# Acoustical Challenges in Long Term Care Facilities

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## 1. Abstract

Providing satisfactory acoustical environments in healthcare facilities can be ensured by applying recommended minimum design requirements provided in Sound and Vibration Design Guidelines for Hospital and Healthcare Facilities [1]. However, there are still acoustical challenges within long term care facilities that should be addressed, such as:

- Maintaining speech privacy between rooms and corridors with large undercut door openings for air flow;
- Maintaining STC ratings of the demising walls where the ceiling plenum is utilized for ducting and plumbing systems;
- Maintaining speech privacy between rooms and corridors while good speech intelligibility through corridors for caregivers to hear calls from residence inside the room is required.

I will discuss the aforementioned issues experienced in one Long Term Care (LTC) facilities, including all challenges for improving acoustical separation between a room, holding a person with dementia who was screaming during days and nights, and the public area, TV room / eating room. Proving the steps taken to improve this acoustical separation is discussed including all challenges on how to not affect fire separation of demising walls and door.

## 2. INTRODUCTION

Following a call from a manager of a long term care facility explaining noise issue within their facility, where one hundred and thirty elderly people reside, a review of their acoustical environment was undertaken.

The facility was a new building built in two levels with private rooms located on the perimeter of the building and the communal areas (e.g. TV room, dining room, etc.) positioned in the middle.

One elderly person who was suffering from dementia was relocated from another facility to one of the private rooms in this new facility. Her screams all day and night long resulted in discomfort environment for all other residence within the facility.

Steps taken to solve this issue are discussed in this paper.

## 3. METHOD

To evaluate level of background noise within the facility and acoustical separation between private rooms and between private rooms and the communal area, a site visit was arranged.

During our site visit, no scream was heard and the elderly person was quiet. We were told the subject quietness might be because of having companionship (e.g. our presence in the room).

In our site visit we reviewed architectural and mechanical drawings to evaluate STC rating of the demising walls and any openings through HVAC systems within the facility. Through this review we understood:

- Interior walls were all 152 mm steel studs with 15.9 mm Type X GWB on both sides filled with acoustical batt insulations, achieving STC 51.
- Doors to all private rooms were solid core with gaskets at the opening side which was not large enough to seal the gaps.
- The corridors were pressurized to have a positive pressure and undercut doors were used for air-intake and air exhausts and placed in the bathrooms.
- No electrical outlets were located back to back to affect the STC rating of the demising walls.

No acoustical treatments were considered anywhere within the building which is typical within most Long Term Care facilities [2, 3]. A white noise generator device was located inside the room to be played inside the room when the subject was screaming. The staff in the facility was using the device to mask the person's screams!

## 4. FIELD MEASUREMENTS

The white noise generator was used to investigate the effectiveness of the gaskets on the door.

The instrument used was a Bruel and Kjaer sound level meter Type 2250 with one octave band frequency analyzer and a free field ½" microphone.

The measured noise level was 70.4 dBA and 59.2 dBA, inside and outside the room, respectively. The measured noise level outside the room was conducted with door closed. To evaluate the effectiveness of tight seals around the door perimeter, figure tape was used to cover all gaps around the perimeter of the door. The measured noise level with the sealed door was 4.6 dBA lower than the one with existing conditions and it was equal to 54.6 dBA. The background noise within the facility during the measurements with all normal activities was equal to 50.5 dBA.

Measured noise level within the adjacent room was 40.78 dBA. No noise from the adjacent room could be heard through the demising wall or doors.

## 5. RECOMENDATIONS

It is found that the large opening under the door equal to 5/8" with no proper seals around the perimeter of the door was the main noise leaking points. Since the door's undercut was used for air intake, alternative should have been considered to seal this opening. The best option was to close the undercut door and add a quiet vent silencer. However this option due to door's fire rated properties wasn't the best solution. We suggested Pemko seals at the bottom of both sides of the inactive door and acoustical bottom door for the active door. It is also suggested to seal the perimeter of the door with draftseal self-adhesive bulb or Pemko products. It is decided to close the opening under the door and add a custom fabricated metal duct complete with louvre grilles and internal lining to provide fresh air into the room.

We also recommended to boxing in the duct with 5/8" thick Type X Gypsum Wall Board built on metal stud framing.

Since the air transfer duct was penetrated through a one hour fire rated wall assembly, a fire damper was required.

Addition of sound absorptive materials to the ceiling of the room to lower RT within the room was also suggested.

## 6. DISSCUSIONS

Installation of the duct requires cutting holes in the drywall of the wall beside the narrow door, so appropriate precautions must have been taken to contain dust while the work was in progress. We assumed that facility operator would have their own safety and environmental protocols to follow when doing maintenance or renovation work inside the facility. We also offered to pass on recommendations from the CSA standards that describe special measures for this type of situation if they were unsure what to do.

We also reminded them about the fire-rated labels attached to the ends of the doors. These labels indicated that both doors were fire rated and form part of the smoke separation that prevents smoke from migrating from the corridor into the resident room and vice versa. It was important not to compromise the integrity of these doors, so we were taking a careful approach to adding accessories to the door and frame.

## 7. CONCLUSIONS

We submitted recommendations in order to improve acoustical environment within LTC after receiving a phone call from the facility manager. This was to increase acoustical separations between a private room and the facility communal area. Phase 2 of acoustical upgrades to the private room was suggested once we realized the Phase 1 recommendation on improving gasketing around the perimeter of the door wasn't satisfactory. The owner of the facility planned our recommendations on their own, including all activities related to retaining a contractor and getting the work done. Thus, we didn't get involved with tendering or monitoring of construction activities.

Phase 2 of acoustical upgrade consisted of sealing the undercut at the entrance doors to the private room and providing an alternate means of allowing fresh air into the room via a special transfer duct specially designed to allow air movement but not noise transmission.

Not jeopardizing the fire and smoke separations provided by the door was one of our priorities.

At the time of writing this paper, the owner of the facility was implementing the recommendations. Thus, no outcome from this implementation was available at this time.

## AKNOWLEGEMENT

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## REFRENCES

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