

ASPE Chapter Meeting Integrations with ASPE Education



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Plumbing Acoustic Isolation



**ASPE Continuing Education
Presented by HOLDRITE®**



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Learning Objectives



- Understand how plumbing noise impacts occupant experience/comfort
- Identify sources of plumbing noise
- Recognize contributing factors of plumbing noise
- Identify cost effective methods of plumbing acoustic isolation
- Best practices for acoustically isolating plumbing systems
- Updating plumbing specifications to incorporate plumbing acoustic isolation systems

Content

- What is to Plumbing Acoustic Isolation
- Sources of Plumbing Noise
- Mitigating Plumbing Noise
- Ideal acoustic isolation methods
- Specifications update
- Summary
- Assessment



What is Plumbing Acoustic Isolation



- Plumbing system noise is a common irritant to building occupants
- Three main contributing factors:
 1. Owner/developer & design team's lack of awareness
 2. Lack of contractor awareness
 3. Perceived high cost of acoustic isolation methods



What is Plumbing Acoustic Isolation



- Advances in recent years have made mitigating plumbing system noise simpler
- Products and services readily available
- Third-party lab test data highlight ISO 3822 Standards
- Plumbing installation detail drawings demonstrate proper isolation methods
- Implementing proper materials and methods will contribute to quieter plumbing systems



What is Plumbing Acoustic Isolation



- In spite of recent advances in acoustic isolation materials and methods
 - Plumbing system noise remains a persistent issue
 - One of the most intrusive and difficult sounds to mitigate
 - Often tolerated when generated within tenant's own space
 - Is an annoyance when peace and quiet is disturbed
 - Is a primary reason for tenant complaints in multifamily dwellings
 - Can cost building owners significant dollars in nuisance claims

What is Plumbing Acoustic Isolation

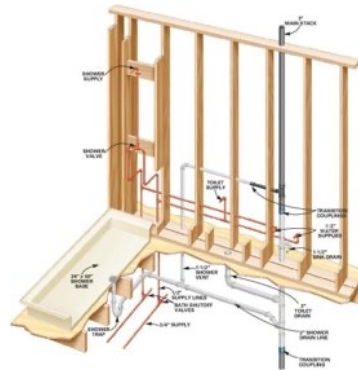


- Plumbing system noise viewed as a complicated, labor-intensive and expensive problem to solve
 - As a result, controlling plumbing noise is viewed as too costly to mitigate
 - Is often “value engineered” from construction budget
- In reality, mitigating plumbing noise does not need to be difficult or expensive



What is Plumbing Acoustic Isolation

- Many factors contribute to plumbing system noise
- Plumbing systems generate both airborne and structure-borne noise
- Four main categories of a building's plumbing system which contribute to plumbing noise:
 - Drainage system
 - Water supply and distribution
 - Fixtures, faucets and appliances
 - Valves, pumps and equipment



Code Requirement for Acoustic Isolation



Uniform Plumbing Code 2010

609.10

- *Building water supply systems where quick-acting valves are installed shall be provided with water hammer arrester(s) to absorb high pressures resulting from the quick closing of these valves. Water hammer arrestors shall be approve mechanical devices in accordance with the applicable standard(s) referenced in Table 14-1 and shall be installed as close as possible to quick-acting valves.*

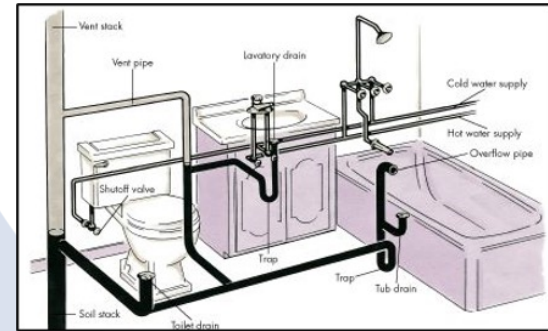
International Plumbing Code 2012

604.9

- *Water hammer. The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. A water-hammer arrestor shall be installed where quick-closing valves are utilized. Water-hammer arrestors shall be installed in accordance with the manufacturer's specifications. Water-hammer arrestors shall conform to ASSE 1010.*

Sources of Plumbing Noise

- Drainage Systems
 - Includes sanitary waste piping from plumbing fixtures
 - Storm drainage piping from roof and deck drains
- Drainage systems constructed of plastic pipe
 - ABS or PVC
 - Transmit water turbulence noise more readily
- Bathtubs
 - Enameled steel
 - Fiberglass



Sources of Plumbing Noise



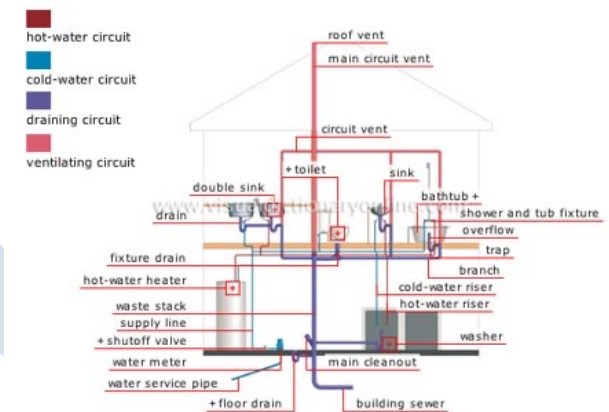
- Shower Pans
 - Fiberglas
 - Plastic
- Tub and Shower Valves
 - Mounted directly to structure
 - Tub Spouts with direct contact to structure and fixture
 - Shower Spouts with direct contact to structure and fixture



More application drawings at www.holdrite.com

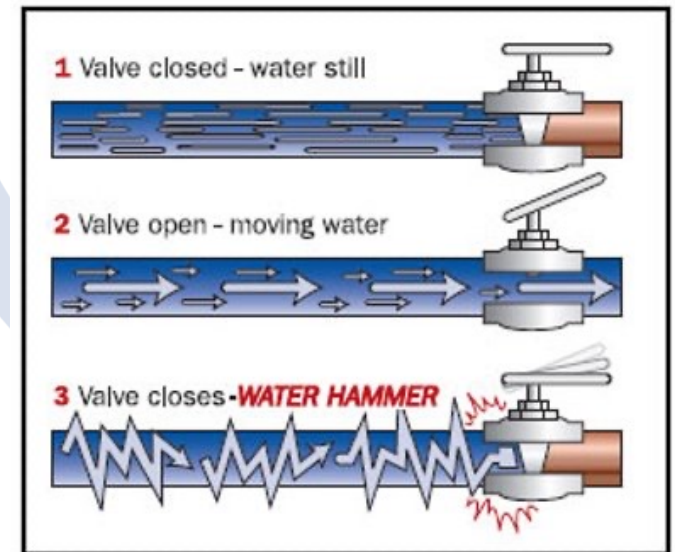
Sources of Plumbing Noise

- Water Distribution Systems
 - Pressurized domestic/potable water systems
 - Pressurized nonpotable water systems
 - Copper, PVC, CPVC and PEX systems
 - Common cause of airborne and structure borne noise is flow of water during activation of fixture or faucet
- Contributing factors include
 - Water pressure
 - Flow velocity
 - Turbulence
 - Direct contact between piping system and building structure



Sources of Plumbing Noise

- Water Distribution Systems
 - Other common noise generators
 - Water hammer
 - Caused by water velocity stopped suddenly
 - Typically, in appliances with quick-closing valves: Ice makers, auto washers, flush valves
 - Thermal expansion/contraction of plastic piping
 - Most commonly heard as squeaking or creaking
 - Occurs as pipe material expands/contracts
 - Direct contact with building structure components



Sources of Plumbing Noise

- Fixtures, Faucets, Appliances, and Appurtenances
 - Manufactured from a variety of materials
 - Vitreous china, marble
 - Stainless steel, enameled steel, cast iron
 - Fiberglass, plastic
 - Each material contributes to airborne and structure borne noise differently
 - Stainless steel, plastic and fiberglass transmit noise when water strikes their surfaces
 - If mounted directly to building structure components, will transmit this noise through structure



Sources of Plumbing Noise



- Fixtures, Faucets, Appliances, and Appurtenances
 - Faucets typically constructed of brass, stainless steel, plastic or cast metal
 - Wall thickness contributes to level of noise generated
 - Degree of direct contact with fixture also a contributing factor
Hard surface countertop, ceramic tile tub deck, etc.
 - Appliances vary widely in noise generated by each
 - Cost of an appliance usually related to manufacturer's published operating noise levels



Sources of Plumbing Noise

- Valves, Pumps, and Equipment
 - Valves emit noise levels depending on friction or turbulence they generate
 - Certain types of valve generate more noise than others
 - Globe valves are noisier due to design causing greater turbulence
 - Partially opened/closed valves generate high noise levels due to turbulence caused by partial obstruction



Sources of Plumbing Noise

- Valves, Pumps, and Equipment
 - Pumps generate varying degrees of noise and vibration
 - If piped incorrectly will generate turbulence and cavitation
 - Direct contact with building structure components will contribute to structure-borne noise
- Equipment-generated noise varies widely
 - Frequencies and vibration
 - Generally handled by plumbing & mechanical consultants



Mitigating Plumbing Noise



- Drainage Systems
 - Use of cast iron pipe and fittings most common method of mitigating drainage system noise
 - Isolate components of drainage system from direct contact with building structure
 - Using neoprene rubber or felt to isolate drain piping from structure will mitigate structure-borne noise



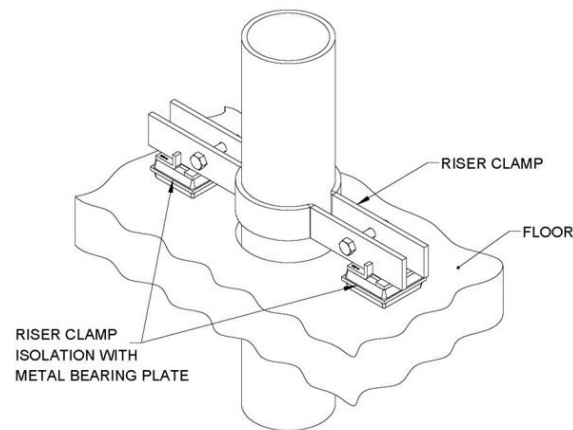
Mitigating Plumbing Noise

- Drainage Systems
 - Inconsistent application of acoustic isolation materials will result in an overall failed attempt
 - Incomplete isolation of drainage system components
 - Use of products not designed for use as an acoustic isolation material; e.g.: foam rubber pipe insulation
 - Recommend the use of engineered and ISO 3822 laboratory-tested products
 - This will make the task of acoustical isolation fast, easy and affordable



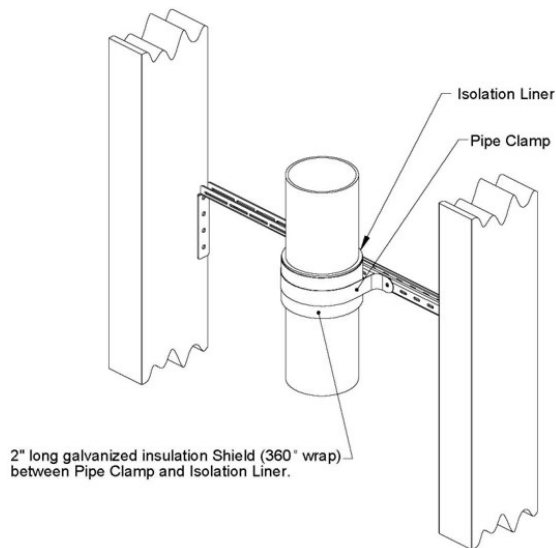
Mitigating Plumbing Noise

- Drainage Systems
 - Isolate pipes passing through floors
 - Transfer of noise minimized by use of rubber or neoprene pads placed under riser clamps



Mitigating Plumbing Noise

- Drainage Systems
 - Isolate pipes at mid-span and hanger supports
 - Transfer of noise minimized by use of felt, rubber or neoprene isolation material between pipe and supports



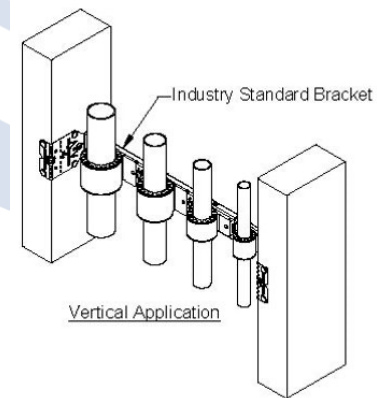
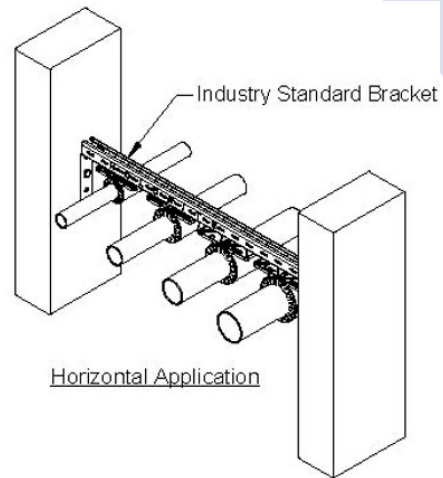
Mitigating Plumbing Noise



- Water Distribution Systems
 - Three primary factors affect noise
 - Water pressure
 - Water velocity
 - Number and type of constrictions and fittings
 - Almost always transmitted as structure-borne noise
 - Water tubing material has some effect on system noise
 - Independent lab tests show plastic tubing to be nearly 4 times quieter than copper tube

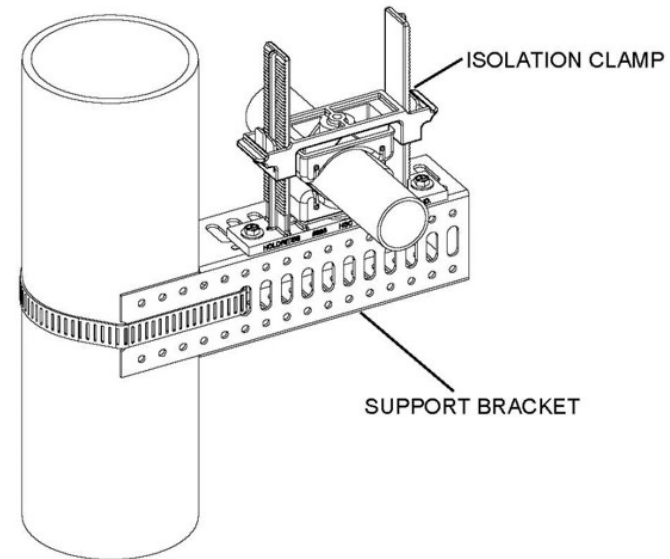
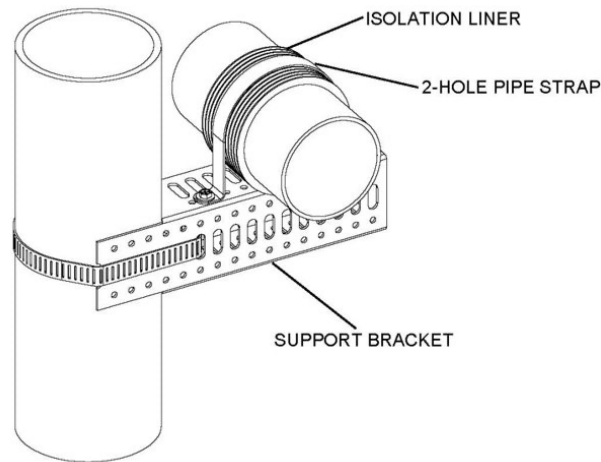
Mitigating Plumbing Noise

- Water Distribution Systems
 - Similar to drainage piping, water piping systems should not have direct contact with building structure



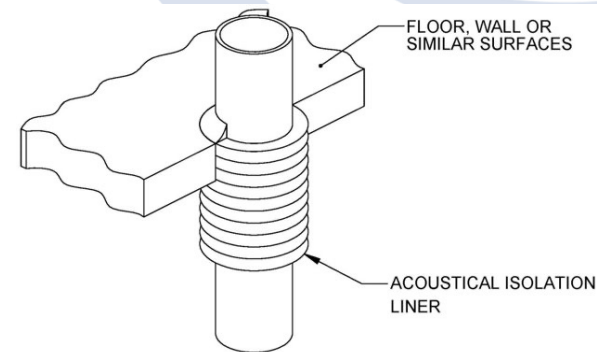
Mitigating Plumbing Noise

- Water Distribution Systems
 - Engineered solutions are simple and cost effective



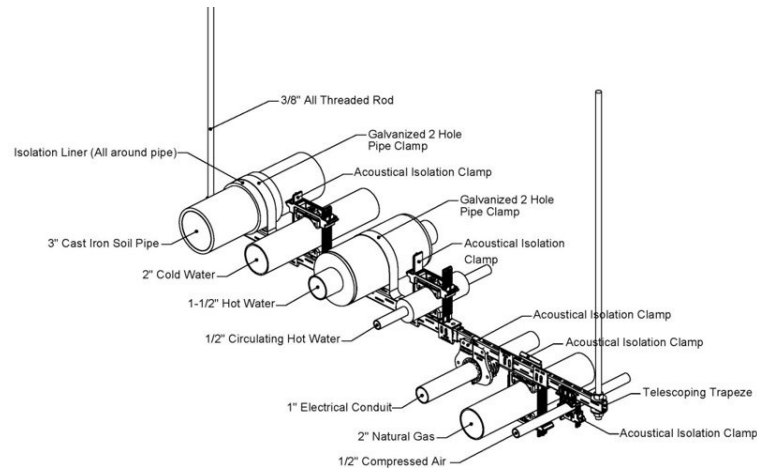
Mitigating Plumbing Noise

- Water Distribution Systems
 - Engineered and ISO 3822 lab tested products readily available to meet nearly all plumbing acoustical isolation challenges



Mitigating Plumbing Noise

- Water Distribution Systems
 - Engineered and ISO 3822 lab tested products readily available to meet nearly all plumbing acoustical isolation challenges



Mitigating Plumbing Noise



- Water Distribution Systems
 - Water hammer – the result of water velocity stopped suddenly – generates significant noise resulting from fast-closing valves
 - Reducing pressure and velocity will help mitigate this noise
 - A better solution is the installation of shock arrestors or water hammer arrestors
 - These should be introduced in the piping near the fast-closing valves

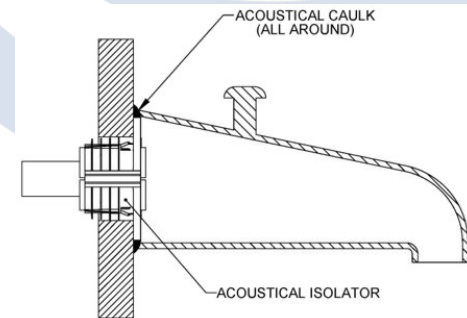
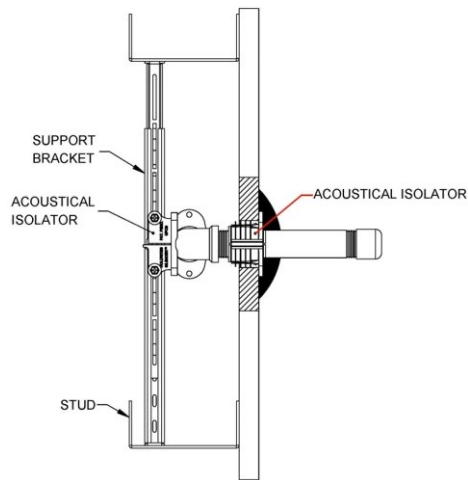
Mitigating Plumbing Noise



- Fixtures
 - A common way to mitigate noise from fixtures is to choose those made of materials that absorb sound
 - Vitreous China
 - Cast iron
 - Prevent contact between fixture supply stub-outs and wall surface materials
 - Provide annular space between wall material and supply piping
 - Fill annular space with acoustical caulk or felt

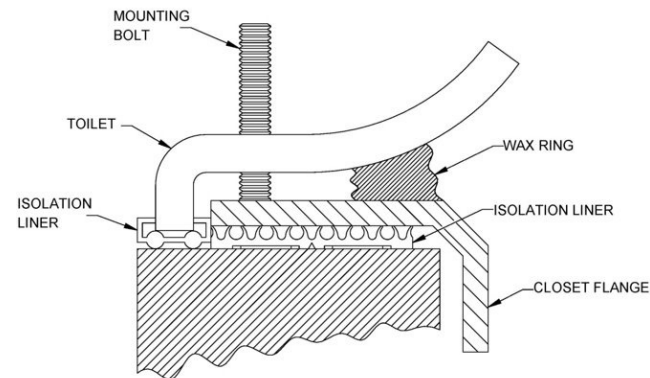
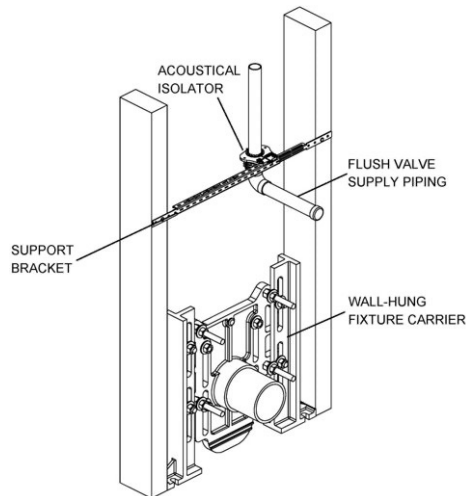
Mitigating Plumbing Noise

- Fixtures
 - Tub and shower mixing valves, showerheads and tub spouts should be isolated from direct contact with structure members

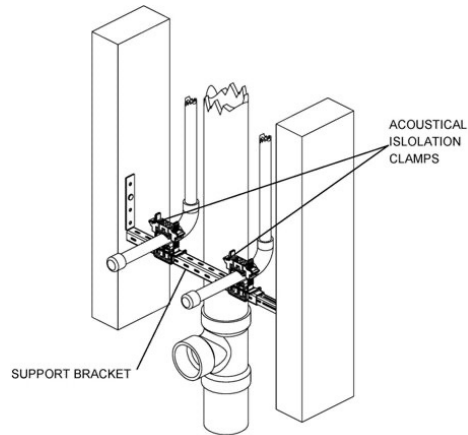


Mitigating Plumbing Noise

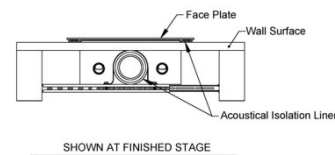
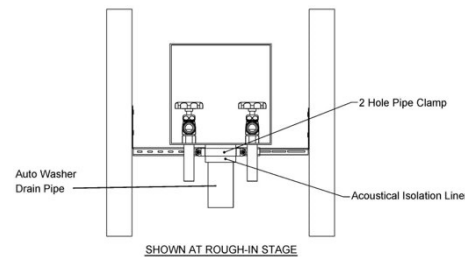
- Fixtures
 - Water closets, either floor mounted, or carrier mounted should be isolated for better acoustical isolation



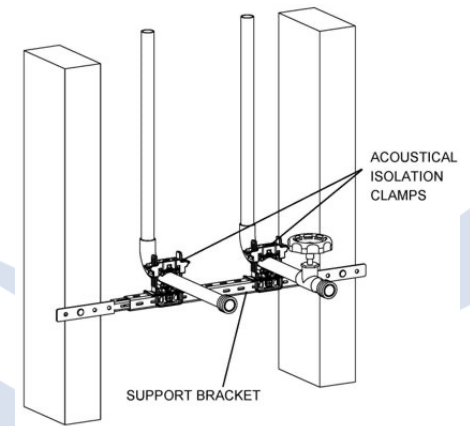
Ideal Acoustic Isolation Methods



Lavatory or Sink

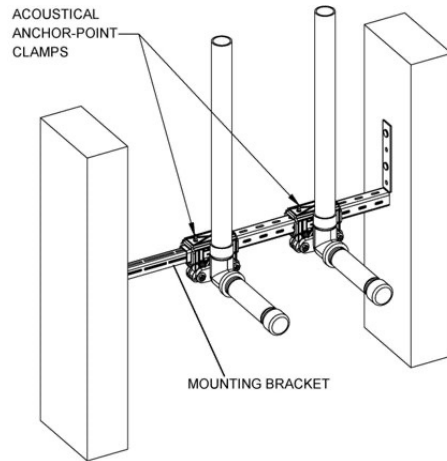


Laundry Outlet Box

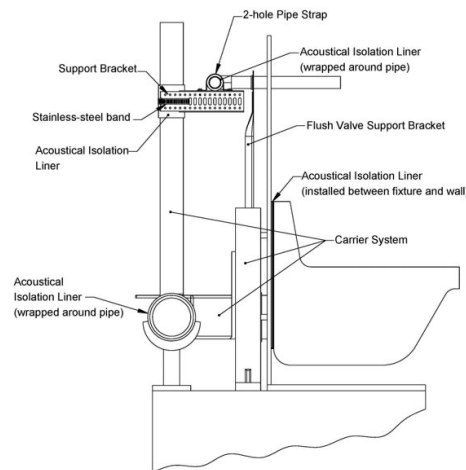


Hot Water Tank Piping

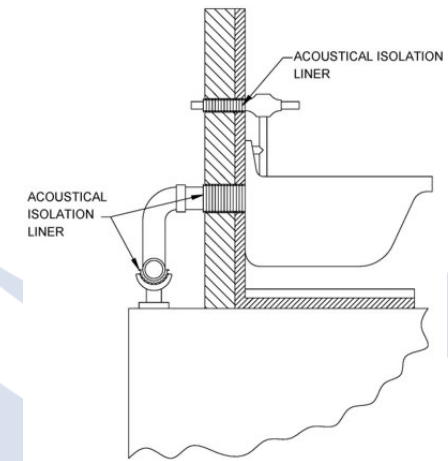
Ideal Acoustic Isolation Methods



Mop/Service Sink



Wall-hung Fixture with Carrier Support System



Wall-hung Water Closet or Similar

Specifications Update



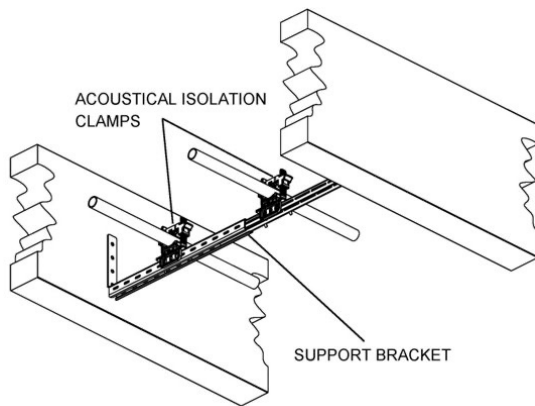
- To ensure the proper application of acoustical isolation
 - Introduce specification language that will offer guidance to the installer:

2.12 ACOUSTICAL NOISE AND VIBRATION ISOLATION

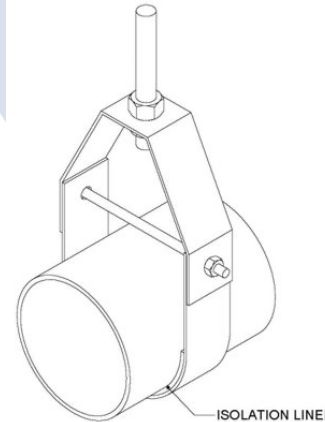
- A. Acoustical Isolation System: Consisting of through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support bracketry. For applications requiring acoustical isolation of tubing, piping, and equipment from structure.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide **<manufacturer> <model #>** used with **<manufacturer>**, **<model #>** or a comparable product by one of the following:
 - a. **<Insert manufacturer's name.>**

Specifications Update

- To ensure the proper application of acoustical isolation
 - Include application detail drawings as a guide to proper installation:



Typical Horizontal Overhead Piping Support
Provide [mfg.] [model #] or Approved Equal



Typical Hanger Isolation
Provide [mfg.] [model #] or Approved Equal

Summary

- Review your Plumbing Specifications
- Do your specifications include language disallowing field-devised methods?
- Add appropriate standard, code and/or guideline
- Encourage the use of engineered ISO 3822 lab tested systems where applicable



Assessment

1. Which of the following contribute to building noise?
 - a. Drainage system noise
 - b. Water supply/distribution system
 - c. Fixtures, faucets and appliances
 - d. All of the above
2. Which of the following types of fixtures provide better noise isolation:
 - a. Vitreous china
 - b. Enameled steel
 - c. Cast iron
 - d. Both a and c
3. A common cause of airborne and structure borne noise is/are:
 - a. Activation of fixture or faucet
 - b. Water pressure
 - c. Direct contact between piping systems and building structure
 - d. All of the above
4. PVC and ABS waste piping systems contribute to building noise through
 - a. Thermal expansion & contraction
 - b. Transmitting water turbulence noise
 - c. Vibration
 - d. Both a and b
5. Third-party lab tests of acoustic isolation products highlight which of the following:
 - a. International plumbing code section 604.9
 - b. ISO 3822
 - c. Uniform plumbing code section 609.10
 - d. Both a and c
6. Which of the following contribute to water distribution system noise
 - a. Gate valves
 - b. Globe valves
 - c. Full port ball valves
 - d. Full port gate valves
7. A common way to mitigate noise from fixtures is to
 - a. Specify fixtures made from dense materials like cast iron
 - b. Isolate the fixture from contact with building structure
 - c. Prevent contact between fixture supply stub-outs and wall surfaces
 - d. All of the above
8. Independent lab tests show plastic water tubing to be
 - a. A cost effective alternative to metal piping systems
 - b. Easier to install
 - c. Nearly 4 times quieter than copper tube
 - d. None of the above
9. Which of the following are ideal materials for plumbing acoustical isolation
 - a. Neoprene rubber
 - b. Foam rubber pipe insulation
 - c. Felt
 - d. Both a and c
10. Pumps will generate varying degrees of noise based on
 - a. How they are piped into the system
 - b. Whether installed with direct contact to building structure
 - c. Levels of vibration
 - d. All of the above

Questions?

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Thank You!

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