

PROVIDING 'GOOD', 'BETTER' OR 'BEST' ACOUSTICAL PLUMBING SYSTEM PROPOSALS FOR COST-SENSITIVE CLIENTS

Chip O'Neil

Director of Business Development, HOLDRITE® 2560 Progress Street, Vista, CA, USA, 92081 coneil@holdrite.com

1. INTRODUCTION

Throughout the conceptual and design stages of a building's construction cycle, numerous decisions are made and modified, based on cost/benefit measurements. Early on, the Building Owner and the design team make determinations as to the quality level target for a project, based on market needs and trends as well as financial capabilities and interests of investors. For instance, in the case of an office building, will it provide "Class A" or a "Class B" office space? These decisions affect nearly every aspect of a building's parts and pieces. In this case, we will concentrate on the noise and vibration options and choices related to a building's plumbing and piping systems.

When it comes to the costs associated with effective acoustical isolation of a plumbing system there are a variety of choices available. Though effective isolation materials and methods are available for very modest costs, there is often the challenge of "Value Engineering" to face. As in most facets of building construction, there are a variety of quality levels available when it comes to plumbing system's acoustic isolation options.

Becoming familiar with "Good", "Better" and "Best" materials and methods, in order to be helpful during the budgeting and design stages of a building project can make you a valuable asset to the entire design team and to the Building Owner. Learn to provide valuable input during the Cost-Benefit analysis for a building project. Base your input to your client upon solid laboratory test data arranged by specific plumbing system applications, such as through-stud isolation, riser clamp isolation, shower head attachments, hanger isolation, etc.

This paper will provide fundamental presentation points and cost control advice for any plumbing or piping system. This information takes into account both labor and material factors, in order to generate a real world "Installed Cost Analysis", while specifying a proven engineered system for your client.

2. Common sources of plumbing noise

Both "Airborne" and Structure-borne" noises are involved, but for the most part we will focus on the structure-borne noise component. The airborne side of the issue is best left to discussions relating to wall and floor assemblies, etc. Plumbing system noise can affect both "STC" and "IIC" ratings, of course. The portions of plumbing and piping systems that come into play include: Drainage systems

(Sanitary Waste and Storm Drain/Rain leader), water distribution systems, fixtures, faucets & appliances, valves, pumps and equipment.

The main issue to be addressed is the breaking of direct contact between the piping system components and the buildings multiple components and surfaces. Over the years, when contractors have been directed to take action regarding acoustical isolation of plumbing systems they have made a wide variety of attempts to one level or another and with widely varying results. When contentiously performed, effective acoustical noise and vibration isolation of these systems can reduce the noise perception by more than half! Some of the comparative examples of failed and successful methods include the ones shown in Figures 1.1 through 1.4.



Fig 1.1 Water tubing isolation using foam insulation and successful use of an engineered isolator



Fig 1.2 Paper compared to an isolated tube clamp



Fig 1.3 Shower head support compared to an engineered anchor point



Fig 1.4 Mid-span support (vertical/horizontal) showing a questionable use of felt and tie wire, and to engineered tube clamps

3. Why do contractors' bid prices skyrocket when an acoustical spec is included in the project scope?

The answer is simple. Most people tend to resist change. Contractors are no different. They prefer to continue with status quo and when told they must modify their means and methods of installation and install specialized materials they tend to retaliate by sharply increasing their prices. They do this because, for the most part, Contractors and individual tradesmen have little or no knowledge of acoustics and how to effectively succeed in meeting the requirements being proposed...which they don't understand in the first place and for which their installers have little or no training to perform. As a result they believe that they will be corrected and will have to re-work a great deal of their installations after their initial attempts are deemed ineffective by an engineer. Please remember, plumbing codes typically do not include requirements related to comprehensive noise and vibration isolation. Why do they resist? Most often it is because the direction given in the project's specification documents is vague and without detail. They also view an acoustical engineer/consultant as "just another authority to answer to", which they believe will translate into productivity slow-down and countless correction notices. Productivity slowdowns translate into the need to charge higher prices to cover their anticipated costs.

Additionally, many of these contractors fear and may have actually experienced litigation resulting from their failure to succeed in meeting the criteria imposed by an acoustical specification.

4. Tiered Cost Options in Today's Economy

In today's economy, Building Owners and Developers are looking for value as much or more than ever. Much of this is due to market uncertainty and low "ROI" expectations. As a result, many feel they cannot afford the "Best". As a result, when the project is in its design and/or pre-construction stages it is often faced with the need for "Value Engineering". During this process, having the ability to offer tiered choices, or "Good", "Better", "Best" options may well result in your continuing to be retained as an acoustical engineer and/or consultant to one level or another, rather than possibly facing the reality of being completely removed from project's scope all together. "All

or Nothing" is not a good place to find yourself in when it comes to the chopping block called "Value Engineering". "Good", "Better", "Best" options are available for plumbing and piping system acoustical isolation.

4.1 Providing Options for Building Owners

To help you determine your client's perceived value of a building that is well isolated against noise transfer, ask yourself these two questions: 1) Might investing in a quieter building garner increased rent or sales revenue? 2) Might providing a quieter building serve as a way to help avoid possible litigation at the hands of unhappy building occupants later on? Depending on the answers to those two Cost/Benefit questions, provide tiered options to your client. Here are some examples that might be employed for a multi-story multi-family building such as a condominium or a hotel.

4.1.1 Minimal isolation ("GOOD")

- Soft isolators at all penetration locations of plumbing supply water and drainage lines, such as through studs, joists & at hanger support points
- Rubber/neoprene isolators under equipment
- Flexible water flex connectors, rather than hard piped connections

Cost: Approx. \$100 material and 1Hr of added labor (above code minimum requirements) in a 2-Bath dwelling

4.1.2 Mid-range isolation ("BETTER")

- Soft isolators between all piping and building assemblies, such as through wall studs, ceiling joists, hangers & under all pipe riser clamps
- Soft isolators at mixing valves, showerheads & similar attachment points
- Spring isolated pipe connections to equipment and concrete inertia pads at equipment bases
- Spring isolators at hangers in mechanical rooms and within 50' of mechanical equipment connections
- Braided/non-metallic hose connections at equipment
- Cast iron drainage piping, rather than plastic
- Use of braided water connectors at all fixture faucet connections and toilet inlets

Cost: Approx. \$300 of material (mostly related to the upgrade to cast iron pipe) and 5 Hrs of added labor (above and beyond code minimum requirements and mostly related to the slower installation of cast iron pipe) in a 2-bath dwelling

4.1.3 Premium isolation ("BEST")

- Soft isolators between piping and building assemblies, such as through wall studs, ceiling joists, hangers &

under all riser clamps

- Soft isolators at any and all possible contact points, including mixing valves and shower head piping
- Spring isolation and inertia pads at equipment bases
- Spring isolators at hangers on all drain lines, liquid pressure lines (such as domestic water & hydraulic lines) and on all suspended equipment hangers
- Braided/non-metallic hose connections at equipment
- Cast iron drainage piping, rather than plastic
- Isolate all plumbing fixtures and their attachment points to floors and walls with soft neoprene liner, such as at toilets, tubs, etc.
- Use of braided water connectors at all fixture faucet connections and toilet inlets

Cost: Approx. \$400 of material (mostly related to the upgrade to cast iron pipe) and 8 Hrs of added labor (above and beyond code minimum requirements and mostly related to the slower installation of cast iron pipe and the fixture isolation) in a 2-bath dwelling.

5 Is “Good”, “Better”, or “Best” perceptible?

The following example shows 1 of 70+ tests performed by an ISO 3822 accredited lab, comparing common installation practices to installations employing acoustical materials readily available in today’s market:

- Water pressure for each test was 45 PSI, water flow rate was 4.6 FPS and the resulting acoustic spectra analyzed in 1/3 octaves bands, 80–10,000 Freq. Hz
- Application: Shower Head Installation

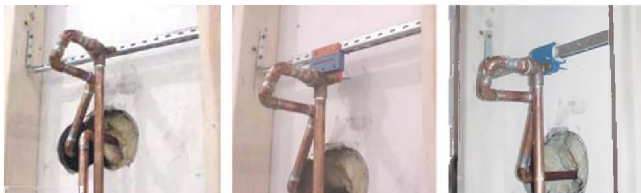


Fig. 5.1

Fig. 5.2

Fig. 5.3

Figures 5.1 thru’ 5.3 Three Anchoring Methods Tested and Compared

6 A quiet plumbing system

Many things can be done to help assure that your client gets the biggest bang for their buck. These things include: Influence pipe, fixture & equipment selections, influence locations of plumbing system components to avoid sensitive areas, select appropriate and effective acoustical isolation products to be used, assure material compatibility and ease of use and cost, customize your Project Specification language, include Installation Detail Drawings with instructions, require product submittals & samples for approval, inspect for compliance during construction, provide clear specification language, provide product Spec

Sheets from manufacturers or specify model numbers, provide simple Installation Instructions from manufacturers, provide Installation Detail Drawings and produce a blueprint Installation Detail Page.

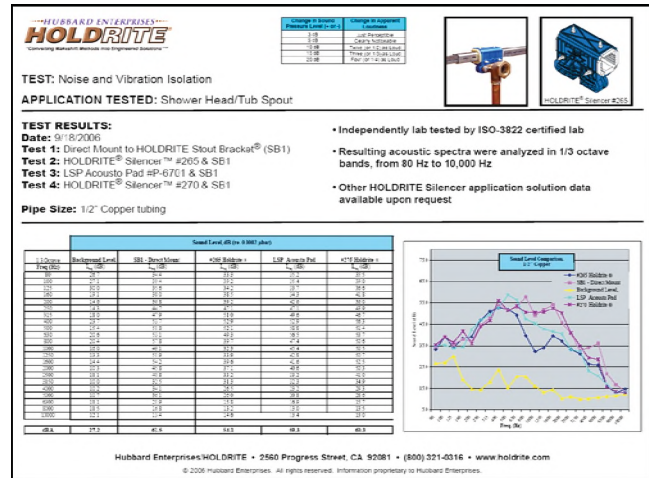


Fig 5.4 Noise Pressure Level Test Results
 Background noise level- 27.2 dBA; Anchored directly to support bracket- 61.5 dBA Anchored to Acousto Pad #P-6701- 59.3 dBA
 Anchored to HOLDRITE Silencer #265- 54.1 dBA
 NOTE: Sheet rock was installed on walls in each case, prior to noise level readings

7 Conclusion

Plumbing system noise mitigation should not be difficult. Partnering with committed manufacturers who can help you with “application specific” product solutions and the accompanying test data from neutral 3rd party labs will aid in your success as an acoustical consultant and help you avoid being “Value Engineered” out of the project scope.

Up-sell “sound quality” to “high-end” builders/owners by providing proof of affordability (positive R.O.I.) with “GOOD”, “BETTER” and “BEST” options.

REFERENCES

1. American Society of Plumbing Engineers (ASPE)- Plumbing Engineering Design Handbook, Volume 1 – Fundamentals of Plumbing Engineering, Chapter 10
2. ISO 3822: Laboratory Test of Noise Emissions from Appliances and Equipment used in Water Supply Installations. International Organization for Standards
3. Engineering Resource Binder, Hubbard Enterprises-HOLDRITE Silencer installation instructions