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Hollow-sounding tiles may signal installation problems

By Donato Pompo,
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A common symptom I come across in investigations is ceramic or stone tile that sounds *hollow*. A simple way to check if a tile is hollow or solid sounding is to tap on the tiles with a hard object such as a steel ball bearing. Chains or special sounding devices can be used for larger areas. If the tile is well-bonded to the concrete substrate, it will have a high-pitched sound. A lower-pitched or a hollow sound can indicate voids or debonding beneath the tile somewhere within the tile assembly.

A low tone doesn't always signify a problem and the type of sound you hear also depends on the configuration of the tile assembly. For example, when tile is installed over a less-dense substrate – as in



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the case of wood, a non-bonded mortar bed, a sound-control mat or other membrane, or over a steel-framed wall – tapping often produces a hollow-sounding tone even though the tile may be well attached. If the entire installation sounds hollow, that too may be due to the type of substrate used.

Look for resultant damages (symptoms) – such as loose or cracked tile or grout – that indicates trouble.

What signals a potential problem is a differential in sound from one area of an installation to another, or from one portion of the tile to another. Notice if the hollow-sounding tiles are grouped together or are spread out randomly – is there a pattern? Does the whole tile sound hollow or does only a portion of the tile sound hollow? Remove a solid-sounding tile to see if it has the same problem but hasn't debonded yet and might at a later date.

Spot-bonding

Spot bonding can also produce hollow-sounding tiles when tapped. Spot-bonding is when an installer applies “spots” of adhesive on each corner of a tile and one in the center, and then presses it into place. This leaves voids under the tile, and ultimately throughout the entire installation, which can lead to big problems. When this improper installation method has been used you'll hear

the hollow sound where there is no adhesive (the voids) and you'll hear solid sounds where the tile is spot-bonded.

Spot-bonding does not meet industry standards for coverage either for residential floors (80% contact required) or commercial floors, exterior applications and interior wet applications (95% contact required) – all with no



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voids greater than 2 square inches and full thin-set contact at all tile edges and corners.

Voids that occur with spot-bonding become pockets for water and moisture to collect, which could lead to efflorescence and other moisture-related problems. The lack of support beneath the voids also make the tile more vulnerable to damage from live loads such as falling heavy objects, heavy equipment, rolling vehicles, loaded dollies, carts, etc.

Spot bonding is only appropriate when used either for mechanically anchoring stone slabs or in tile applications using an epoxy adhesive for a ventilated wall system.

Forensic investigation

The only way to determine if the hollow sounds signal trouble is to remove some hollow-sound-

ing and some solid-sounding tiles from different areas of the installation for comparison. This allows you to find out what's different in the assemblies of the hollow- vs. solid-sounding tiles and determine whether individual defective tiles can be repaired or if the entire installation needs to be replaced.

Removing solid-sounding tiles shows differences in the installation and similarities to hollow-sounding tiles. Sometimes solid-sounding tiles have also been improperly installed or compromised, but have not been subjected to the same stresses as tiles in other areas; these tiles may look okay, but they may eventually debond and need to be repaired. On the other hand, you may find that a bonded mortar bed has debonded from the slab, causing the hollow sound, but that condition will not

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cause any problems in terms of the longterm performance of the tiled floor.

Causes of debonded tiles

Some common reasons why tiles debond:

- The concrete substrate is not properly prepared. Concrete curing compounds, or other contaminants, may act as bond breakers or the concrete surface is too dense and doesn't absorb moisture well enough to allow thinset to achieve an adequate bond.
- The backs of the ceramic or stone tiles are not properly cleaned before application. Dirt and manufacturing residues are contaminants and act as bond breakers.
- Thin-set mortar adhesives will "skin over" if too much time has passed between troweling it on to the substrate and before the tile is embedded into it, and will lose tackiness, thereby reducing the bond to the tile. Improper slaking or mixing contributes to this; so does applying thinset over a too-porous substrate.

Other factors that contribute to debonding are excessive floor or wall deflection (vertical movement) and the lack of movement joints (expansion joints). This can result in tile tenting to release pressure from the tile assembly.

Conclusion

The best way to ensure that you don't end up with tile and stone

installation problems is to verify that installers are following industry standards. The Certified Tile Installer program through CTEF and the Advanced Certifications for Tile Setters (ACT) program validate basic – and in the case of ACT – advanced skills possessed by the tile setter. Visit www.tilecareer.com for more information.

The University of Ceramic Tile and Stone (UofCTS) offers a convenient and practical online education course for tile installers (setters and helpers) to learn the current industry thin-set and substrate preparation standards. Visit www.UofCTS.org for more information.

Installers should issue RFIs (request for info) if the architect's specifications are not clear or thorough. Installers should have their own internal quality control plan as a way to avoid potential problems and to catch deficiencies early on so they don't become a costly problem. The quality control process in itself becomes a platform for training installers to make sure they understand and follow industry standards. Make sure you are up to date on, and follow, industry standards and read and follow manufacturers' directions to avoid costly problems down the road.

Donato Pompo CTC CDT CMR MBA has worked in the ceramic tile and stone industry for over 35 years as a union installer, an importer and distributor for, and a sales manager

for an international manufacturer of installation products. Donato has operated his own forensic and consulting business for over 12 years and serves on a number of industry committees. For more information on Donato and his company, Ceramic Tile and Stone Consultants, visit www.CTaSC.com or email Donato@CTaSC.com.

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