

# Survey Impact of the Built Environment in LTC facilities during the COVID-19 Pandemic

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Florence Nightingale championed the concept that the environment, and particularly the Built Environment is a crucial factor in infection control. Based on her observations of deplorable conditions during the Crimean war, she believed the upgraded environment could be a protective umbrella. She advocated for improved ventilation and sanitation. she said “depriving patients of appropriate ventilation is nothing but manslaughter under the garb of benevolence”. (Gregory, 2021, Noskin, 2001). The role of the LTC physical environment is the focus of this article.

Evidenced based research is critical for understanding the impact of the Built Environment, but equally important is listening to the Users. A survey was sent to several Long-Term Care facility directors and managers in British Columbia and Canadian Nursing Home included the Survey questionnaire in the 2022 Winter edition. The Survey focused on how facilities coped with COVID-19 in terms of the impact of the Built Environment in 2020 and 2021. The nine Survey questions for the most part followed the Engineering Controls Pyramid for Infection Prevention in LTC developed by the author for a previous article (Benbow, 2020). Selected responses of common themes are supplied below.

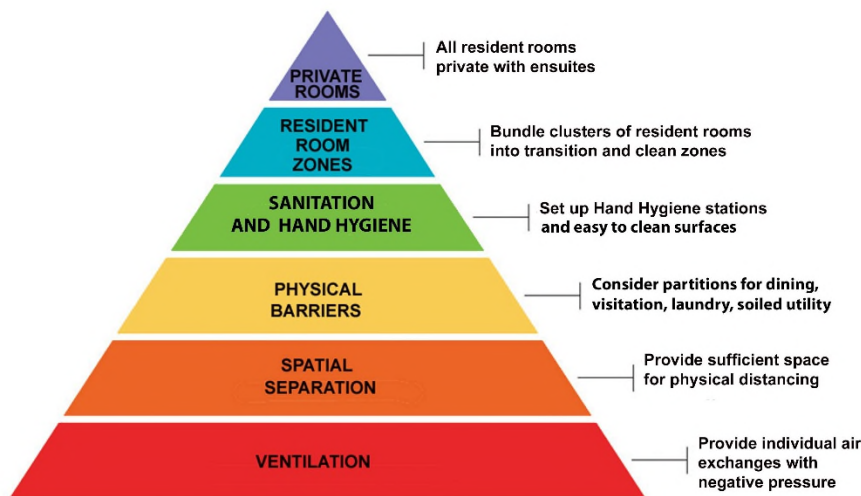


Fig. 1. Engineering Controls Pyramid for Infection Prevention in LTC

1. **BIGGEST CHALLENGE:** What was your biggest challenge in your facility’s design in caring for residents during the COVID-19 pandemic?

For older facilities the biggest challenge was crowding in amenities such as dining and common areas. There was insufficient space for social distancing and the older design made it

difficult to subdivide into smaller separate units for cohorting and limiting spread within the facility.

One older facility with over one hundred residents highlighted the difficulties of trying to subdivide a large centralized facility into more manageable units:

- *To protect the residents, we separated our building into three distinct units and size of spaces was the main issue given the number of residents in each care unit. Security between units is a requirement to keep residents from interacting with other units during outbreak or enhanced surveillance. There was insufficient space for meals and activities, insufficient space to store equipment on each of the units. This included food service supplies, medical supplies, PPE etc, activity supplies. Access to bathing, rehab and other services was not available while separated into the distinct units without crossing zones... Limited space for activities, residents' access to activities and social interactions had to be re-thought. Limited space to safely socially isolate, 6 feet between staff during meals, we had to adapt areas for breaks... Each area needed its own utility room, chemical storage, and staff space but was not available.*

For newer facilities that followed a Household design some facilities found that there was limited space for resident pacing and activities once access to more of the facility was curtailed. Also, resident rooms are still being designed with limited up space in order to encourage residents to spend time away from their own rooms and socialize in amenity areas. This small size of resident rooms can make it difficult during times of lockdown and quarantine.

All facilities faced the challenges of accommodating visitors safely, keeping surfaces and furniture clean, and insufficient storage for PPE.

**2. VENTILATION:** What is your Ventilation system and has it been adapted to better cope with COVID-19? Does it recirculate air, does it use filters, outside air access to rooms?

The common theme arising from this question highlights a further plight of older buildings: outdated HVAC systems. And the high cost of upgrading to current standards. One older facility did manage to get a Federal grant to upgrade its electronics and air conditioning and also set up a Preventive Maintenance contract to keep the HEPA filters clean and replaced and to test air quality. Another facility has applied for a similar Provincial grant to help upgrade their HVAC system.

However, many facilities were unable to do much if anything and some were unfamiliar with their current system and what is needed to mitigate aerosol transmission of the virus. Even fairly new facilities fell short of recommendations for appropriate air exchanges and HEPA filters. While most older facilities do have opening windows, some newer ones do not have this option for fresh air.

An older facility reported that improving their ventilation was quite challenging due to cost.

- *Upgrade cost for ventilation estimated to be one million.*

**3. SPATIAL SEPARATION:** How have you dealt with the need for Spatial Separation: have you modified Group Activities, Dining, Lounges? Have you reduced group size for certain activities such as providing two sittings for dining or provided additional activity space?

Facilities in the Survey responded that they adapted their dining function to accommodate social distancing. Most reduced seating to 1 or 2 residents per table, added tables if there was sufficient space, or took turns eating in the dining room. Where in the past residents had been discouraged from eating meals in their own rooms, during the pandemic residents were encouraged to eat in their room if they so desired.

Large group activities were curtailed. In Household model facilities inter-community activities were stopped. Even small group activities ceased during enhanced surveillance periods. Individual activities were developed during lockdown such as corridor activities like door bingo.

- *We stopped inter-community activities but continued to have elders who are living in a community together (Household) to continue to do activities together. We used to have events with the entire building, or select residents from different neighborhoods, but that reduces in times of higher community spread. We also prepared individual activities, when possible, that were used during our outbreak when elders isolated for 14 days. With 11 elders in a dining room, we only needed to add one extra table per dining room and kept some residents in their rooms if they preferred, to maintain 6 ft of space in the dining room.*

Household model facilities have built in common areas in each unit but these can be somewhat small for activities.

- *The spatial separation is hard to attain in certain units, especially special care unit. The dining areas are small and due to nature of the disease, the residents wander into each other's space.*

Older facilities found it even more difficult to provide common space for small group activities once they had subdivided into smaller units.

- *We divided into three isolated units as necessary, although this requires additional staffing to provide same services to all three units (e.g. rehab) Activities offered between mealtimes and use of smaller wing lounges, but much staff time was needed to cleanup from meals, then re-set for activities. Because common space was so limited in two of the three units, we had many challenges regarding meal times. We purchased overbed tables so that residents could eat in doorways.*

One of the most challenging issues for most facilities was the need to accommodate social distancing in staff break areas. Some facilities were able to convert unused rooms into additional break room area for staff.

- *Added second staff lounge by converting large lower-level room.*

**4. PHYSICAL BARRIERS:** Have you used Physical Barriers such as plexiglass partitions on dining tables to reduce droplet spread? Have you provided visitor rooms with partitions to protect residents? Have you adapted routes to keep soiled laundry, deliveries and other services separate from residents?

Several facilities set up temporary visiting areas inside in unused areas such as an old office or private dining room:

- *At one point, we had a specific visiting area in our closed day program. We put up cubical walls to separate families from one another and to give enough space for visitors to be 6 ft. when needed. We have significant outdoor space and bought heaters etc. so people could visit more safely outside.*
- *We were able to set up 4 completely separate visiting areas for our residents and guests. Guests would be given a fresh mask, screened, directed to wash their hands before being escorted to the visiting area. After each visit, the area would be sanitized as well as at the beginning of each day each area would be cleaned thoroughly by housekeepers. High touch areas were done multiple times daily.*

Some facilities used outdoor walking paths for access to window visits, and some set up temporary outdoor areas such as patios, benches and tents with heaters for visits and activities.

- *We created a half door off our back patio that allowed families to visit with their loved ones. It had a table across it to maintain 6 ft.*

Plexiglass barriers were not found to be very effective.

- *Due to the layout of the nursing stations plexiglass was not an option to use. We did however, have taped off areas for people to know where to stand at the nursing stations.*
- *Plexi glass barrier was used in offices but it was taken away due to its ineffectiveness.*
- *We did not use plexiglass for dining as this caused responsive behaviours in residents.*

Rerouting was found to be challenging but useful for deliveries, soiled utilities, laundry and other services and for guiding access for visitors. Some found Zones to be useful in controlling access points.

- *Limited entrance and exit for visitors to front door. Did extra cleaning, and no stopping enroute to resident room for visitors.*

- *Had to use temporary separation to ensure risk of transmission mitigated for laundry as only one clean and one dirty entrance which was on one of our 3 units. Had to add garbage bins to other outside areas and set up new external routes for laundry which gave rise to WorkSafe issues and extra lighting and accessories required to handle laundry carts etc....Soiled dish carts, laundry carts, garbage pushed through unit doors to the main area where it was collected by others.*
- *During outbreak, we had levels of infectious risk: red, orange and green. We had restrictions on access to the green zones from the red and often would pass items to other care partners who were not exposed to the red zone, through the orange zone, to bring into the green zone. Deliveries changed to being left at main doors or shipping entrances as opposed to brought right in.*

**5. HAND HYGIENE STATIONS:** What is available in your facility for Hand Hygiene? Have you modified the provision and access of Hand Hygiene stations? If so please describe.

Many facilities upgraded their number and accessibility of Hand Hygiene stations during the pandemic.

- *Additional hand hygiene stations were installed at every transition area in the building (between units, rooms, departments) -High touch areas like door codes labelled to cue staff -Initially hand hygiene product was donated and of sub-par quality, may look into new product to increase compliance -Screener time set aside in schedule for hand hygiene audits to look for areas of improvement Each resident room has a washroom, dining/activity spaces. More challenging in scu where staff carried their own bottle of antibacterial lotion.*

Some facilities were quite creative in adding Hand Hygiene stations.

- *We were able to turn a telephone station which no one ever used into a hand washing station that is located just passed the front entrance. It allows anyone to use it before they go further into the facility as well as when they are leaving. A much better use of the space. We also converted the coffee station, where residents/family could help themselves to a coffee, into a hand washing station that is fairly central.*

Some Household Model facilities struggled to keep the ambience of Homelike rather than institutional.

- *Homelike design did not favor wall mounted hand sanitizer stations. Used a lot of portable sanitizers. Plan to permanently wall mount in future.*

**6. ZONES:** Is your facility designed into zones or Households? Have you cohorted residents into zones to separate residents and dedicate staff into Quarantine zones for COVID positive and symptomatic residents; and clean zones for residents who are uninfected and have not been exposed? How has this worked?

Older facilities struggled with setting up zones to cohort residents because of the size of their existing units and design layout.

- *Our facility is not designed into household units but we did cohort residents into one of three units for almost a year to support risk mitigation. This was challenging as the units do not have the necessary space, equipment, utility etc. requirements. We did use the zone system and while we did not experience a full outbreak we did add door locks etc. to ensure residents were able to be isolated from other units.*
- *Our facility is split into 3 separate units. Each unit has 2 sides with 25 residents on each side for a total of 50 residents on each unit ... The plan was/is, in the event needed, to cohort residents who became positive.*
- *We can't really create /zones in our site because of the nature of the design on the unit and the fire doors*

The Household model facilities functioned much better in that generally they have fewer residents per unit so they could treat each Household independently in terms of zoning and cohorting.

- *We are divided into communities and neighborhoods. We have 6 communities. Each community is 2 neighborhoods... We quickly locked in areas when risk is higher and limit interactions between them in activities and in staffing when possible. We have been able to stop COVID from moving around our building in 2 separate outbreaks – our biggest challenge being staffing. During our first outbreak, we also repurposed our day programs (which were closed) as an isolation room to quarantine our positive elder. This worked very well – again the struggle was staffing.*
- *We are designed into neighbourhoods. We would isolate each neighbourhood if there is an outbreak of any kind. In addition, we would place a resident on droplet precautions and have tray service for each resident that is confirmed to have a virus. Being able to keep residents in smaller neighbourhoods of max 18 residents has limited the spread of any virus that comes into the home.*
- *Household bubbles excellent. Dedicated staff. Didn't have to limit residents to own room.*

**7. PRIVATE ROOMS:** Have you had sufficient number of private rooms to isolate residents with symptoms, exposure or positive test.

If residents were in shared accommodation efforts were made to find a spare room to repurpose for isolation and quarantine. This was challenging for facilities with large numbers of shared accommodation and limited private rooms. However, often where residents shared rooms, both got COVID.

- *Too many double rooms.*

- *If we were concerned about a resident or that resident was showing symptoms our goal was to isolate them and move the resident into the palliative room (private room) if it was not being used. If it was being used, then we would set up an isolation cart and have the resident isolate in their room, which can be challenging as not all residents understand or are compliant.*
- *Our 2 Covid residents were roommates so we were able to isolate them in their room.*

**8. ADAPTATIONS:** Have you made any other adaptations to the physical structure of your facility to cope with COVID-19?

A common modification was to set up a screening and testing station for staff and visitors.

- *In order to ensure that all staff and visitors go through one point of entry for screening we created a physical screening station at that entrance.*
- *We used a small lounge at end of one of the halls now inaccessible to residents to support rapid testing of resident visitors.*

Another innovative adaptation was temporary screening around COVID impacted resident doors.

- *We have privacy screens so we set that up around their door to create a donning/doffing station for staff. It also served as a barrier for other residents on that unit that wander as well as a visual for the residents in that room when they wanted to leave room (both dementia).*

**9. RECOMMENDATIONS:** Based on your recent experience with COVID-19 please provide your recommendations for planners, architects, and engineers of LTC facilities to better cope with contagious diseases.

Interestingly the recommendations tended to follow the Engineering Controls Pyramid in terms of frequency.

**PRIVATE ROOMS:** Private rooms were almost universally recommended.

**ZONES/HOUSEHOLD MODEL:** The Survey received strong overall support for the Household Model.

- *We had great success with our outbreaks because of our physical build. We are also very well prepared for many other emergencies that will overall benefit our residents in these situations. It was very simple for us to make and adjust restrictions and control over areas, keeping some elders from isolation all together while others were in active outbreak, without transmission occurring.*

**SANITATION/HAND HYGIENE:** Another major recommendation was for enhanced Hand Hygiene station availability and surface sanitation.

- *The recommendation I have for future reference is to ensure there are easily accessible water hand washing stations throughout the building. A couple in corridors of units. Apart from mask wearing, handwashing has been the #1 reason for reduced sickness.*
- *Need furniture and other surfaces that are more easily cleanable, wipeable.*

**PHYSICAL SEPARATION:** There were a number of recommendations for physical separation such as having a single point of entrance for visitors, a separate visiting room, and outside access for visiting. Also, a separate service entrance, with clear accessible routes for garbage, laundry, bathing and rehab. Another common issue was needing appropriate separate storage areas for equipment, clean and soiled utility areas,

**SOCIAL DISTANCING:** Increasing area sizes to enable social distancing was a common suggestion, for example, increased staff break areas, and increased common area space in each resident unit.

- *Bigger staff rooms (we had to take a private pay room out of commission because our previous staff room couldn't accommodate more than one person as per the two-metre guideline.*

**VENTILATION:** And of course, ventilation was a considerable concern including inspection, regular maintenance and upgrading to current design standards.

## CONCLUSION

Those who responded to the Survey appreciated the opportunity to express their concerns and lessons learned. Although the survey sample size was small, saturation of data occurred rapidly with clear common themes that supported the Engineering Controls Pyramid for Infection Prevention in LTC. These Suggestions and Recommendations should help identify infection control environmental issues for LTC design practitioners.

One responder pointed out that further research should expand the Users surveyed to include staff representing all departments. Front line staff can add important lessons learned from actual hands-on work experience in the Built Environment.

And finally, another responder suggested that we expand our user group to include residents, the priority users. She emphasized the importance of finding a balance between quality of life and safety (Braun, 2020).

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