

SOUND SOLUTIONS

PLUMBING NOISE

No. 8

Although it often does not receive the attention it deserves in construction manuals and acoustic text books, plumbing noise is a significant source of annoyance, particularly for occupants of multi-tenant residential buildings. Understanding the causes and transmission paths that are involved in plumbing noise will help you to avoid future plumbing noise problems and solve existing problems.

Plumbing noise comes in two broad categories: 1) supply line noise and 2) waste line noise. The noise generation mechanism and the noise control procedures for these two categories are different.

Supply Line Noise

Plumbing noise is generated in supply line piping when water under pressure flows through pipe fittings and flow control valves. Generally speaking, higher water pressures and higher flow velocities will result in increased noise levels. Supply pipes should be sized for a maximum flow rate of 4 feet/second. The maximum recommended flow rate (in gallons per minute) for common pipe sizes is shown below:

Pipe Diameter		
1/2"	3/4"	1"
2.5 gpm	5.5 gpm	10 gpm

In addition to minimizing the flow velocity and water pressure, it is also important to lay out the piping system to keep pipes away from noise sensitive areas such as bedrooms and living rooms, whenever possible.

The most common source of supply line noise is flow noise generated at the flow control (on/off) valve. There are literally hundreds of different valve designs - some are noisy and others are reasonably quiet. Valve manufacturers are reluctant to conduct and publish results of noise tests on their products probably for many reasons. Consequently, the consumer is left in the dark as to which valves are the quietest and which are the valves to avoid.

One effective means of reducing valve flow noise in rooms adjacent to plumbing walls with supply lines is to isolate the pipe from the wall structure using an acoustical isolation clamp. This clamp reduces the amount of vibrational energy that is transmitted into the wall. Acoustical isolation clamps come in several different designs, but all designs basically incorporate a soft rubber-like element surrounding the pipe.

The National Research Council (NRC) of Canada has conducted extensive research into the effectiveness of various pipe designs and support methods in reducing supply line plumbing noise in residential buildings. Their findings show that rigid clamps (such as J-hooks

or hard plastic clamps) allow the greatest noise radiation of all clamping methods. Wrapping 1/2" thick felt pads around the pipe reduces the noise by about 10 dBA below the rigid clamp levels. The lowest noise levels were obtained by using 1/2" thick closed cell foam rubber (Armaflex pipe insulation) wrapped around the pipe. The noise levels with Armaflex were about 20 dBA less than those using rigid clamps.

Other findings of the NRC research include the fact that plastic pipe is about 10 dBA less noisy than copper pipes *when both are rigidly clamped in the supply line system*. However, there was essentially no difference between plastic pipe and copper pipe noise when the pipes are resiliently attached to the wall.

Wall construction was also found to be a factor in supply line plumbing noise radiation. Adding insulation to the stud cavity is generally effective only when the pipe is resiliently supported. In addition, attaching the gypsum board with resilient channels (and using double layers of gypsum board) will also reduce supply line plumbing noise levels. Of course, the ultimate in supply line noise control would be to use double stud construction where neither the pipe or the pipe clamp comes into contact with the adjacent wall.

In many situations the problem is so critical that it is also necessary to wrap the pipe within the stud cavity. This may be necessary, for example in a luxury condominium where supply lines pass through a master bedroom suite. In this case it is advisable to wrap the pipe with fiberglass pipe insulation with an additional layer of sheet lead outside the insulation. The sheet lead serves as a noise barrier for noise radiated by the wall of the pipe. This approach should only be used when the pipe is resiliently supported.

Waste Line Noise

Noise from waste lines is caused by waste water impacting the inner wall of the waste line, causing it to vibrate and radiate noise into the stud or joist cavity. This primarily occurs at elbow and branch fittings in the waste piping system where the water flow is turbulent.

Waste line noise can be minimized by using cast iron pipe. NRC noise measurements from cast iron pipes show them to be about 10 dBA less noisy than plastic pipe. If plastic pipe must be used near noise sensitive areas, the pipe can be wrapped with fiberglass insulation and sheet lead in a manner similar to the supply pipes. Packing the stud or joist cavity with batt insulation will also help to a lesser degree. However, for the additional cost of the insulation, sheet lead, and labor to install, it may be less expensive to simply install the cast iron pipe.

The above information has been reviewed and is believed to be accurate, however we assume no responsibility for errors or omissions.

