

MJM CONSEILLERS EN ACOUSTIQUE INC
MJM ACOUSTICAL CONSULTANTS INC
6555, Côte des Neiges, Bureau 440
Montréal (Québec) Tél.: (514) 737-9811
H3S 2A6 Fax: (514) 737-9816
site internet: www.mjm.ac.ca
Courrier électronique: mmarin@mjm.ac.ca

**RESEARCH PROJECT ON THE
NOISE PRODUCED BY DWV PIPES
MADE OF CAST IRON, PVC AND ABS**

Prepared by

MJM Acoustical Consultants inc.
6555 Côte des Neiges, bureau 440
Montréal (Québec)
H3S 2A6

Report submitted July 10, 2000 to

Cast Iron Soil Pipe Association
199 Saginaw Pkay #12
Cambridge (Ontario)
N1T 1T9



CAST IRON... "THE QUIET PIPE"

Tests recently conducted in the Domtar Acoustical Laboratory by MJM Acoustical Consultants Inc prove it!

DWV pipes made of **Cast Iron** are quieter than PVC pipes(System 15), or ABS pipes whether the pipes are enclosed or not.

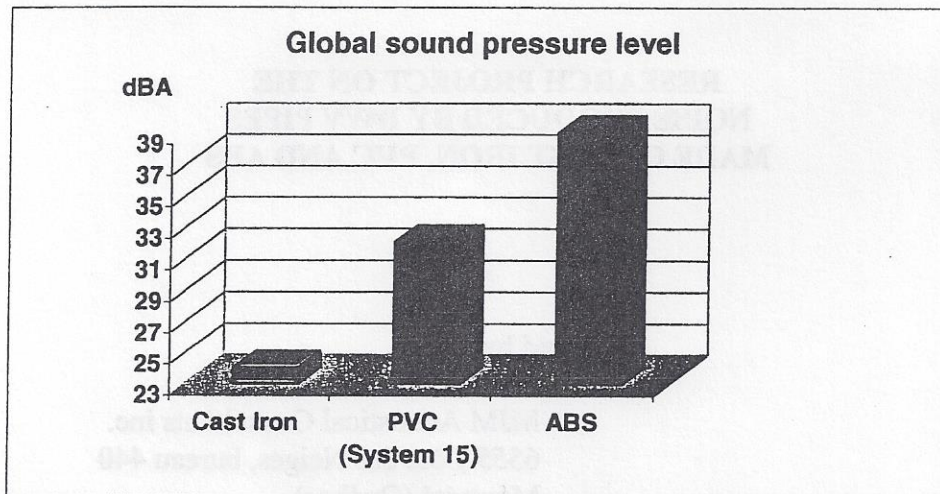


Figure : Sound pressure level(dBa, ref.20 μ Pa) radiated by pipe assemblies tested.

MJM Acoustical Consultants Inc. was retained by the "CAST IRON SOIL PIPE ASSOCIATION" to conduct a research project on the noise produced by a DWV pipe installation which can be found in most North American single or multi-dwelling homes : a water closet discharging in a 3" horizontal waste pipe connected to a 3" vertical waste stack, enclosed in a wall made with 1/2" gypsum board.

The pipes were installed in the experimental set-up by a certified union plumber employed by Plomberie Roland Bourbonnais.

For a complete copy, contact CAST IRON SOIL PIPE ASSOCIATION - 1-519-621-8141

EXECUTIVE SUMMARY

MJM ACOUSTICAL CONSULTANTS INC. has been retained by the CAST IRON SOIL PIPE ASSOCIATION to conduct a research project on the noise produced by several 3" diameter DWV pipes made of cast iron, PVC, and ABS. The experimental set-up used during this study is typical of a DWV pipe installation which can be found in most North American single or multi-dwelling homes: a water closet discharging in a 3" horizontal waste pipe connected to a 3" vertical waste stack, enclosed in a wall made with 1/2" gypsum board. The objective of the project was to study the noise emitted by DWV pipes installed in a typical building.

During the course of this research project, eight series of acoustical measurements were conducted on seven types of North American DWV pipes: four with cast iron soil pipes, three with PVC pipes, and one with ABS pipes. All the pipes were installed in an identical physical configuration and tested in the same acoustical conditions following strictly the same procedure to allow for direct comparison of the sound pressure levels emitted by each pipe during a 1.6 gallon (6 litres) water closet flush.

The acoustical measurements were conducted in the Domtar Acoustical Laboratory by the researcher in charge of the project, Mr. Jean-Marie Gu  rin, M.Sc.A., consultant, with the assistance and the supervision of Mr. Michel Morin, architect, President and Principal consultant of MJM ACOUSTICAL CONSULTANTS INC. The pipes were installed in the experimental set-up by a certified union plumber at the employment of Plomberie Roland Bourbonnais.

All throughout this research project, efforts have been made to ascertain the reliability of all the tests performed:

- The instrumentation used and the procedure followed to measure the sound pressure levels generated by the pipes was strictly the same for all measurements.

- The background noise in the 90 m³ reverberation chamber in which the pipes were installed was monitored to ensure that it was always 10 dB below the noise radiated by unenclosed pipes for frequencies above 125 Hz; in the case of enclosed pipes, especially at high frequencies, the noise radiated by the pipes was not always 10 dB higher than the background noise.
- For each type of pipe under test, a demonstration has been made that the noise measured in the 90 m³ room was exclusively irradiated from the pipes under test and that there was no contribution resulting from airborne noise transmission from one chamber to another which could have altered the measurement results for the frequency range selected.
- Repeatability and reproducibility tests have been conducted on each type of pipe under test.

Table Exec-1 below is a summary of the overall noise levels in dBA emitted by each type of pipes while evacuating a 1.6 gallon (6 litres) water flush in the four configurations for which the tests were conducted:

Type of pipe	Global sound pressure level (dBA, ref 20 microPa)			
	Bare pipes	Enclosed pipes	Vertical pipe unenclosed	Horizontal pipe unenclosed
XH (extra heavy) - ASTM A74	40	24	39	32
No-Hub long - CISPI 301, CSA B70	42	25	41	36
No-Hub short - CISPI 301, CSA B70	41	24	40	36
SV (service) - ASTM A74	43	26	41	39
System 15 (solid wall)	49	32	42	48
PVC 7300 - ASTM D2665 (solid wall)	48	33	43	47
PVC 4300 - ASTM F891 (cellular core)	51	34	45	48
ABS 3300 - ASTM F628 (cellular core)	55	39	49	54
Average cast iron	41	25	40	36
Average PVC	49	33	43	48

Table Exec-1: Overall "A" weighted sound pressure level radiated by pipe assemblies tested

The conclusions reached during this study are as follows:

- This study establishes clearly that DWV pipes made of Cast Iron are quieter than PVC pipes (by 6 to 10 dBA¹ with an average difference of 8 dB), or ABS pipes (by as much as 15 dBA) whether the pipes are enclosed or not.
- There is little variation in the noise levels radiated during a flush by different types of PVC pipes; the variation did not exceed 3 dBA in terms of global sound pressure level. The same 3 dBA variation also exists between vertical cast iron pipes stacks; for horizontal cast iron DWV pipes however, differences of up to 7 dBA were noted.
- The tests performed on partially enclosed assemblies highlighted significant differences in the radiation pattern of horizontal drain and vertical stacks. With cast iron pipe assemblies the vertical runs radiated more noise than the horizontal runs during a water closet flush. In the case of PVC and ABS pipes the opposite behaviour was noted: the horizontal runs produced significantly more noise than the vertical runs.
- The insertion loss provided by the drywall enclosure does not seem to be dependent on the pipe assembly tested: the global insertion losses measured vary from 15 dBA to 17 dBA.

1 dBA: "A" weighted sound pressure level expressed in decibels: the "A" weighting is added to simulate the human ear sensitivity (more acuity at frequencies above 1000 Hz, and less acuity for frequencies below 1000 Hz).

A decibel is the smallest sound pressure variation detectable by the human ear. An increase or decrease of 3 dB or less is generally considered marginal. An increase of 10 decibels in the sound pressure level of a noise source leads to the subjective impression that its loudness has doubled; inversely reducing the sound pressure level of a noise source by 10 decibels corresponds in reducing by half its perceived loudness.

