.2

Table 3: Noise readings from Jarvis Dehider used in abattoirs environment.

Note: These trials were conducted on older model Jarvis Dehiders designed to run on air supplied at 90 p.s.i. It is noted that the latest models are designed to run at 50 p.s.i.  
Hence, the laboratory data is probably more indicative of the potential Noise reductions than the validation trial data.

## 1.2 Bettcher Whizard Knife

Figure 6: Bettcher Whizard knife with both hoses attached. Note black muffler on coiled end of clear hose.



**Bettcher Whizard Knife: Before Noise Modifications**

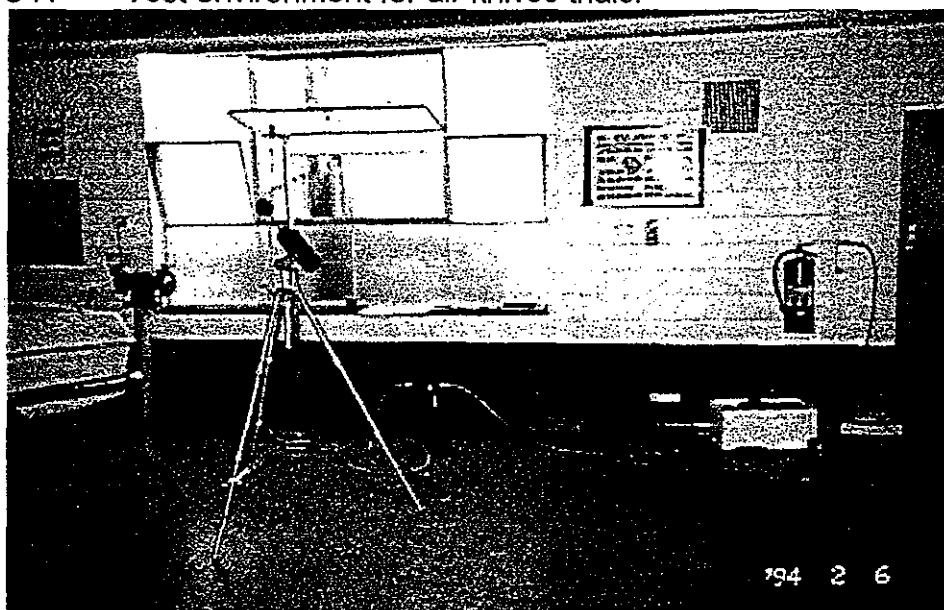
Table 4 summarises the results of the noise measurements taken before modifications were made to the Bettcher knife.

ABATTOIR	Leq dB(A)	SPLF Max dB(A)	dB(Lin)
Meat Works (C)	84.0	93.9	107.6

Table 4: Measurement of Bettcher Whizard knife before modifications.

A number of trials were conducted for the Bettcher Knife in a laboratory environment as shown in figure 7.

Figure 7: Test environment for air knives trials.



**Bettcher Whizard Knife: After modifications noise readings**

Figure 8: Bettcher Whizard knife with 45° elbow mounted Silvent 705

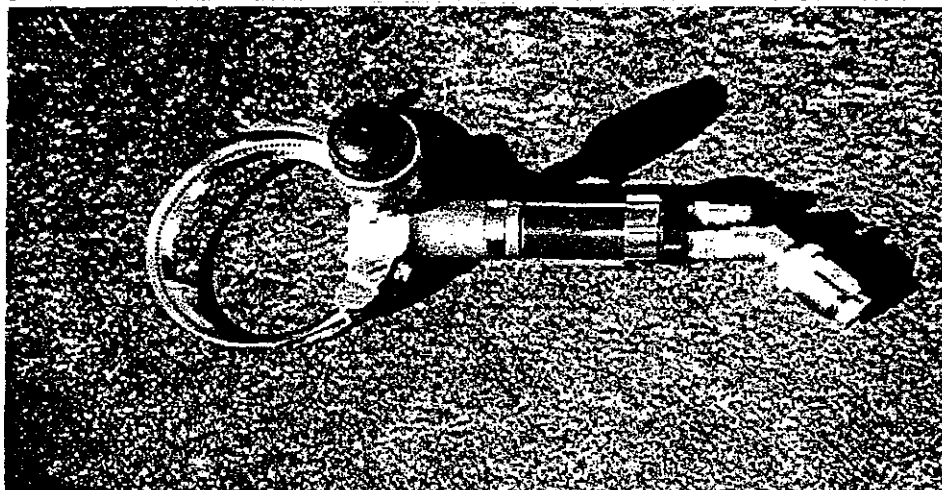


Figure 9: An Allied Witan MO5 muffler disassembled

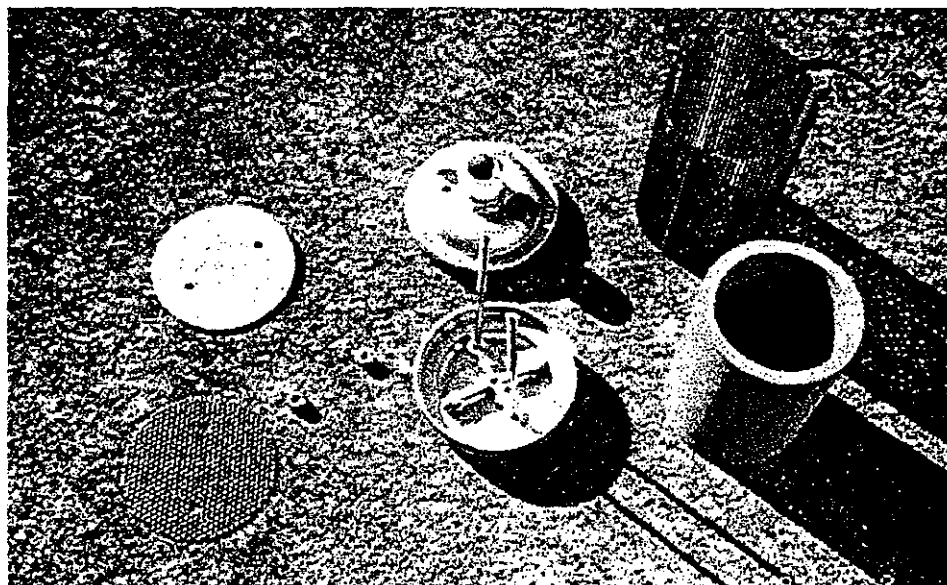


Table 5 summarises the results for the Bettcher knife after noise reducing modifications.

**Tool:** Bettcher Whizard Model 1300UZ

Hose and fitting details: Except where noted, CEJN-320 series fittings (as used at Mid Coast) 7.2mm inside diameter. 10mm inside diameter Ragno PU flexible polyurethane hose.

Measurement Type	Revolutions per minute	Pressure (p.s.i.)	Leq dB(A)	SPLF Max dB(A)	Linear Peak dB(Lin)
No muffler attached	1260	90	106.0	110.1	116.7
Manufacturer's muffler – CEJN320	959	90	73.4	76.4	98.4
Silvent 705 on short attachment	1134	90	82.8	86.8	98.9
Allied Witan M02 three meter hose	1040	90	75.9	78.2	92.7
Allied Witan M05 three meter hose	1079	90	75.8	81.3	96.2
Silvent 705 three meter hose	1050	90	74.3	78.0	90.7
Other: Bettcher hose used with Hansen fittings	897	90	73.2	75.9	91.8

Table 3: Results from modifications to Bettcher Whizard knife.

Other data:

Please note that the Bettcher handbook does not give any operational speed information, either loaded or unloaded.

Note: Appendix One provides technical information on these tools and adaptors provided by their manufacturers.



**SECTION TWO:                    Stainless Steel Benches**

The results of the trials in dropping bones onto stainless steel benches are provided in Tables 6 and 7.

**(A)    Untreated Stainless Steel**

BONE TYPE	500MM DROP HEIGHT		1 METRE DROP	
	SPLF Max	Lin Peak	SPLF Max	Line Peak
Leg	92.6	118.2	90.1	103.3
Head	91.5	110.5	100.0	123.4
Shoulder	89.9	104.8	91.9	105.9
Rib	86.8	104.3	91.2	117.6

Table 6:        Results from trials on treated stainless steel table tops.

**(B)    Treated Stainless Steel**

BONE TYPE	500MM DROP HEIGHT		1 METRE DROP	
	SPLF Max	Lin Peak	SPLF Max	Line Peak
Leg	106.9	120.3	109.9	122.7
Head	107.4	123.7	110.1	124.1
Shoulder	105.0	116.3	110.7	123.9
Rib	100.8	119.4	106.2	121.5

Table 7:        Results from trials on untreated stainless steel table tops.

It is evident from these trials that the noise dampening properties of the treated stainless steel reduces the noise levels significantly.

The manufacturer and supplier of "Acoustop Vibradamp" is :-

D.G. Latimer & Associates (Aust) Pty Ltd  
11-17 Park Street,  
Footscray Victoria 3011  
Telephone: (03) 9318 1011  
Fax:            (03) 9318 1411

Contact: Mr Richard Latimer

Figures 10 and 11 show the stainless steel benches constructed for this trial.

Figure 10: Untreated Stainless Steel bench.

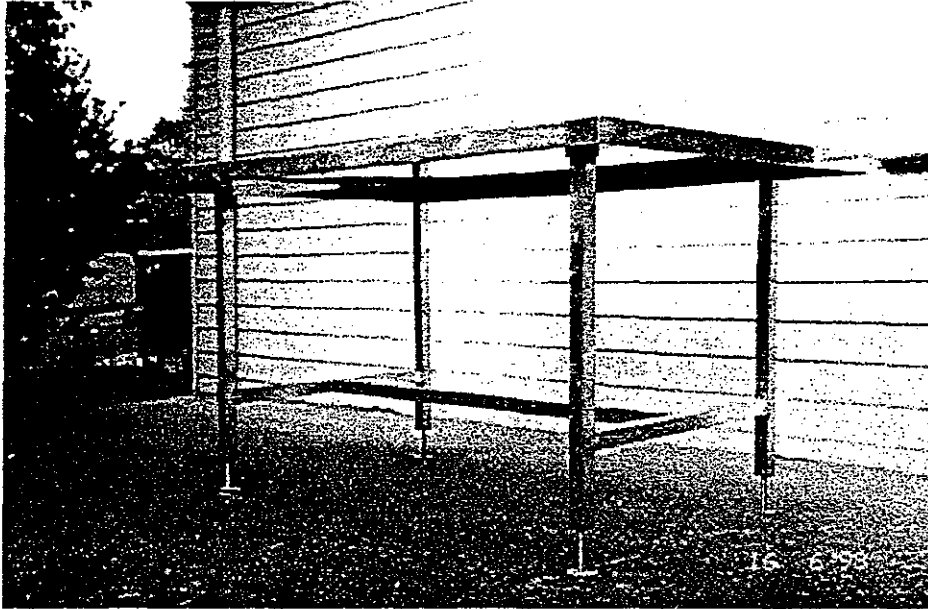
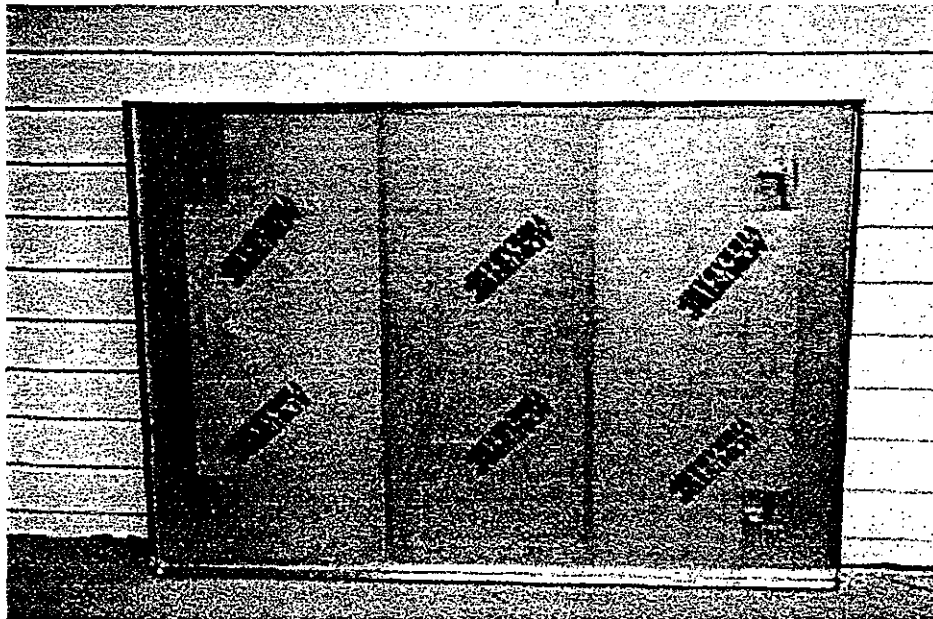


Figure 11: Treated Stainless Steel table top.



A brochure on Acoustop Vibradamp is provided in Appendix One.

## SECTION THREE:

Hook and Rail Noise

TREATMENT	RESULT		
	Leq dB(A)	SPLF Max dB(A)	dB(Lin)
1. (a) Plastic surface of rails used in chillers at Bunge Meat Industries.	80.2	83.0	98.6
(b) Nearby unprotected rail surface for comparison	88.4	96.5	107.2
2. (a) Polypropylene facing of shackle return rail.	87.5	98.3	112.9
(b) Untreated facings to shackle return rail.	93	N/A	121.8
3. Plastic hooks from All Care suppliers used for small stock.	<ul style="list-style-type: none"> <li>• These hooks virtually eliminate the contact noise of hook to hook compared to steel hooks.</li> <li>• Cleaning of plastic hooks is much simpler due to need</li> </ul>		
4. Use of polypropylene and rubber at end of hook rail to absorb noise.	<ul style="list-style-type: none"> <li>• Works adequately for single hooks but does not reduce hook to hook noise.</li> </ul>		
5. Aluminium hooks	<ul style="list-style-type: none"> <li>• The use of aluminium hooks that fit over rails and fitted with a nylon segment under the rail can provide effective noise reduction.</li> </ul>		
6. Screw feed rails	<ul style="list-style-type: none"> <li>• Rather than a sloping rail to let hooks slide quickly down to a collection point, utilise a screw feed descent which slows the hooks and reduces impact noise at the bottom.</li> </ul>		

Table 8: Summary of results in relation to hook and rail noise.

The supplier of All Care plastic hooks is:-

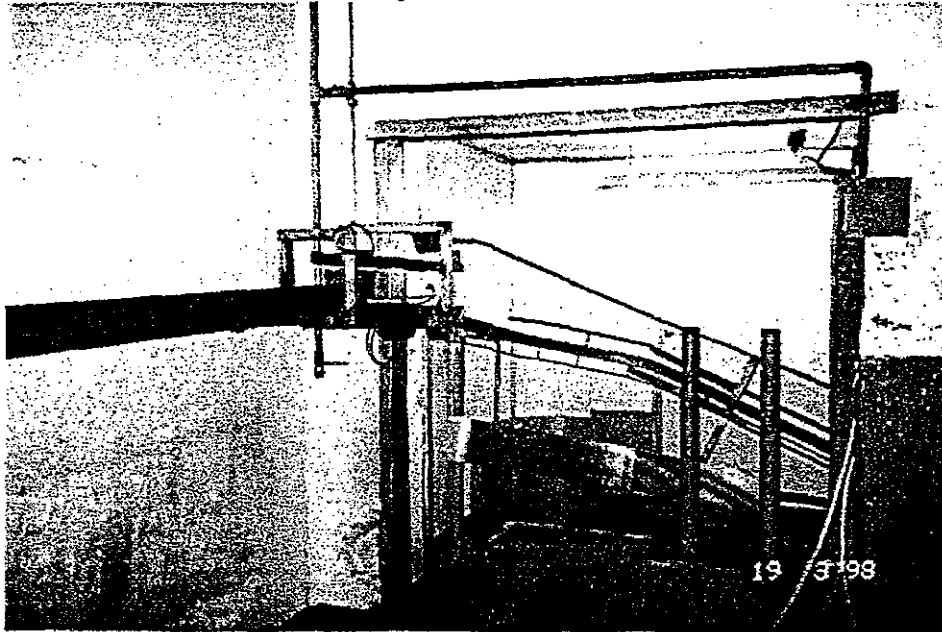
All Care, Nunawading, Victoria.  
 Tel: (03) 9894 4488  
 Fax: (03) 9894 2442

Contact: Maurice Smith,

Figures 12 – 17 show a range of hook and rail configurations with the relevant noise readings identified.

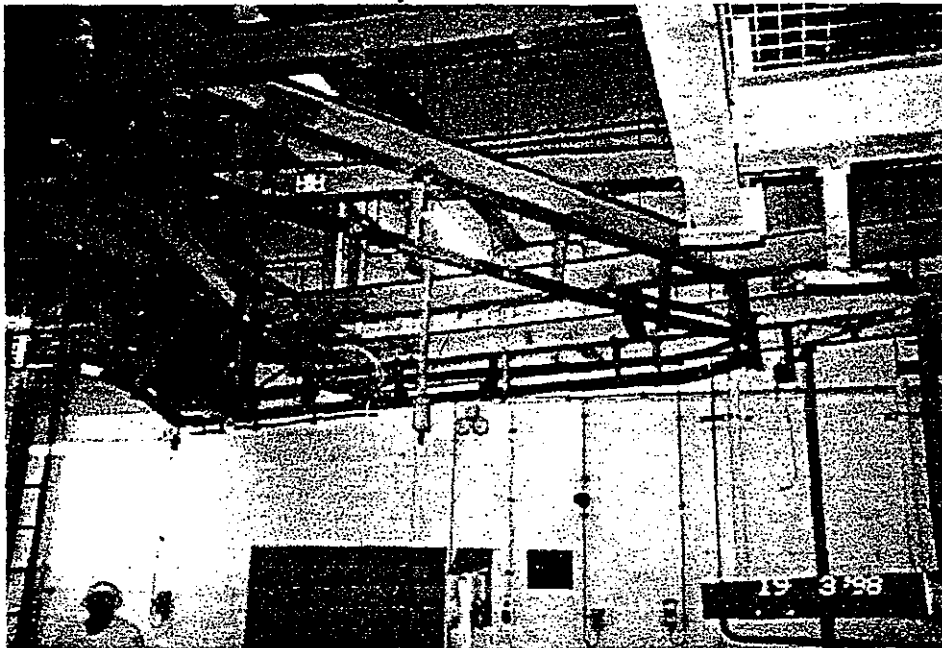
$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
95.4	108.8	123.3

Figure 12: Beef rail descending between floors.



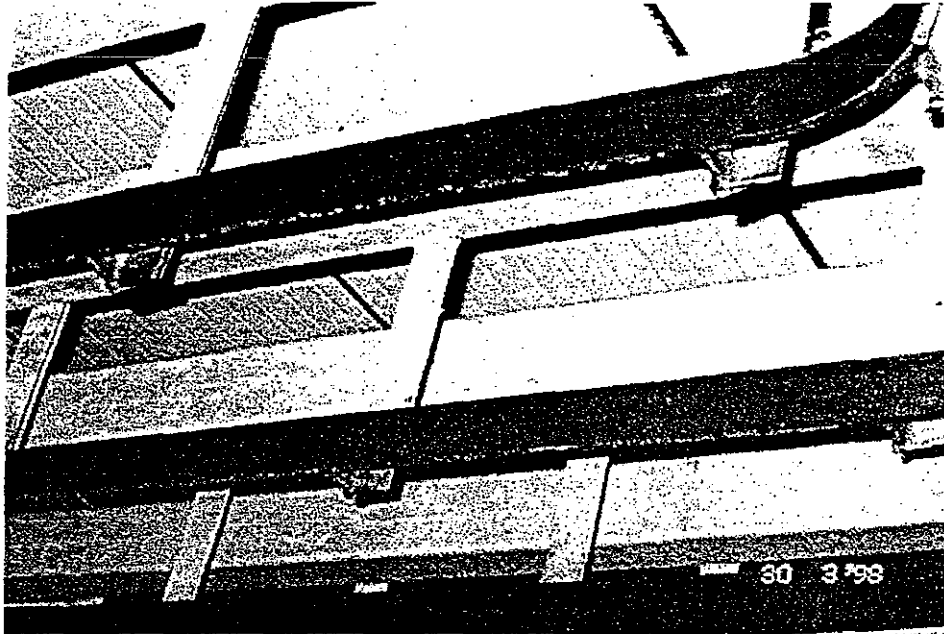
$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
88.4	97.8	111.5

Figure 13: Curved corner rail system.



$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
88.4	96.5	107.2

Figure 14: Bare metal rails in chiller.



$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
80.2	83.0	98.6

Figure 15: Plastic surfaced rails in same chiller as Figure 14.

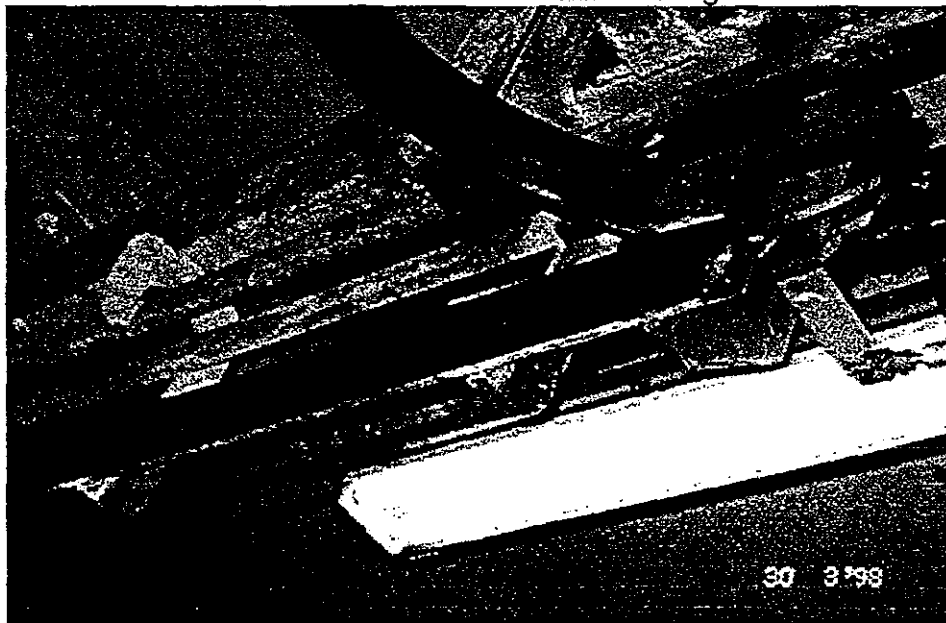
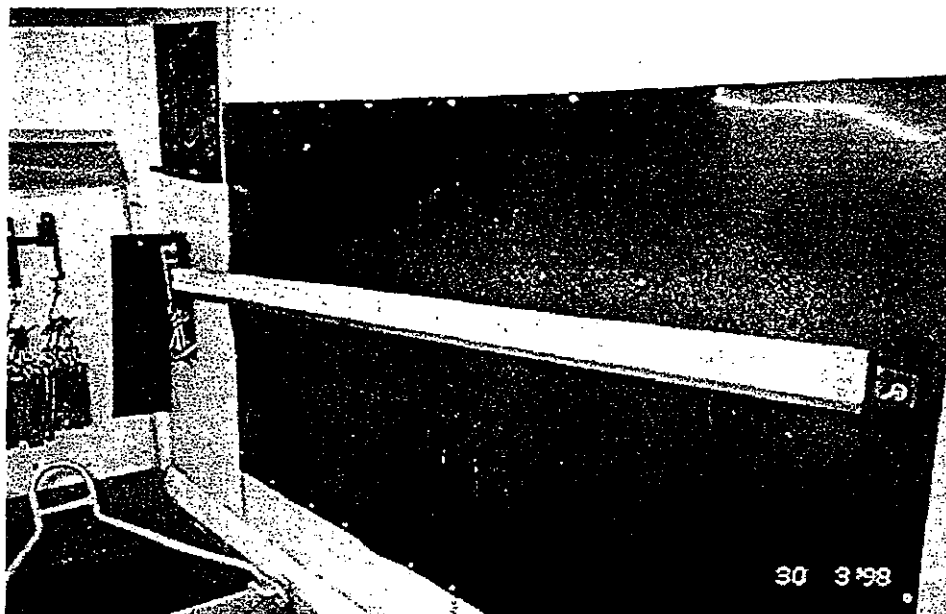


Figure 16: Polypropylene facing mounted on shackle return to absorb noise. As animal noise in the stickhole area was greater than hook noise, no valid readings were possible.



<b>L<sub>Aeq</sub> dB(A)</b>	<b>SPLF Max – dB(A)</b>	<b>dB(Lin)</b>
87.5	98.3	112.9

Figure 17: Polypropylene facing on shackle return room rail. Pre-facing noise levels were 93dB(A) and 121.8dB(Lin) in this room.



## SECTION FOUR:

## Other Noise Sources

### 4.1 Vacuum Sealing Machines

A range of machines are now used in some abattoirs' boning rooms to seal cuts of meat in vacuum sealed packs. Some of these machines incorporate air streams to blow water off the sealed packs. The air streams have been identified as an important noise source.

Indicative noise levels measured at three different abattoirs were:

Boning Room	LAeq dB(A)	SPLF Max	Linear Peak dB(Lin)
Abattoir A	89.2	103.9	117.9
Abattoir B	93.0	97.1	110.6
Abattoir C	94.7	100.2	115.1

### 4.2 Chute Noise

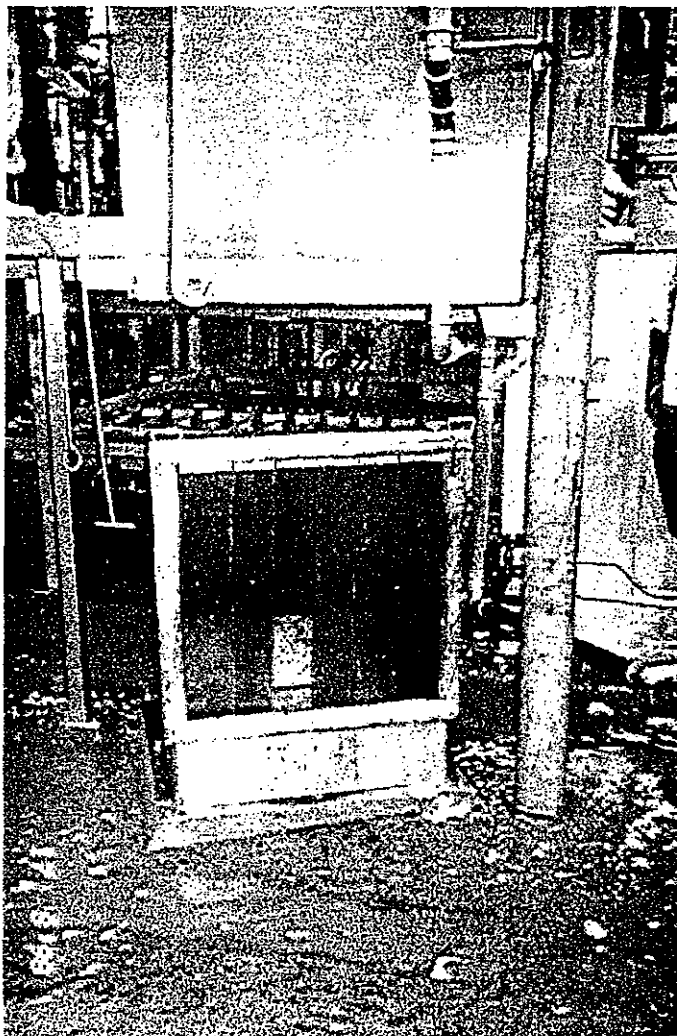
A high level of impact noise was identified when bones are tipped into stainless steel bone disposal chutes.

Figures 18-20 provide noise reading from a variety of chute designs together with photographs of these chutes.



$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
99.0	105.8	123.4

Figure 18: Stainless chute used for head disposal.

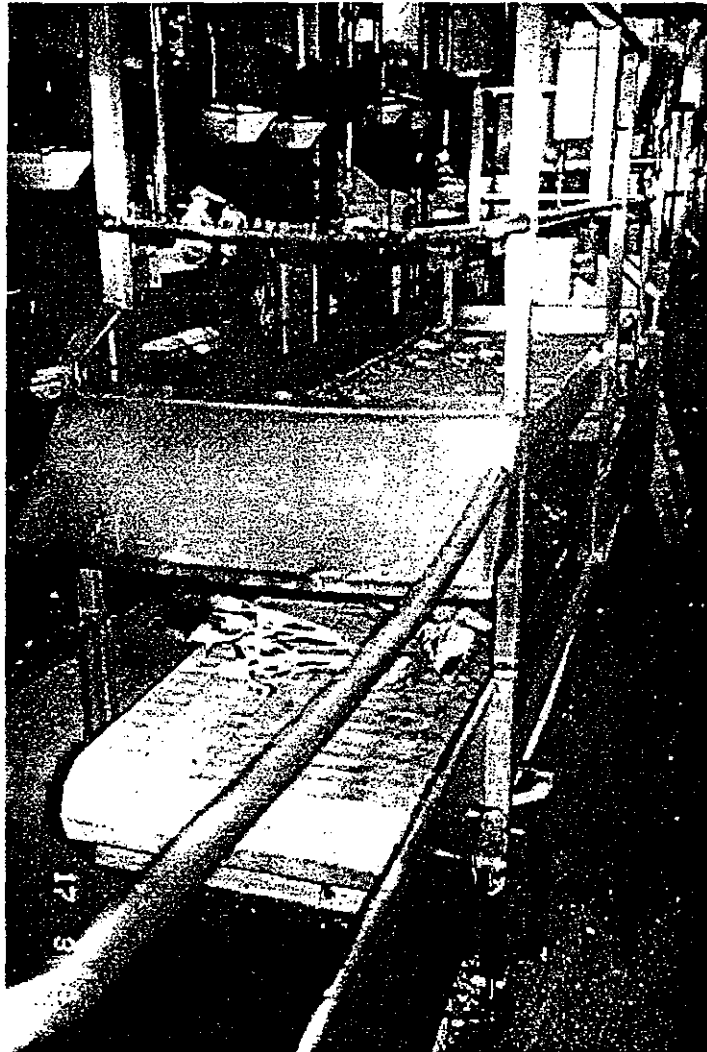


Note: Some abattoirs bolt 6mm insertion rubber around this style of chute to dampen noise. Other options require evaluations.

Figure 19 and 20 show typical boning room exit chute from bone conveyor.

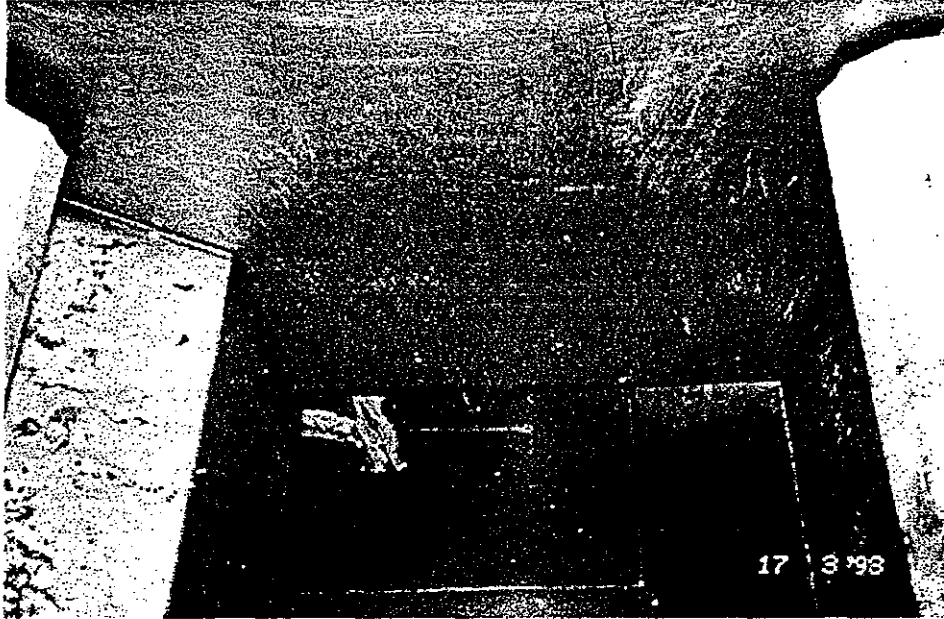
$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
97.7	103.9	117.3

Figure 19: Boning room chute entry conveyor.



$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
97.7	103.9	117.3

Figure 20: Stainless exit chute from boning room conveyor into bone processing area below boning floor.



### 4.3 Other Issues

Rib saws also known as scribe saws, were also found to provide excessive noise. These were not included in this current project but would warrant further investigation. The results of the initial measurements are shown in Table 9.

Abattoir	Beef/Sheep/Pig Line & Position	$L_{Aeq}$ dB(A)	SPLF Max – dB(A)	dB(Lin)
Abattoir (B)	Beef – ribs being cut	99.7	104.9	117.3
	Beef – ribs background noise level	86.0	95.0	110.3
Abattoir (D)	Beef – used on carcasses in chillers 1 metre from exhaust	99.6	103.7	115.3
	Beef – at ear level	100.5	102.7	114.8

Table 9: Rib saw noise measurements.

Figure 21: Rib saw used at some Abattoirs

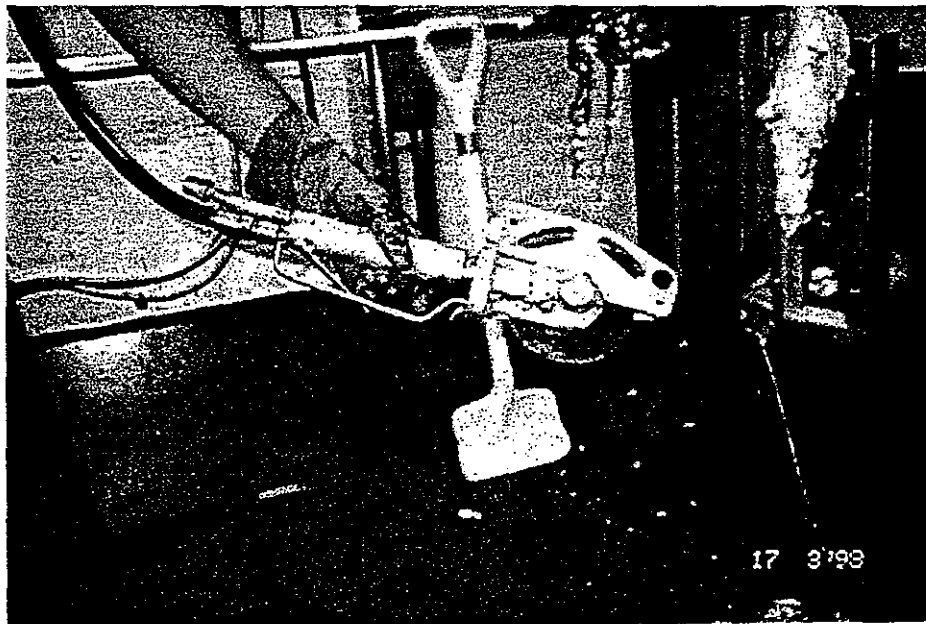


Figure 22: Rib saw in use



## CONCLUSION

This project has found that engineering modifications can effectively reduce the noise levels in abattoirs through a range of simple innovations. Details are provided in this report of initiatives to reduce noise from:-

- air powered
  - Jarvis Dehider knife
  - Bettcher Whizard knife
- impact onto stainless steel benches
- impact with hooks and rails

A range of further areas for noise reduction were also identified. These were:-

- air exhaust from vacuum sealing machines
- impact noise in bone chutes
- noise from rib saws

We would like to thank the participating abattoirs and tool suppliers for their co-operation. We also thank the Meat Research Corporation and the OHS Best Practice Project for funding this research.



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**David Caple**  
**David Caple & Associates Pty Ltd**  
**Project OH & S Consultant**

Enc.

**APPENDIX ONE**

**Technical data on air knife exhaust filters,  
airhose connectors and acoustic dampening material.**

## SPECIFICATIONS

### Model JC IIIA

Motor Power	0.55HP ≈ 410W	
Operating Pressure	45 PSI	3.1 bar
	90 PSI	6.2 bar
Air Consumption	12 CFM	0.34 m <sup>3</sup> /min
Blade Speed (in oscillations)	6500-7000/min	
Control Handle	Single Pneumatic Trigger	
Blade Diameters	3.9 in	100 mm
	4.3 in	110 mm
Overall Length	13 in	330 mm
Weight	2.9 lbs	1.3 kg

## INSTALLATION INSTRUCTIONS

### 1 Make the necessary air connection.

1.1 The required compressed air supply is 45-50 PSI, 12-14 CFM (3.1-3.4 bar, 34-37 m<sup>3</sup>/min) or 90 PSI, 10 CFM (6.2 bar, 0.37 m<sup>3</sup>/min). See page 1 for proper operating pressure.

1.2 An air filter/regulator/lubricator (Jarvis part number 3022003) must be installed in the air supply line. *Keep the lubricator filled at all times.*

1.2.1 Use Jarvis (USDA Approved) Air Mist Lubricator Oil.

1 Pint (0.47 l) .....	1062010
1 Gallon (3.8 l) .....	1062011
5 Gallons (18.9 l) .....	1062012

## OPERATION INSTRUCTIONS

**IMPORTANT: ALWAYS DISCONNECT THE COMPRESSED AIR SUPPLY IN ACCORDANCE WITH OSHA'S LOCKOUT/TAGOUT PROCEDURES (29 CFR 1910.147) WHEN INSTALLING OR REMOVING THE BLADE.**

Refer to the parts diagrams on pages 4-5 for referenced items.

1 Each day, before you begin operation, perform the following.

1.1 Make sure that the compressed air supply is at the proper pressure and that the lubricator oil is up to the full mark. (Use Jarvis Air Mist Lubricator Oil; if using a conventional air mist lubricator: set the feed rate at 5 drops per minute; if using a *micro fog* air mist lubricator\*: set the feed rate at 100 drops per minute). \*Almost all air mist lubricators are *micro fog* air mist lubricators.

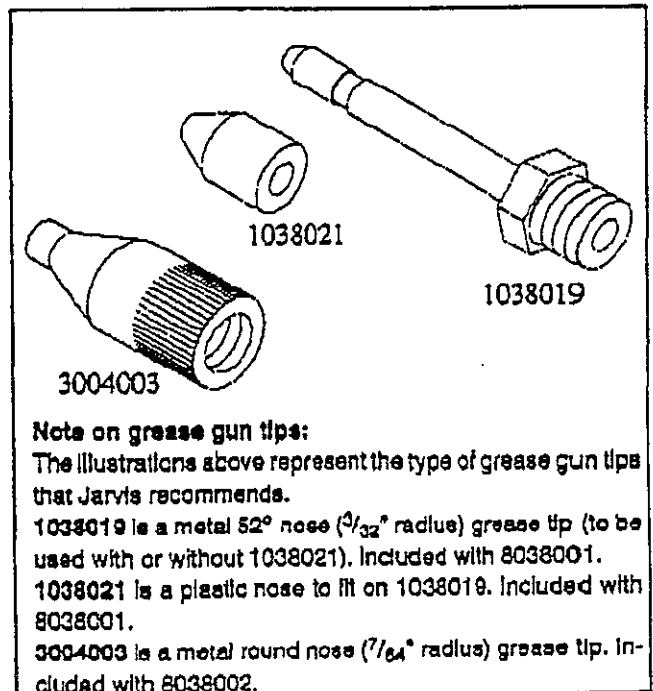
2 Three times per shift, perform the following.

2.1 Grease all three grease fittings using Jarvis Grease Gun (part no. 8038001) and Jarvis White Grease (part no. 1062003 - Lubriplate FML-2).

2.1.1 Grease fittings (items 2 "A" and 2 "C") with two (2) pumps of grease.

2.1.2 Ensure that grease is getting into the eccentric shaft (item 15), grease fitting (item 2 "B") with four (4) pumps of grease.

2.1.3 Jarvis 14 oz. cartridge-type Grease Gun (part no. 8038002) and Grease Cartridge (part no. 1062031) are also available.



### Note on grease gun tips:

The illustrations above represent the type of grease gun tips that Jarvis recommends.

1038019 is a metal 52° nose (3/32" radius) grease tip (to be used with or without 1038021). Included with 8038001.

1038021 is a plastic nose to fit on 1038019. Included with 8038001.

3004003 is a metal round nose (7/64" radius) grease tip. Included with 8038002.

# JARVIS®

8034011

## PRODUCTS CORPORATION

33 ANDERSON ROAD, MIDDLETOWN, CONNECTICUT 06457-4926

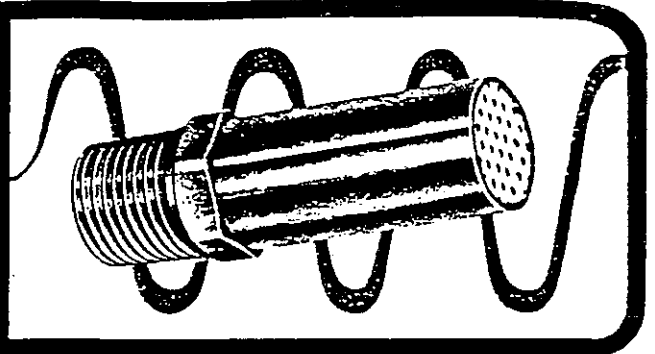
UNITED STATES OF AMERICA

TEL. 860-347-7271 FAX. 860-347-8978



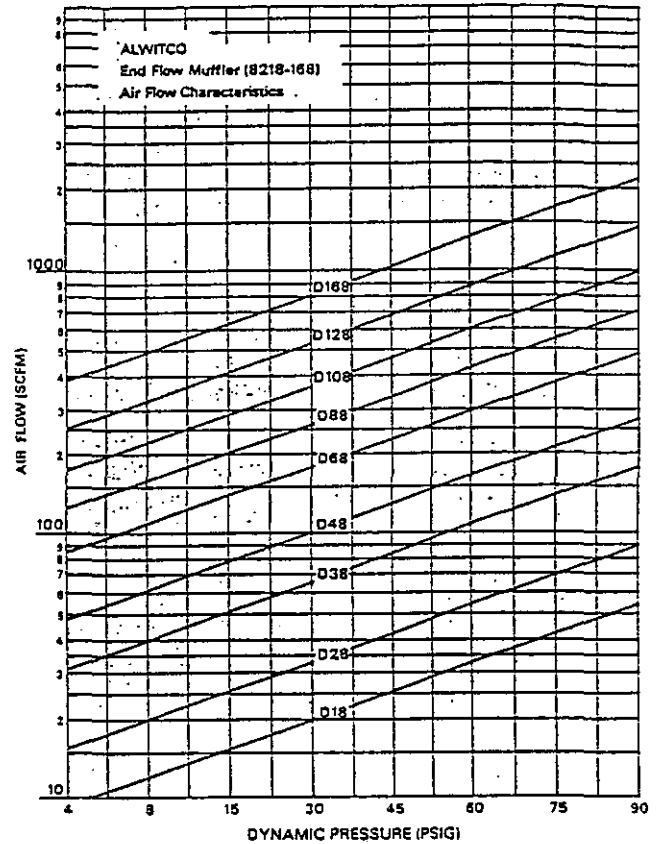
# End Flow Muffler

## DF TYPE



Alwitco End Flow Mufflers are particularly designed for use where it is desirable to direct the flow of exhaust air in a single direction. Discharged axially, the exhaust air flows freely through a unique honey-combed end cap which disperses the air blast and effectively dampens exhaust noise.

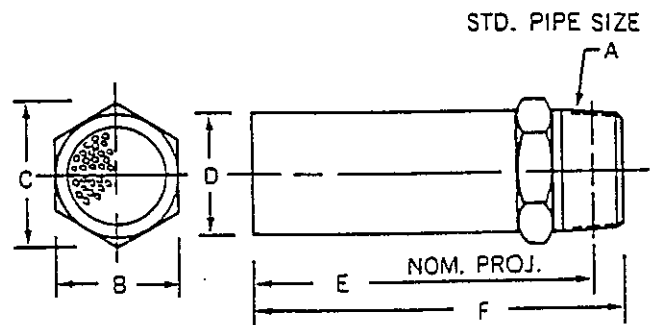
The light weight and relatively small size of Alwitco End Flow Mufflers permit them to be used in almost any location. Standard male pipe threads make direct attachment quick and easy.



### DF TYPE SPECIFICATIONS

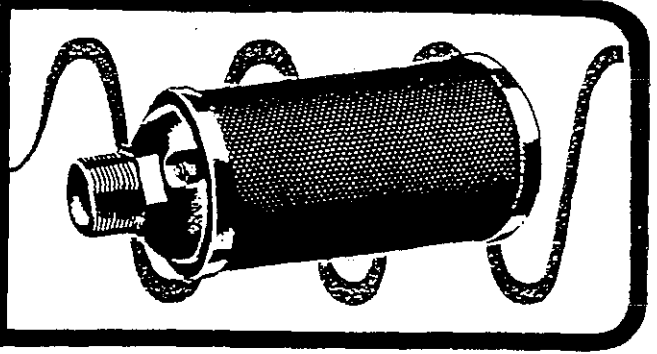
Model	D18	D28	D38	D48	D68	D88	D108	D128	D168
A	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
B	7/16	9/16	1 1/16	7/8	1 1/16	1 3/16	1 5/16	2	2 3/8
C	1/2	21/32	13/16	1	1 1/4	1 1/2	1 31/32	2 1/16	2 3/4
D	7/16	9/16	1 1/16	7/8	1 1/16	1 3/16	1 5/16	2	2 3/8
E	1 7/32	1 17/32	2	2 13/32	2 13/16	3 13/32	4 5/32	4 19/32	5 1/16
F	1 3/8	1 3/4	2 1/4	2 23/32	3 3/32	3 3/8	4 1/2	5	5 1/2
Wght./lb.	.09	.10	.15	.18	.30	.60	.90	1.2	1.9

(All dimensions in inches)



# Air Exhaust Muffler

## EP TYPE—SINGLE CHAMBER



... WITH THE ALLIED WITAN ATOMUFFLER DESIGN FOR NOISE CONTROL

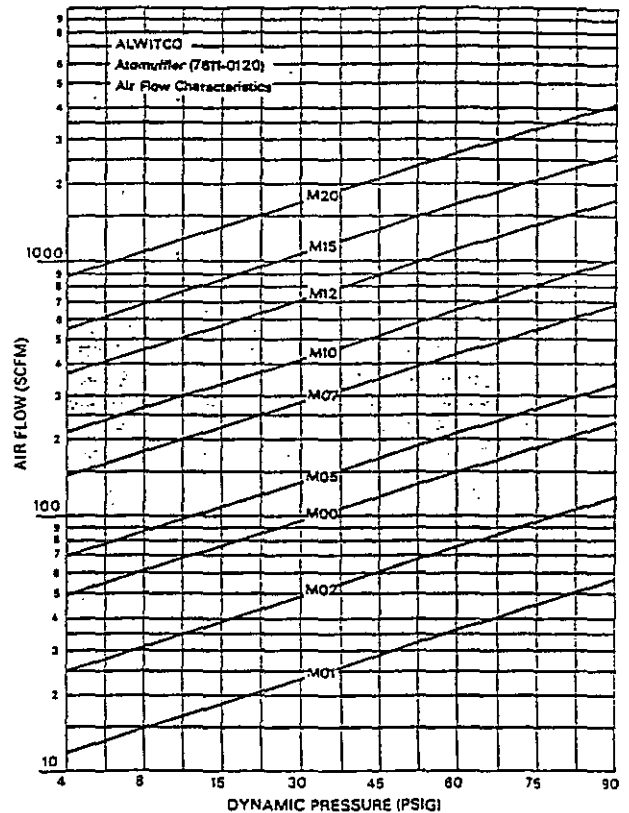
*Stops Noise Before it Starts*

Description—Page 1      Noise Control Data—Page 2

Thoroughly proved by years of use in thousands of plants, Atomuffler EP Type Air Exhaust Mufflers more than meet all requirements for the effective control of air exhaust noise from air cylinders, valves, tools, hoists, clutches and other air operated devices—with negligible impairment of operating efficiencies.

Like all Allied Witan Atomufflers, the EP Type Muffler is constructed with an expansion chamber completely free of obstructions, from which the exhaust air, at reduced velocity, is softly dispersed through the openings of the perforated cylinder wall of the muffler—free of noise and providing complete protection to personnel from injurious air blast.

Constructed entirely of corrosion resistant material for maintenance-free performance, EP Type Mufflers are supplied with standard male pipe thread connections for quick, easy attachment to the air exhaust port and may be mounted in any position.

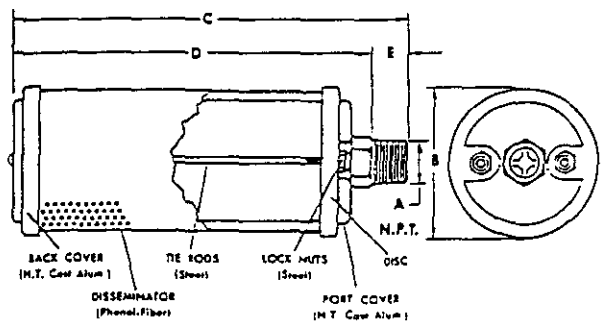


**Q-AIR**  
 Q-AIR Pty Limited  
 Phone: 03 9706 6155  
 AUSTRALIA  
 HOUSE OF COMPRESSED AIR

### EP TYPE 4-44 SERIES SPECIFICATIONS

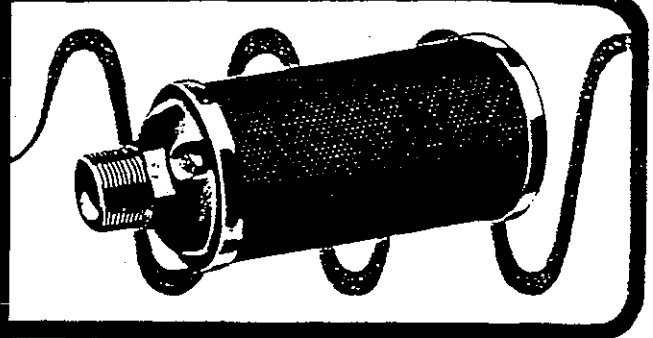
Model	M01	M02	M00	M05	M07	M10	M12	M15	M20
A	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
B	1 1/8	1 1/4	2 3/8	3 1/4	3 3/8	3 7/8	3 7/8	5 1/8	5 1/2
C	3	4	4 3/4	5 1/2	6 3/4	8	8 3/4	13 1/4	18 1/4
D	2 3/8	3 1/2	4 1/4	5	6 1/8	7 1/4	7 1/4	12	17
E	3/8	1/2	1/2	1/2	3/4	1	1	1 1/4	1 1/4
Wght./lb.	.25	.31	.50	.62	.75	1.0	1.0	4.0	5.0
Exhaust Surface Area/In <sup>2</sup>	4.6	7.1	12.2	16.9	24.1	31.8	39.9	79.5	119.3

(All dimensions in inches)



# Air Motor Muffler

## SINGLE CHAMBER



... WITH THE ALLIED WITAN ATOMUFFLER DESIGN FOR NOISE CONTROL

*Stops Noise Before it Starts*

Description—Page 1      Noise Control Data—Page 2

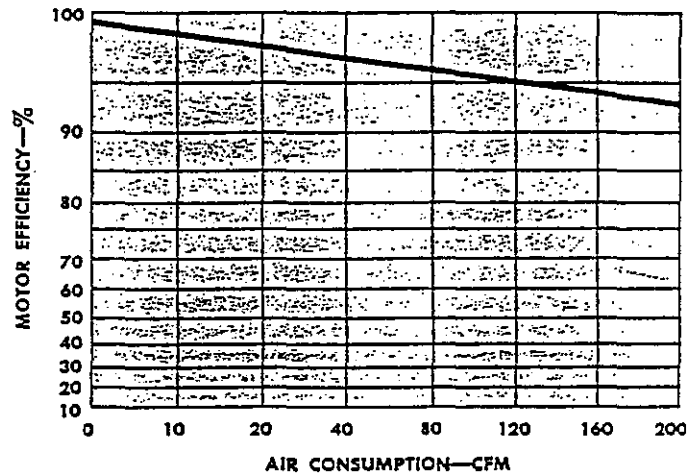
The EP Type 4-44 Series Muffler is particularly applicable for silencing the objectionable whine created by air motor exhausts.

Like other mufflers with the Atomuffler design for noise control, this 4-44 Series Air Motor Muffler is constructed with a unique obstruction-free expansion chamber, from which the exhaust air, at greatly reduced velocity, is softly and quietly dispersed through the extra large disseminator area provided by the perforated cylinder wall of the muffler.

With negligible mechanical impedance, the 4-44 Series Air Motor Muffler effectively eliminates the air exhaust noise, with little impairment of the air motor operating efficiency.

Ordinarily supplied with standard pipe thread connections for quick, direct attachment to the air exhaust port, Air Motor Mufflers can also be supplied, when specified, with special inlet fittings to fit your particular equipment.

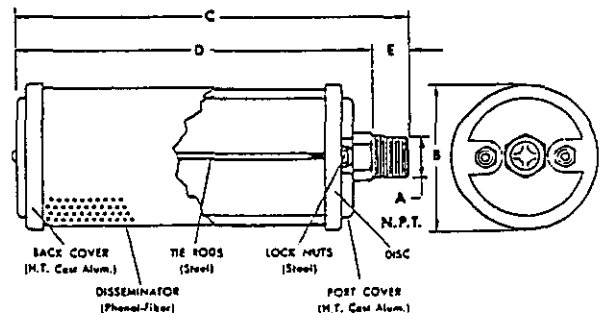
**Note:** For use with air motor starters used on trucks, trailers and other vehicles, Air Starter Mufflers are specially constructed and assembled to withstand road vibration. To order, add suffix "AV" to part number of model required. Example: EP Type—4-44 Series Model M10-AV.



### EP TYPE 4-44 SERIES SPECIFICATIONS

Model	M01	M02	M00	M05	M07	M10	M12	M15	M20
A	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
B	1 1/8	1 3/8	2 1/8	3 1/4	3 3/8	3 7/8	3 3/8	5 1/8	5 3/8
C	3	4	4 3/4	5 1/2	6 3/4	8	8 1/4	13 1/4	18 1/4
D	2 3/8	3 1/2	4 1/4	5	6 1/8	7 1/4	7 1/4	12	17
E	3 3/8	1/2	1/2	1/2	3/8	3/4	1	1 1/4	1 1/4
Wght./lb.	.25	.31	.50	.62	.75	1.0	1.0	4.0	5.0
Exhaust Surface Area/IN <sup>2</sup>	4.6	7.1	12.2	16.9	24.1	31.8	39.9	79.5	119.3

(All dimensions in inches)





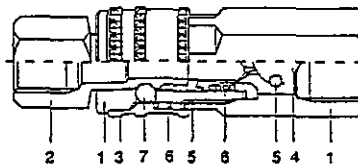
**Serie 320**

- CEJN original standard
- Extremely high flow capacity
- Zero-Matic couplings for total safety available
- Anti-hose whip nipples included in range
- Stream-Line re-useable connections available
- All brass version - Series 321

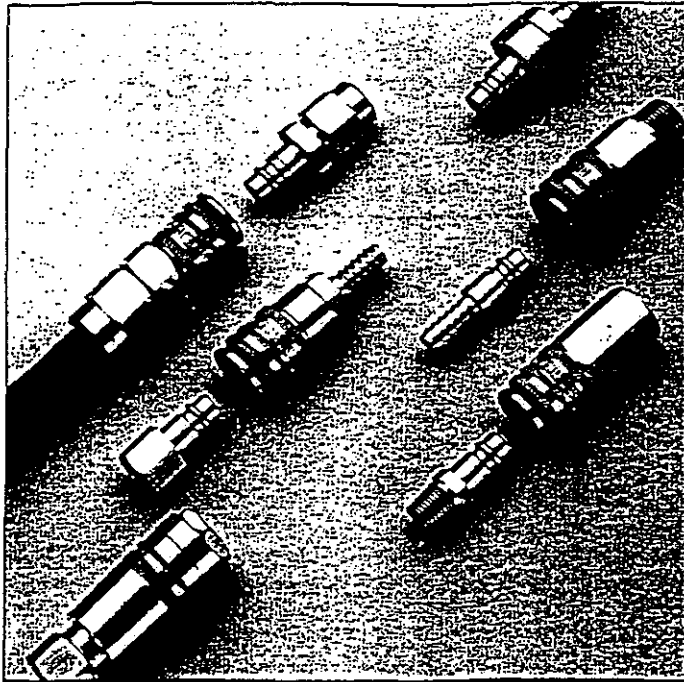
**Technical specification**

Flow capacity at 6 bar (87.0 PSI) inlet pressure, Δ 0,5 bar (7.25 PSI)	2030 l/min. (71.6 C.F.M.)	Zero-Matic 1760 l/min (62.2 C.F.M)
Max working pressure	35 bar (508 PSI)	12 bar (174 PSI)
Min burst pressure	140 bar (2030 PSI)	48 bar (696 PSI)
Temperature range	-30°C de +100°C (-22° F de 212° F)	
Nominal flow diameter	7,4 mm (9/32")	

**Materials**

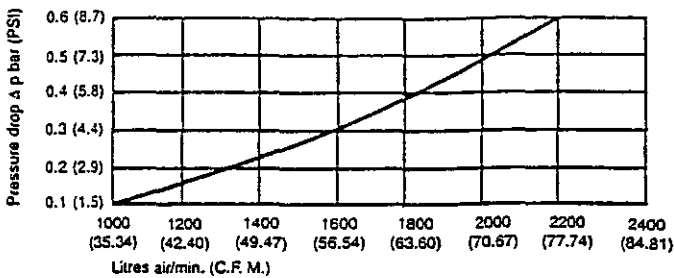


- |                                 |   |           |                 |
|---------------------------------|---|-----------|-----------------|
| 1 Coupling body<br>(Series 321) | Brass, nickel plated<br>Brass, chrome plated        | 4 Valve   | Brass           |
| 2 Nipple body<br>(Series 321)   | Steel, hardened zinc plated<br>Brass, chrome plated | 5 Seals   | Nitrile         |
| 3 Locking sleeve                | Steel, hardened nickel plated                       | 6 Springs | Stainless steel |
|                                 |   | 7 Balls   | Stainless steel |



**Flow diagram**

\*Flow 10 320 1204/10 320 5204 at 6 bar (87.0 PSI) inlet pressure



Couplings	Part No.	Description	A	B	C	Nipples	Part No.	Description	A	B	C	
	10 320 1002	6,3 mm 1/4"	63.2	23.4	19.0		10 320 5001	5 mm 3/16"	43.0	13.0		
	10 320 1003	8 mm 5/16"	65.7	23.4	19.0		10 320 5002	6.3 mm 1/4"	42.5	13.0		
	10 320 1004	10 mm 3/8"	66.2	23.4	19.0		10 320 5003	8 mm 5/16"	45.0	13.0		
	10 320 1005	13 mm 1/2"	64.2	23.4	19.0		10 320 5004	10 mm 3/8"	45.0	14.0		
							10 320 5005	13 mm 1/2"	45.5	17.0		
All brass version:												
	10 321 1002	6,3 mm 1/4"	66.3	23.4	20.0		10 320 5151	BSPT 1/8"	37.5	15.0	13.0	
	10 321 1003	8 mm 5/16"	68.3	23.4	20.0		10 320 5152	BSPT 1/4"	39.0	16.2	14.0	
	10 321 1004	10 mm 3/8"	67.3	23.4	20.0		10 320 5154	BSPT 3/8"	41.5	19.6	17.0	
	10 321 1005	13 mm 1/2"	66.3	23.4	20.0		10 320 5155	BSPT 1/2"	48.0	25.4	22.0	
							10 320 5451	NPT 1/8"	37.5	15.0	13.0	
All brass version:												
	10 321 1152	BSPT 1/4"	59.3	23.4	20.0		10 320 5452	NPT 1/4"	39.0	16.2	14.0	
	10 321 1154	BSPT 3/8"	58.3	23.4	20.0		10 320 5454	NPT 3/8"	41.0	19.6	17.0	
	10 321 1155	BSPT 1/2"	51.8	25.4	22.0		10 320 5455	NPT 1/2"	46.0	25.4	22.0	
							All brass version:					
							10 321 5152	BSPT 1/4"	41.0	16.2	14.0	
	10 321 1202	BSP 1/4"	56.2	23.4	20.0		10 321 5155	BSPT 1/2"	45.0	25.4	22.0	
	10 321 1204	BSP 3/8"	56.2	23.4	20.0		10-320-5201	BSP 1/8"	30.5	15.0	13.0	
	10 321 1205	BSP 1/2"	55.7	28.9	25.0		10-320-5202	BSP 1/4"	36.5	19.6	17.0	
	10 320 1402	NPT 1/4"	55.2	23.4	20.0		10-320-5204	BSP 3/8"	38.0	23.1	20.0	
	10 320 1404	NPT 3/8"	55.2	23.4	20.0		10-320-5205	BSP 1/2"	42.5	31.2	27.0	
All brass version:												
	10 321 1202	BSP 1/4"	56.3	23.4	20.0		10-320-5401	NPT 1/8"	30.5	15.0	13.0	
	10 321 1204	BSP 3/8"	56.3	23.4	20.0		10-320-5402	NPT 1/4"	36.0	19.6	17.0	
	10 321 1205	BSP 1/2"	60.3	28.9	25.0		10-320-5404	NPT 3/8"	38.0	23.1	20.0	
							10-320-5405	NPT 1/2"	41.0	31.2	27.0	
							All brass version:					
	10 320 1058	5.0 x 8.0	60.2	23.4	20/14		10 320 5202	BSP 1/4"	36.5	19.6	17.0	
	10 320 1060	6.5 x 10.0	60.2	23.4	20/16		10 320 5058	5.0 x 8.0	42.3	16.2	14.0	
	10 320 1062	8.0 x 12.0	64.2	23.4	20/19		10 320 5060	6.5 x 10.0	44.3	18.5	16.0	
	10 320 1066	11.0 x 16.0	64.4	27.7	24/24		10 320 5062	8.0 x 12.0	47.3	21.9	19.0	
							10 320 5066	11.0 x 16.0	53.3	27.7	24.0	
	10-320-1188	BSPT 1/2"	75.5	28.0	22.0		10 320 8003	8 mm 5/16"	62.9	25.0	24.0	
	10-320-1236	BSP 3/8"	67.0	28.0	20.0		10 320 8004	10 mm 3/8"	62.4	25.0	24.0	
	10-320-1436	NPT 3/8"	67.0	28.0	20.0		10 320 8005	13 mm 1/2"	61.9	25.0	24.0	
	10-320-1487	NPT 1/2"	74.5	28.0	22.0							



# ACOUSTOP Vibradamp CLD Tiles

### Introduction:

ACOUSTOP Vibradamp CLD Tiles are an extremely weight and thickness effective damping material. Manufactured in a constrained layer form, ensuring easy onsite installation. AV CLD 304 has been developed for the food processing industry to give reduction from noise generated by impact or vibration while meeting hygiene requirements.

ACOUSTOP CLD Tiles are ideal for chutes, trays or any metal surface subject to impact or vibration. CLD tiles dissipate noise energy through the shear deformation of the material.

### Product Construction:

ACOUSTOP Vibradamp CLD Tiles are a manufactured form of constrained layer damping using an Advanced Modified Viscoelastic Acrylic Polymer, factory laminated for easy onsite installation.

- Code:** AV CDL 304
- Name:** ACOUSTOP Vibradamp CLD Tiles
- Product Construction:** 0.9mm 304/B2 Finished Stainless Steel  
0.2mm Modified Viscoelastic Acrylic Polymer
- Tile Size:** Standard 400mm x 1200mm  
Non standard sizes produced to order
- Thickness:** 0.9mm Steel  
0.2mm Polymer  
1.1mm Total
- Operating Temperature:** 80°C Constant  
200°C Short Term
- Adhesion:** To steel 16.8N/25mm

### Specification Guide:

"The vibration damping used shall be ACOUSTOP Vibradamp CLD Tiles. It shall be made of 304/B2 Finished Stainless Steel as the constraining layer with a 0.2mm modified viscoelastic acrylic polymer as the damping layer."



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