FSTC Of High Rise Concrete Wall

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Introduction

Sound transmission loss tests following ASTM E336-84 procedures were conducted in a concrete framed high rise residential building. Tests were conducted on an 8 inch concrete shear wall with laminated drywall each side following initial noise complaints and remedial work. The field test results showed dramatic differences from FSTC 50 to 56 due to mounting of the drywall.

Initial Conditions

The wall construction separated two dwelling units with an open kitchen and living/dining area on one side (source) and a bedroom (receive) on the other. Voice communication could be carried out through the wall. A bare 8 inch thick concrete wall has a lab STC rating of 58. It is known that laminating gypsum board to the surface can degrade the acoustical performance.

The Field Sound Transmission Class (FSTC) was measured using a pink noise source and a Larson Davis 2800 Real Time Analyser. Reverberation time was calculated using the room surface characteristics. The STC value was automatically calculated by the analyser.

The FSTC was 50 as shown on Figure 1. A large dip occurred in the 400 Hz region where speech could pass.

Examination

The original solution proposed was to construct an additional insulated metal stud and drywall partition on the bedroom side. However, we recommended the drywall on the bedroom side be removed to check for any deficiencies as any damage to the wall surface would not matter because it would be covered by the new construction.

The bedroom wall was covered with three sheets of 4 foot by 8 foot drywall mounted vertically. One full sheet was first removed. It was discovered that the sheet was mounted with only 6 concrete nails around the perimeter and none in the field. In addition, the 2 inch diameter areas of drywall compound on six inch centres were adhered only to the gypsum board. This may have been due to dust on the concrete surface that was not removed.

The remainder of the drywall was removed and the wall retested. The FSTC was 56 and it was difficult to hear shouting through the wall.

The opposite side of the wall was inspected. Pushing on it caused it to move in and out indicating that it was constructed similarly to the other side. The contractor proposed to hammer in concrete nails over the entire surface but we were unable to do any follow-up testing to investigate the effect.

Conclusions

The poor performance of the initial wall condition appears to be due to the drywall sheets acting as sounding boards. No specific modelling of the phenomenon was performed but this may prove interesting.

Recommendations

The next revision of the National and Ontario Building Codes should include ratings for drywall laminated concrete walls and a cautionary note on the installation. The board should be firmly adhered to the concrete surface. The use of construction adhesive rather than drywall compound should be considered.

Figure 1