PRACTICAL ASPECTS OF OPERABLE WALL SOUND ISOLATION

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INTRODUCTION

Operable walls are typically integral parts of school, major meeting room, conference/convention centre, and hotel facilities. Where the purpose is for simultaneous uses on opposite sides, high sound isolation, often difficult to achieve, is required.

SPECIFICATIONS

Great care is required interpreting manufacturers' specifications. Typically, Sound Transmission Class (STC) ratings according to the laboratory test procedure ASTM E90 are available. However, this may be for the panels alone, not for an actual operable wall, including top, bottom, vertical and edge joints. To be certain, reference must be made to the original *independent* test report, not the sales brochure. Clearly, significantly higher STC ratings can be expected for the panel alone, without all of the joints or operating mechanisms, and this type of specification can be totally misleading.

A test and certification procedure exists through the Operable Partition Manufacturers Association Section/National School Supply and Equipment Association (OPMA/NSSEA). This calls for a fully operable installation nominally 14 ft wide by 9 ft high, including head, jamb, etc., as normally used in the field, installed in the laboratory test opening, for testing according to ASTM E90. OPMA/NSSEA will certify supervised tests in an approved laboratory. There are several problems with this approach; not all manufacturers are members; few partitions have certified tests; the test partition size is much smaller than is typical in actual use. Panel heights can range from two to three times taller and many times longer, exacerbating any difficulties with field installation aspects that affect sound isolation, such as construction tolerances.

Some manufacturers also report independent field tests of operable installations. These are in the form of field transmission loss (FTL) or noise reduction (NR), and Field STC (FSTC) or Noise Insulation Class (NIC). FSTC and NIC are single number indices computed according to ASTM 413 from the spectrum of FTL or NR, as is STC. Field performance ratings are usually best for specification use, because of a more realistic indication of results to be expected. Generally, the FSTC/NIC ratings are about 10 points lower than the laboratory performance. The practical upper limit for well installed, readily available, operable walls is about NIC 42 to 44; while lab STC ratings as high as 58 may be reported. Field results are poor to marginally acceptable for many situations, particularly when sound systems are used. For many uses, this level of sound isolation is inadequate.

PARTITION SYSTEMS

There are many different models of operable walls available, with different operational and installation implications that are relevant to associated sound isolation details. Panels may be individual, hinged in pairs or more, or in a train, all hinged together. Individual panels can negotiate more complex turns and with track switches can be used in different spaces or along different boundaries. When open, panels may nest in set-back pockets out of the space, or simply against a wall in the space.

SOUND ISOLATION FACTORS

There are many relevant factors; some directly related to the partition and its hardware; some related to the base building.

Partition System

Clearly the partition construction itself is the starting point. Various types, with different thicknesses and weights incorporating various materials such as steel, particle board, and gypsum board are available. Typical weights range from 6 to 12 lbs/ft^2. There is a height limit associated with each type, with more substantial construction required for tall panels to avoid unacceptable twisting or other deformations. The vertical joints between panels must nest and seal tightly. The better systems have fairly sophisticated interlocking shapes. Most operable walls are suspended, requiring a track and roller system to carry the often substantial weight. A proper sound seal across the top offers a design challenge.

In some cases the top can be contained within a bulkhead extending below the ceiling, to achieve a sound seal. However, in most cases, the partition must be below the ceiling, (with the support track flush mounted) to allow turning the panels. In these cases, either movable mechanical seals, or fixed flexible sweep seals are used to close the clearance gap between the panels and the ceiling. These clearance gaps are typically about 25 mm and ensure that the partition can be operated. The mechanical seals are superior acoustically because when activated on panel placement, a positive force is created against the track; but they are more complex and costly. The bottom seal situation is similar to the top except that a larger closure force can be used.

Alternative techniques are used to seal the end vertical panels, termed the jamb, including hinged closure panels, and (superior) expanding jamb panels which are analogous to the top and bottom mechanical seals.

Base Building

There are several potential flanking paths that must be addressed in design. Usually, a bulkhead is needed above the track to close off the ceiling space. This precludes a common return air plenum in the ceiling spaces. Separate ducting or silenced transfer ducts must be used. The bulkhead system must allow access to the track system for initial adjustment and for service. In gymnasia, rehearsal halls, or computer rooms there may be floor cavities that should be closed off (along the partition line). Where carpet is the floor finish, bottom seals are compromised. Solid thresholds are preferred.

Potentially, the most significant base building factors in achieving high sound isolation from operable partition relates to construction tolerances. The jambs must be plumb and true (±3.2 mm/ every 3 m). The structure carrying the head track (and the track itself) must be very rigid and designed to include the partition load, so that non-cumulative deflection does not exceed 3.2 mm every 3.7 m. The partition track would normally be installed with the structure, early in construction. As the building progresses, the loading will increase and so will deflections. With concrete construction, the deflections may continue over many months. Thus, the track system must have ready means to adjust its level before and after the partition is hung (with bulkhead access not compromising sound isolation). In some cases, the structural engineer can use reverse camber beams and trusses so that when loaded, they take a straight horizontal shape across the bottom.

Similarly, the floor must have adequate flatness and be smooth (±1.6 mm from flat). To the extent that base building tolerances are exceeded, the partition may not be able to seal properly.

CONCLUSIONS

Design/use decisions should not be based on manufacturer's laboratory STC ratings. Rely only on field test results from independent authorities. Aside from treatment of potential flanking paths, control of construction tolerances for floor flatness, jamb plumbness, head track level and structural deflections are important for proper operation and sealing. Achieving greater than about NIC 42 with readily available systems in practice is not possible (except by use of two partitions separated by a cavity - usually not done because of cost and space.)