Integrated Design and Renovation of Food & Beverage, Hotel, and Hospital Facilities: Case-Based Guide for Professionals

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DOI: https://doi.org/10.51584/IJRIAS.2026.110400031

Received: 02 April 2026; Accepted: 07 April 2026; Published: 28 April 2026

ABSTRACT

The design, renovation, and retrofitting of hotels, restaurants, and hospitals are very difficult because they must deal with a lot of different things at once, including architectural aesthetics, building services engineering, structural integrity, and compliance with many different rules. This paper combines knowledge from different fields with rules that are specific to Hong Kong to make a single guide for professionals who work with these types of facilities. The paper looks at the steps involved in sequential renovation, such as demolition, service coordination, ceiling installation sequencing, and finishing works, while also talking about the different operational needs of each type of facility. The focus is on strategies for optimising space in food and beverage design, the integration of mechanical, electrical, and plumbing services in hotel developments (including swimming pool systems, guest room layouts, and gymnasium ventilation), and the unique ventilation and pressure management needs of healthcare facilities, especially in terms of preventing and controlling infections. The paper critically examines a recent incident concerning a malfunctioning operating theatre lamp in Hong Kong to demonstrate the repercussions of inadequate design integration and craftsmanship. This paper provides practitioners with a comprehensive framework for achieving quality outcomes in these facility types by systematically reviewing licensing requirements, construction sequencing, and discipline-specific design considerations. Recognised are the constraints pertaining to quantitative design parameters and comprehensive regulatory oversight, accompanied by suggestions for additional research.

Keywords: Building Services Integration, Food and Beverage Design, Hospital Ventilation, Renovation Sequencing, Regulatory Compliance, Space Optimisation

INTRODUCTION

Background and Rationale

Designing and renovating hotels, restaurants, and hospitals is a big part of the construction work that goes on in cities all over the world. In Hong Kong, where there are a lot of people and not much land, these types of facilities must follow strict rules and often must work within tight time limits. The coming together of aesthetic, functional, and legal needs makes a multidisciplinary design environment that needs people with expertise in architecture, engineering, and law to work together.

The source document starts with a culturally relevant observation: "Eating is number one like sky" for Chinese people. This statement is a proverb, but it is based on a real economic fact: the food and beverage (F&B) industry is a big part of Hong Kong's economy, with restaurants and cafes in both commercial and residential areas. Hotels are also important for business and tourist travel, and hospitals provide important public services that need to be designed and maintained to the highest standards.

A recent event, described in the source material as "hospital operation theatre lamp loosens and fell off last year in Hong Kong, raising concern of subcontractor workmanship," serves as a warning of the problems that can arise from poor design integration and bad work. This incident, along with other worries about building safety, shows how important it is to have strict rules for renovations and facility management.

Scope and Objectives

This paper examines the integrated design and renovation processes relevant to three categories of facilities: food and beverage establishments (restaurants and cafes), hotels, and hospitals. These types of facilities have very different operational needs, but they do have some important things in common when it comes to how they are built, how building services are integrated, and how they are regulated. The paper is structured according to the following objectives:

1. To outline the steps of renovation that apply to all these types of facilities, from demolition to the final finishing touches.

2. To investigate the rules and procedures for getting permission and licenses that apply to food and beverage and hotel businesses in Hong Kong.

3. To look at ways to make the most of the space available by maximising the usable area within fixed gross floor dimensions.

4. To investigate the building services' needs that are typical of hotel developments, such as how to integrate into a swimming pool, how to set up guest rooms and how to ventilate a gym.

5. To carefully look at the ventilation and pressure control needs of healthcare facilities, with a focus on stopping and controlling infections.

6. To look at what happened with the operating theatre lamp and how it affects the quality of design, integration and construction.

METHODOLOGICAL APPROACH AND ITS LIMITATIONS

This study utilises a practitioner-informed methodology, incorporating regulatory framework analysis, examination of professional methodologies, and a critical assessment of design principles. The source document offers a basis of professional knowledge, encompassing detailed renovation procedures, space optimisation techniques, and design factors pertinent to specific disciplines. The Buildings Department, Fire Services Department, Food and Environmental Hygiene Department, Home Affairs Department, and Electrical and Mechanical Services Department in Hong Kong all have rules that these practical things fit into.

The methodological approach utilised in this paper is characterised as a practice-informed technical review rather than a hypothesis-driven empirical study. The paper systematically delineates and integrates the licensing requirements, approval protocols, and compliance obligations mandated by various government departments for food and beverage, hospitality, and healthcare facilities. It records and organises renovation steps based on the authors' combined experience working on different projects in Hong Kong. These steps include getting the site ready, tearing down buildings, coordinating services, putting up the ceiling in the right order, distributing electricity, and finishing the work. The order of conduits, drainage, MVAC, and sprinklers is based on the best practices that have been observed, not a controlled comparison of different orders. It looks at design ideas for making the most of space, furniture that can be used for more than one thing, swimming pool systems, guest room layouts, gym ventilation, and hospital pressure management. These strategies are shown with examples from real projects and, when possible, compared to regulatory requirements. It also uses a recent case from Hong Kong where a lamp in an operating room failed as an example. This incident is used to come up with design suggestions (integral lamp frames) and to show what can happen when design integration and workmanship are not done well.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

Regulatory Framework and Licensing Requirements

Food and Beverage Establishment Licensing

Setting up F&B businesses in Hong Kong requires getting approval from several agencies. The source document says that some important regulatory factors are:

• Food and Environmental Hygiene Department (FEHD) -- Before starting renovations, applicants must get a food licence from FEHD. FEHD is the main licensing body. It looks at applications based on food safety, hygiene standards, and whether the facility is appropriate (Food and Environmental Hygiene Department, 2025).

• Buildings Department (BD) -- BD must check that the building is structurally sound and that there are no unauthorised building structures (Osennyaya et al., 2022) on the property.

• Fire Services Department (FSD) -- Fire safety installations (FSIs) must be approved by FSD to make sure they are safe and work. FSD checks things like escape routes, fire doors, sprinkler systems, and other fire safety features.

• Ventilation Systems -- BD's Authorised Signatory (Ventilation) and FSD must both agree on these systems because they affect both air quality and fire safety.

• Sanitary Facilities: Toilets, water closets, and wash basins must meet health and hygiene standards for cleanliness and safety.

The source document gives useful advice to people who want to run a food and beverage business. The first thing they should do when looking at a space is to see if there is enough headroom for mechanical ventilation and air conditioning (MVAC) units, chilled air ducts, and lighting fixtures. This initial assessment tackles a major problem in many commercial spaces, especially older buildings, where there may not be enough ceiling void space to support the mechanical and electrical systems needed for restaurant operations. However, the source document does not say what the minimum headroom requirements are or how to do this assessment.

Hotel Licensing and Classification

The Home Affairs Department (HAD) in Hong Kong controls hotels and requires places that offer lodging to travellers to get a licence. The document (Home Affairs Department, 2023) says clearly, there are no specific steps for the licensing process, but it does include checks on building safety, fire protection, hygiene standards, and operational management.

The source document describes hotels as "a combination of F&B, club house, domestic units, swimming pools, or gymnasium". This framing is important because it sees hotel design as a mix of different types of facilities instead of just one type of building. In this model, hotel restaurants and cafes follow design rules that are like those of independent food and drink businesses. Guest rooms, on the other hand, look like homes but come with extra services and amenities that are only available in hotels.

The source document does not say how hotels are classified (for example, by star rating, number of rooms, or services offered) or what different licensing requirements might apply to different classes. For these details, practitioners should check HAD's most recent advice.

Healthcare Facility Requirements

There is not just one licensing system for hospitals, like there is for hotels or food and beverage businesses. Instead, there are many rules that hospitals must follow, including legal requirements, operational standards, and professional guidelines. The source document talks about technical requirements for hospital ventilation, electrical supply, and equipment installation. This shows how specialised healthcare facility design is. Sections 6.1 and 6.4 talk about the specific needs for the electrical supplies and ventilation pressure differentials in an operating room.

The source document does not say what the specific rules are for designing and running hospitals in Hong Kong (for example, Hospital Authority ordinances, Department of Health guidelines, or international healthcare accreditation standards). Doctors and other professionals should look at the Hospital Authority's current design standards and the Department of Health's licensing requirements for private healthcare facilities.

Renovation Procedures

Site Preparation and Demolition

Site preparation and demolition are usually the first steps in renovating a facility. The source document (Buildings Department, 2004) lists a standard order that F&B outlets, hotels, and hospitals must follow.

The first step is to "put up hoarding or barriers to keep the public out of demolition areas". This safety measure is meant to keep people who are not supposed to be there from getting in and to keep the noise, dust, and debris from the demolition contained. This spatial separation is very important for the safety of both people who live in and work in commercial buildings.

During the demolition phase, it is important to carefully manage the utilities that are already in place. The source document says:

Before you start tearing down, make sure to cut off all power and water to the area and keep the stuff to be torn down separately. Check for any hidden wiring or water pipes inside the walls. Workers should use a metal detector to double-check and then begin demolition.

Using metal detectors to find hidden electrical wiring and water pipes is an important safety measure that lowers the chance of accidentally meeting live electrical systems or pressurised water lines. But the source document doesn't say what kind of detector is needed, how to calibrate it, or what detection protocols are acceptable. For detailed procedures, practitioners should look at the relevant guidelines from the manufacturer and industry standards, like those from the Construction Industry Council.

After the demolition, the debris is removed in an orderly manner. Afterwards, use trucks to carry the demolished debris to tips. Tips are places where trash is thrown away, and good waste management should include sorting recyclable materials and following environmental rules, like the Waste Disposal Ordinance (Environmental Protection Department, 2025). The original document does not go into detail about these requirements.

Design Planning and Service Coordination

After the demolition, the source document stresses the need for design planning. Plan for how the future water, drainage, and cabling will be laid out. This is very important to find out if a raised floor is needed to make room for water pipes and cable ducts.

This stage of planning helps decide how to build the floor. If pipes and cables can go through ceiling spaces or wall cavities, regular floor construction (like a concrete slab with surface finishes) may be enough. But long runs of pipes, especially drainage pipes that need slopes that are driven by gravity, may need a raised floor system. For example, in a café or food market where there are underground drainage or water supply pipes, you need to build a raised floor with openings on the ground surface so that pipes can connect to water taps and basins.

Putting in a raised floor adds more structural requirements. The floor must support the weight of people and furniture, as well as the weight of pipes and any water that may leak onto it. It must also be easy to get to for maintenance work. The source document does not talk about these structural issues. Practitioners should look at structural engineering principles and the Buildings Department’s (2012) the Code of Practice for Structural Use of Concrete.

Ceiling Space Installation Sequencing

After the ceiling space has been demolished and cleared, the installation of building services goes in a set order. The source document lists this order as follows:

1. The first step is to put in the conduit, which is attached to the bottom of the concrete ceiling.

2. Next, drainage pipes are put in place. Wastewater flows by gravity and needs to be directed downward into the right downpipes.

3. Next, the MVAC fan coils are put in place. Because they are big and can't bend or turn corners, they need to be put in place before other services take up the space.

4. The last thing to go in is the sprinkler systems. Their pressurised pipes are flexible, so they can bend, turn corners, and go through concrete beams through pre-formed openings, which lets them get around obstacles.

This order is based on the different physical properties of each type of service. Electrical conduits are laid out first to show the routes because they are light and flexible. To allow gravity-driven flow, drainage pipes need to be installed with careful gradient control. This means they need to be put in before other systems can get in the way. Before putting in ceiling grids and other services, you need to put in the big, stiff MVAC fan coils. Last, they put in the sprinkler pipes, which can change direction under pressure. This is to avoid getting in the way of parts that have already been put in.

This sequencing framework provides a coherent approach for overseeing trade coordination. The source document, on the other hand, does not talk about what to do if there are design changes or unexpected site conditions that require a change to the planned sequence.

Ceiling Coordination and Opening Provision

Planning and documentation are very important for coordinating installations that are mounted on the ceiling. The reflected ceiling plan (RCP) must show where the lights, public address systems, closed-circuit television (CCTV) dome cameras, MVAC louvres and diffusers (Architectural Services Department, 2017), lighting troughs, downlights, sprinkler heads, and smoke or heat detectors will go. This lets ceiling contractors set aside and reserve spaces in the plasterboard ceiling for wiring and installation that needs to be done.

The RCP is an important tool for coordinating work because it brings together information from different trades into one drawing. It helps with putting up ceiling grids and figuring out where service outlets should go, which lowers the chance of problems and makes it easier to line up the final ceiling finish with the equipment locations.

The source document does not say what format, scale, or level of detail these plans should have. It also does not say how to settle disagreements when more than one service needs the same ceiling space. Practitioners should look at industry standards, like the Building Services Branch Technical Information Note series, for more information on RCP requirements.

Electrical Distribution and Finishing

The main distribution board is where electrical work starts. In most cases, a vacant shop or office unit needs an isolator (usually rated at 100A or 200A, three-phase) to let tenants connect to all electrical and mechanical (E&M) services and installations.

The three-phase supply capacities listed are what most businesses need. This is because the electrical load from things like MVAC systems, kitchen appliances, and lighting often exceeds what a single-phase supply can handle. But the source document does not go into detail about how to figure out the right supply capacity. For more information on how to calculate maximum demand, diversity factors, and cable size, professionals should read the EMSD's Code of Practice for the Electricity (Wiring) Regulations (2020).

The last step is to finish the work, which includes plastering and treating the walls. Using cement mortar, this process makes concrete surfaces smoother. Examples of materials used include Optimix, Kangerloo, and Nippon. You can then use glue or nails to attach wooden or plastic panels to the concrete surface. The mention of certain proprietary products shows how important it is to choose the right materials to get a good finish. But the source document does not compare these materials or give any guidelines for choosing them, such as price, durability, fire resistance, or ease of installation. Practitioners must refer to the Buildings Department's Code of Practice for Precast Concrete Construction (2021) and pertinent fire safety regulations to ascertain material compliance requirements.

Space Optimisation in Food and Beverage Design

The Principle of Maximising Usable Area

The source document outlines a fundamental principle of food and beverage design in Hong Kong. Due to the limited land area, maximising the utilisation of vertical space by constructing multi-storey buildings is common practice. In the same way, it is important to make the most of the available interior space in a restaurant or dining area with a set gross floor area.

Maximising usable floor space directly responds to Hong Kong’s high rental costs. Increasing seat density within a fixed area improves profitability. The source document goes into detail about specific design methods that are meant to help achieve this goal, which are discussed below.

Multifunctional Furniture and Partitions

The source document has a lot of examples of design elements that serve more than one purpose. This means that dedicated features don't need as much space.

Example 1 -- Using signs as walls. "A tall and big menu sign board marks off an area behind it where people can drink coffee. This does away with the need for an extra partition, which makes the space more private than an open space and quieter, making it better for online meetings. The menu board serves as a spatial boundary marker instead of a regular partition wall. Starbucks and Pacific Coffee are two places that use this method. They have things like Wi-Fi and power outlets that make it easier for customers to do things like having virtual meetings.

Example 2 -- Using refrigerators as walls. "A one-meter-high long refrigerator with a clear front lets people outside see the food inside and choose what they want. This refrigerator serves as both a food counter and a divider between the kitchen and dining area, eliminating the need for separate refrigeration units that would take up more space.

Example 3 -- A sofa design that helps define space. Sofas are usually used for seating in cafés. But "the back of the sofa faces the supermarket, which acts as a wall that keeps the café separate from the busier areas of the supermarket." A long, thin, horizontal plastic strip along the top of the back of the sofa makes it taller, which serves two purposes: it makes the partition higher, which improves spatial definition, and it stops customers from making direct eye contact with each other, which improves privacy. An example of this design solution is a café inside the UNY supermarket at Tseung Kwan O The Metro City Phase 2.

These strategies may help save space in a practical way, but the source document does not check them against building code requirements for minimum circulation widths, means of egress, or accessible design standards (for example, the Buildings Department's (2019) Design Manual: Barrier Free Access). Using furniture as walls could influence fire safety, especially when it comes to escape routes and fire compartmentation. Before putting such design solutions into action, practitioners should make sure they meet FSD standards.

Staircase Design for Comfort and Safety

The source document looks at how to design stairs with safety and comfort in mind. It suggests using "antislip plywood for stairs outside". For stairs inside, it suggests:

• Making the tread deeper so that the whole sole of the foot fits on it

• Putting carpet on the floor to make it softer and more comfortable

• Putting up handrails on both sides

• Adding platforms in the middle to give people a place to rest horizontally while they climb

Increasing the depth of the tread makes the shoe more comfortable and less likely to slip because it gives the foot full support. Handrails on both sides give users with different mobility needs the support they need. Intermediate landings break up long flights, giving users a chance to rest and avoid getting too tired. The source document mentions the Golden Corn Restaurant in Tsim Sha Tsui as an example of how these design ideas have been used.

The source document says, "Metal angle guards can protect the front edges of stair steps from wear caused by shoe contact". Even though this detail is small, it talks about how long staircases will last when they are used a lot.

The source document does not say if the stairs meet the Buildings Department's legal requirements, such as the minimum tread depth, maximum riser height, handrail height and projection, or landing dimensions set out in the Building (Planning) Regulations. In addition to making sure that the stairs are comfortable, practitioners should also make sure that the designs follow these legal rules.

Flooring Selection and Material Considerations

The source document shows that over the past ten years F&B businesses have changed their preferences for flooding in a big way.

Carpets were common in the past, but after outbreaks like SARS and COVID-19, people started using Stone Plastic Composite (SPC) flooring instead. SPC flooring has a soft underlayer that makes it more comfortable, a design that lets it be installed without gaps, and it meets fire safety standards. The material, which is mostly stone, meets the fire resistance standards set by BS EN 13501-1 (British Standard Institute, 2019) for not spreading fire and not being able to catch fire. Carpets are comfortable, but they tend to hold onto dirt and make it hard to clean them well. On the other hand, SPC's impermeable surface and seamless installation make cleaning easier, which is in line with infection control priorities.

Practitioners should check that the materials they use meet current fire safety standards (Fire Services Department, 2022). This is because building codes in Hong Kong usually refer to newer editions of standards, such as BS EN 13501-1 for classifying construction products by fire risk. The source document does not say whether SPC flooring meets the Fire Services Department's standards for smoke production or flame spread rating.

Hotel Design

Hotel as Integrated Facility Type

The source document says that hotels have "food and beverage (F&B) services, clubhouses, living units, and swimming pools or gymnasiums". This description shows how complicated hotel design is, since different types of facilities need to work together in the same building.

The design rules for hotel restaurants and cafes are the same as those for stand-alone food and beverage venues, as discussed in Section 4. The source document, on the other hand, does not say much about clubhouse design, which shows that the analysis is not finished. The next few sections will talk about how to design a swimming pool and how to ventilate a gym.

Swimming Pool Design and Systems

The source document lays out the design requirements for swimming pools in a systematic way, covering structural integrity, water treatment, thermal management, and electrical safety.

(a) Structural considerations -- Building a waterproof tank so that water does not leak through the pool's walls and floor. Bituminous coatings and other water-resistant materials should make up the bottom of the pool. This multi-layered method of waterproofing is based on the idea of redundancy, which means that having more than one protective barrier lowers the risk of failure of any one layer. Waterproofing is an important part of building a pool because leaks can cause structural damage and safety issues.

(b) Water treatment -- There must be a nearby recirculating water plant for the pool to work. This system has a six-way valve that connects to a sand filter tank that can backwash. Backwashing means reversing the flow of water to get rid of debris that has built up in the filter media. A carbon filter is also included to help get rid of organic compounds, which makes the water clearer. Water used to make up for lost pool water should be sterilised.

(c) Thermal management (Hu et al., 2020) -- A gas boiler and a heat exchanger heat the water in the pool to about 30 degrees Celsius. This temperature was chosen so that swimmers would be comfortable while also keeping energy use to a minimum. The heat exchanger separates the boiler circuit from the pool water circuit. This makes it easier to maintain and keeps the pool water clean.

(d) Maintenance rules -- The pool water should be completely drained, and the walls and floor should be cleaned thoroughly once a year, usually in the winter for outdoor pools. This method gets rid of biofilm, algae, and other pollutants that regular filtration (Chan, 2022) and chemical treatment might not be able to get rid of completely.

(e) Electrical safety -- In-pool recessed lighting fixtures work at extra-low voltage (ELV) and have IP68 protection ratings, which means they can be submerged. According to the EMSD Code of Practice for the Electricity (Wiring) Regulations (2020), electrical sources and power outlets in pool areas next to each other must be placed at least the minimum distance apart for each zone.

The source document talks about the EMSD Code of Practice, but it does not say what the important distance requirements are (like the minimum distance between power outlets and pool edges or the zone classifications). For these specific rules, practitioners must look at the Code directly.

Guest Room Design and Services Integration

The source document explains a standard way to plan guest rooms. The rooms are set up in pairs, with a pipe duct running between two adjacent rooms to let in air and hot water pipe risers going from the top to the bottom floor. This central riser sends hot and ambient water lines to the two rooms it serves.

Putting service risers between two rooms in this way makes better use of space and cuts down on the length of the pipes. The layout minimises the amount of floor space needed for vertical service infrastructure by letting two rooms share a service duct.

Chilled water is branched from insulated supply and return risers located within the same duct. A direct current (DC) motor powers a fan coil unit in each room. This type of motor is known for being more efficient and quieter. These features meet important hotel needs, like making guests more comfortable by lowering noise and saving energy.

The control system has "a remote-controlled setup with three operational modes: vacant, occupied, and standby for when guests are approaching the room". This three-mode strategy helps save energy while keeping people comfortable. When the system is empty, it runs very little to save energy. When it is on standby, the room starts to cool down to the desired level of comfort by the time the guests arrive. When it is occupied, the controls change based on what the guests want.

For soundproofing, "Walls use acoustic wooden boards attached to concrete surfaces, which are then covered with decorative wooden frames or wallpaper". This combination lowers the amount of sound that travels between rooms while also looking good.

The source document does not give any numbers for the DC fan coil units (like power use, airflow rates, and noise levels in decibels) or for the acoustic treatment (like sound transmission class ratings). For these parameters, professionals should look at the CIBSE (2020) and ASHRAE standards.

Gymnasium Ventilation and Thermal Comfort

The source document talks about how to design a gymnasium according to professional standards, with a focus on ventilation needs:

Air exchange rates must follow the rules set by the Chartered Institution of Building Services Engineers (CIBSE) (2016) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) (2020). Moreover, occupant comfort parameters, including humidity, temperature, and airflow, should conform to ASHRAE standards, considering clothing insulation and physical activity levels such as sitting or running. CIBSE and ASHRAE both give advice on the right air change rates and thermal comfort standards for places where people are very active.

The phrase "clothing amount and thickness, alongside activity type" is in line with ASHRAE Standard 55's method for measuring thermal comfort. This standard uses metabolic rate (measured in met units) and clothing insulation (measured in clo units) to set the rules for what is acceptable in indoor spaces.

The source document does not say what the temperature setpoints, humidity ranges, or air change rates are. For these specific requirements, practitioners should look at CIBSE Guide B2 (Ventilation and Ductwork) and ASHRAE Standard 55 directly.

Hospital Design

Ventilation and Infection Control

Hospitals have ventilation rules (Panaras, Gropca & Papadopoulos, 2022) that are very different from those in most commercial buildings.

Because hospital wards need very clean air, the common practice of recirculating return air (which is often used in mechanical ventilation and air conditioning systems to save cooling energy) is usually not done. Instead, return air, which may be contaminated by patients, is usually disinfected with ultraviolet lamps and then sent outside to keep infectious aerosols from getting into places where people walk.

This use of once-through ventilation instead of air recirculation is a big change from the usual rules for commercial buildings, where energy efficiency is often a big factor in how ventilation is designed. In hospitals, though, the need to lower the risk of infection is more important than saving energy.

The goal of the design is to keep airborne pathogens inside patient rooms and stop them from getting into hallways or other areas. To keep negative pressure, the air that comes out of the ward through dedicated air ducts must be more than the air that comes in through fan coil units. This difference in pressure makes a small vacuum, which makes air flow in instead of out. This keeps contaminants from spreading. The air that comes out of exhaust is never reused. Instead, it goes back to the central air handling unit to be cleaned before being released outside.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

On the other hand, hospital pharmacy rooms are kept under positive pressure to keep the medicine sterile. "This setup makes sure that no air that might be contaminated from hallways or patient waiting areas gets into the pharmacy. The fan coil units in the pharmacy provide more air flow than the exhaust fans, which creates a pressure gradient (Park, Go & Song, 2024) that pushes air out. As a result, the flow of unfiltered air with pollutants into the building is stopped.

The source document talks about the importance of positive and negative pressure, but it does not give any numbers for airflow rates, pressure differentials (like Pascals or inches of water gauge), or specific design parameters. To use these principles, professionals need to look at standards like ASHRAE (2021) Standard 170 (Ventilation of Health Care Facilities), the UK Health Technical Memorandum (HTM) series, or the design guidelines from the Hong Kong Hospital Authority for more information on what is needed.

Portable Ventilation Solutions

The source document talks about backup plans for wards that are not getting enough chilled air from the main MVAC system: "Put a portable ducted air conditioner in the room. Use a flexible aluminium duct to send the warm air from the condenser coil outside through a sealed opening in the window glass". This method is meant to be a temporary fix, but it works well to increase ventilation when the central system is not working well enough. The focus on a "sealed-perimeter hole" shows how important it is to keep the building envelope intact to stop uncontrolled airflow and keep outside elements from getting in.

The source document gives a first-hand account of the installation process. It compares making a sealed opening in window glass to similar steps used to install toilet exhaust fans and talks about previous work done at a house called Serenity Place. Familiarity with similar installations enabled in-house execution without subcontractor involvement. This shows the benefit of having skills in more than one area. However, it is important to remember that installing electrical equipment and changing building envelope elements must follow the rules and, if necessary, be done by professionals who have the right licenses.

Specialised Ward Requirements

The source document lists specific needs for leprosy wards and says that "the design of airflow rates is especially important in some specialised hospitals. "All staff and visitors wear face masks" is one of the steps taken to keep people from getting in without permission. Also, there is a lot of prominent signage at the entrance to the hospital that is far away from the hospital perimeter. This is to keep people from coming in unless they are family members visiting patients.

This short conversation shows how different infection control strategies might be needed in specialised healthcare settings. The emphasis on physical separation, clear signage, and the utilisation of personal protective equipment indicates a comprehensive strategy for preventing disease transmission. However, the source document does not say whether leprosy wards are still open in modern Hong Kong hospitals or whether these design ideas are still useful today.

Electrical Supply and Critical Systems

The source document lays out the electrical supply needs for operating rooms: "The main switchboard's essential emergency section should supply power to these areas". There are an emergency generator and an uninterruptible power supply (UPS) in this part. Also, all lifts (not just fireman lifts) get their power from this emergency section so that passengers don't get stuck inside if the power goes out.

This design adds more levels of reliability to the power supply:

• The main switchboard's essential emergency section gets power from both the regular power source and the emergency generator. This way, there is always backup in case the main supply fails.

• The integration of UPS protects sensitive medical equipment from short power outages that could damage them.

• Giving all lifts emergency power instead of just fireman lifts lowers safety risks by keeping lifts running during power outages.

The source document does not say how big the UPS needs to be (for example, how long it needs to run in minutes or hours), how big the generator needs to be, what kind of transfer switch it needs, or what medical equipment needs to be connected to the emergency supply. For these details, practitioners should look at the EMSD's Code of Practice for the Electricity (Wiring) Regulations and the Hospital Authority's engineering standards.

Operating Theatre Lamp Design: A Critical Incident Analysis

The source document wraps up the hospital section with a design suggestion based on the incident that was talked about in the abstract. Lamps lit on the operational bed for surgery, and the lamp never fell because it was part of the overhead support frame. Replace the whole integral frame if the lamp stops working. Small amounts of money are not as important as people's lives. "Metal frames are cheap". This suggestion suggests that lamps should be built into their support frames to avoid the same problem that happened in Hong Kong, where an operating room lamp fell off its support frame. The lamp is designed to be a permanent part of the support structure, not a removable part. This should make it less likely to come loose. The economic argument (that patient safety should come before small cost savings) shows how important it is to put safety first when making design choices.

The recommendation makes sense, but the source document doesn't do a good job of explaining what caused the incident. Some important questions that still need to be answered are:

• Was the failure caused by design flaws (like not having enough attachment points), manufacturing defects (like using bad materials or doing bad work), installation mistakes (like not using enough torque or missing fasteners), or maintenance problems (like not checking and retightening connections)?

• What were the legal effects (for example, an investigation by the Hospital Authority or prosecution under the Occupational Safety and Health Ordinance)?

• What exact changes have been made to codes or standards (like hospital design guidelines or EMSD wiring rules) in response?

A more thorough analysis of incidents would help create better preventive strategies in all the right areas. If the Hospital Authority's incident investigation report is available to the public, practitioners should read it for more information and suggestions.

Critical Analysis and Implications for Practice

Strengths of the Integrated Approach

The source document has several strengths that make it a useful reference for professionals. Focus on practical matters and a wide range of fields. The sequential renovation framework gives practitioners clear directions, and the space optimisation strategies give them specific design ideas. The paper recognises that professionals often work in multiple types of facilities, such as hotels, hospitals, and food and beverage outlets, and that they use the same skills in different settings.

The guidance is based on the laws that govern building projects in Hong Kong, and it includes references to licensing requirements from FEHD, BD, FSD, HAD, and EMSD. The paper is different from other design guides because it is based on local rules.

The use of the operating room lamp failure as a case study, even though it doesn't go into much detail, shows how important it is to learn from real-life mistakes. This evidence-based approach is in line with the best practices in industries where safety is very important.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

Limitations and Gaps

The source document has several important flaws that readers should be aware of:

(a) Lack of a formal research method -- As mentioned in Section 1.3, the paper does not have a clear research design, list of data sources, or analytical framework. This diminishes academic credibility and reproducibility. The paper is best described as a technical guide based on practice rather than an academic study based on a hypothesis.

(b) Absence of quantitative design parameters -- There are qualitative descriptions throughout the paper, but no quantitative specifications. For example, Section 5.4 talks about air change rates for gymnasiums, Section 6.1 talks about pressure differentials for hospital wards, Section 6.4 talks about UPS capacity for operating theatres, and Section 2.1 talks about minimum headroom for F&B ceilings. Practitioners must refer to the cited standards (ASHRAE, CIBSE, EMSD Code) for these values, but the paper does not say which tables, clauses, or editions are relevant.

(c) References to rules that are not complete -- Even though many rules are mentioned, the specific clause numbers, edition dates, and scope of each rule are usually not. For instance, the reference to BS476 (British Standard Institute, 1970) for SPC flooring fire resistance is more than fifty years old; more recent editions are used in current building codes. The EMSD Code of Practice for wiring regulations is also mentioned, but the edition is not given (the source document says 2020, but readers should check the current version).

(d) Not enough critical evaluation -- A lot of the talk is more about describing than judging. The paper outlines design strategies, such as employing refrigerators as partitions, without comparing them to alternative methods, analysing their shortcomings, or addressing possible adverse effects, including fire safety concerns and accessibility challenges. A more critical approach, which would include comparing different design strategies and judging how well they work, would make the academic work deeper.

(e) Not enough thought given to theoretical frameworks -- The paper fails to address pertinent theoretical frameworks from the academic literature, including systems integration theory, sustainable design principles, or human factors engineering. Adding these kinds of frameworks would make the analysis deeper and put the paper in the context of a larger scholarly conversation.

(f) The geographic scope is not clearly defined -- The regulatory framework is specific to Hong Kong; however, the paper does not clearly indicate that design principles cannot be directly applied to other jurisdictions with varying building codes, climatic conditions, or cultural practices.

Implications for Practice

(a) Framework for installing in order -- The suggested order of installation—starting with conduits, then drainage, MVAC fan coils, and finally sprinklers—gives a clear way to handle trade coordination in ceiling spaces. This order considers how each type of service works (flexibility, gravity dependence, rigidity, and pressure tolerance) and can help avoid problems that would need expensive rework. This sequencing logic should be used by project managers and site supervisors in their construction plans and coordination meetings.

(b) Design that serves more than one purpose to make the most of space -- For F&B designers who work in places with high rents, the strategies shown—using sign boards as partitions, refrigerators as counters, and sofas as spatial boundaries—show how creative use of functional parts can make dedicated features take up less space. However, practitioners must ensure that these solutions adhere to fire safety regulations (FSD requirements for escape and fire compartmentation), accessibility standards (Barrier Free Access requirements for circulation widths), and hygiene regulations (FEHD requirements for food contact surfaces and cleaning access).

(c) Hotel efficiency with a twin-room layout -- The paired guest room layout with shared service ducts between rooms is a way to make better use of space by cutting down on the floor area needed for vertical risers. This setup also shortens the pipes and cuts down on the heat that could be lost when hot water is distributed.

Practitioners should assess the suitability of this configuration in relation to their specific site constraints, encompassing floor plate geometry, column spacing, and acoustic separation between rooms.

(d) Three modes of control to save energy -- The addition of vacant, occupied, and standby modes to hotel guest room controls shows an effort to balance energy-saving goals with the comfort of guests. This method meets the requirements of the building energy code in Cap. 610 and can help a building get green building certification (for example, BEAM Plus). Practitioners should set the right temperatures and recovery times for their climate and how many people they expect to be there.

(e) Ventilation rules for stopping the spread of infections -- The principles listed above—once-through airflow systems (to avoid recirculation), negative pressure for isolation rooms, positive pressure for pharmacies, and contingency planning with portable units—are the basis for infection control measures in healthcare facilities. These principles are in line with international standards (ASHRAE 170, HTM 03-01), but they need to be backed up by specific design parameters. Early in the design process, hospital engineers should work with infection control teams to figure out the right pressure differentials, air change rates, and filtration needs.

(f) A dependable power supply for critical care -- Connecting all the operating rooms and lifts to the main switchboard's emergency section, with backup from both emergency generators and UPS, is a key safety requirement. Practitioners should do a failure mode and effects analysis (Molavi-Taleghani et al., 2020) to find single points of failure and set the UPS capacity (runtime) based on how long it takes for the generator to start up and stabilise and how long utility outages usually last.

(g) Designing integral equipment for applications where safety is very important -- The suggestion to make operating room lights as part of their support frames instead of detachable parts comes from a known failure mode. This principle suggests that in safety-critical applications where detachment could harm a patient, designers should either use connections that can't be released or add extra attachment mechanisms. Healthcare workers should use this rule not just for operating room lights, but also for other overhead equipment, like patient hoists, imaging equipment, and service columns that hang from the ceiling.

CONCLUSION

The integrated design and renovation of food and beverage establishments, hotels and hospitals require a multidisciplinary approach that encompasses architectural aesthetics, building services engineering, structural considerations, and regulatory compliance. This paper has combined practical knowledge with Hong Kong-specific rules to make a complete guide for people who work in these types of facilities.

The phased renovation framework described here—starting with putting up hoarding and isolating utilities, then going through demolition, design planning, service installation (from conduits to drainage to MVAC to sprinklers), coordinating the ceiling, distributing electricity, and finishing work—provides a structured method that can be used for many different types of facilities. The sequencing logic considers the physical characteristics of each service type and can help avoid expensive problems during construction.

In food and beverage design, strategies for space optimisation emphasise the benefits of integrating multifunctional components that serve various purposes, thereby minimising spatial requirements without sacrificing functionality. The switch from carpet to Stone Plastic Composite (SPC) flooring shows that people are more concerned about cleanliness, which is a result of recent pandemics. But professionals need to make sure that these kinds of plans follow rules about fire safety, accessibility, and cleanliness.

Hotel design means putting in different types of facilities, like restaurants and bars, clubhouses, residential units, swimming pools and gyms, all in one building. The twin-room layout with shared service ducts makes better use of space, and the three-mode control system (vacant, occupied, standby) strikes a good balance between saving energy and making people comfortable. When designing a swimming pool, you need to pay close attention to waterproofing the structure, treating the water (filtration, disinfection, backwashing), controlling the temperature (heat exchangers, gas boilers) and making sure the electrical system is safe (ELV lighting, IP68 ratings, and placing outlets in different areas). Gymnasium ventilation must consider high levels of activity among people, and the rates of air exchange and thermal comfort must meet CIBSE and ASHRAE standards.

There are unique problems that come with designing a hospital, especially when it comes to ventilation and infection control. Using once-through ventilation systems (which keep potentially contaminated air from recirculating), negative pressure rooms for sick patients, and positive pressure environments for pharmacies help to meet important disease containment goals. To keep important services running all the time, it is important to make sure that there is always a reliable electrical supply. This means that operating theatres and all lifts should be connected to the main switchboard's emergency section, which is backed up by both emergency generators and uninterruptible power supplies. The suggestion to use integral operating theatre lamp designs instead of detachable parts is based on a recent incident in Hong Kong where the equipment failed. It also follows the general rule that safety-critical equipment should have backup or fail-safe attachment mechanisms.

Readers should be aware of the source document's many flaws. It does not have a clearly defined research method, does not have any quantitative design parameters, does not include all of the necessary regulatory references, and does not critically evaluate other approaches very well. The paper is more of a technical guide based on practice than an academic study based on a hypothesis. Therefore, practitioners should augment this guidance by directly consulting the referenced codes and standards (EMSD Wiring Code, Building Energy Code, FSD codes, ASHRAE standards, CIBSE guides) and by collaborating with qualified professionals (Registered Energy Assessors, Registered Electrical Workers, Authorised Persons) for project applications.

Despite these constraints, the paper constitutes a significant resource for professionals engaged in the renovation and design of these facility types. It combines practical steps, regulatory requirements, and design elements specific to each field to help achieve results that meet both functional and safety needs.

The main goal of integrated design is to make spaces that are safe, comfortable, and effective for people to do a wide range of things, from eating and sleeping to getting medical care and recovering. To reach this goal, you need to be good at your own field and be able to work with people from other fields, follow rules, and learn from both your successes and your failures. The authors hope that this paper will help Hong Kong's building industry become more skilled and that future professionals will build on and improve the practices described here.

RECOMMENDATIONS FOR FUTURE RESEARCH AND PRACTICE

Based on the critical analysis above, the following suggestions are made for researchers and practitioners.

For Researchers

Research on formal case studies -- Do structured case studies of renovation projects in all three types of facilities. These should include information about design choices, coordination processes, regulatory approvals, and outcomes after the project is done. This kind of research would give real-world proof to back up the practice-based advice given here.

Studies that use numbers to compare things -- Quantitative design parameters from finished projects should be measured and reported. These include the air change rates achieved in gymnasiums, the pressure differentials maintained in hospital isolation rooms, the UPS runtime specified for operating theatres, and the energy savings realised from three-mode control systems. These benchmarks would help set local design standards and confirm international standards in Hong Kong.

Comparative assessment of design options -- For every design strategy proposed (e.g., multifunctional furniture, twin-room configuration, portable ventilation), perform comparative analyses with alternative methods, evaluating costs, benefits, risks, and trade-offs. This kind of research would help make design decisions based on facts.

Mapping regulations and finding gaps -- Systematically map the regulatory requirements for each type of facility across all relevant government departments (FEHD, BD, FSD, HAD, EMSD, Hospital Authority). This will help you find gaps, overlaps, and unclear areas. This map would be useful for professionals and show where it might be helpful to make regulations more consistent.

Finding out what happened and sharing what you learn -- Make a structured plan for looking into and sharing what you learn from facility failures, like the operating room lamp incident. This framework should include looking at the root cause, what the law says, and what specific changes need to be made to codes, standards, or practices. A centralised, anonymised reporting system for near-misses and incidents in building services would help the whole industry get better all the time.

For Practitioners

Get in touch with regulators early -- Before starting any design or renovation work, talk to the right regulatory bodies (FEHD for food and beverage licenses, BD for structural changes, FSD for fire safety, and EMSD for electrical installations) to make sure you know what you need to do and what problems you might run into. Getting involved early lowers the chance of expensive redesigns or delays.

Keep track of decisions about document coordination in a systematic way -- Keep a coordinated drawing set that shows where every service outlet is, how every pipe and cable will be routed, and the assumptions about how things will be done. This set should include reflected ceiling plans, service routing drawings, and clash detection reports. This paperwork helps with building, commissioning, maintenance, and changes that will happen in the future.

In terms of contracts, you should list specific quantitative needs -- When hiring contractors or subcontractors, use quantitative performance specifications instead of qualitative ones. For example, instead of saying "adequate ventilation," say "air change rate of 12 ACH," "pressure differential of -2.5 Pa relative to corridor," or "UPS runtime of 15 minutes at full load." Quantitative specifications make it easy to see and measure what is acceptable.

Do evaluations after people move in -- After the project is done, carefully check to see if the design has met its goals, such as how many people can sit in F&B venues, how comfortable guests are in hotels, how often infections happen and how reliable equipment is in hospitals. These evaluations give us information that helps us do better on future projects.

Put money into skills that cross disciplines -- Because integrated design involves many different fields, professionals should learn more than just their main field. Electrical engineers need to know about how to ventilate spaces, mechanical engineers need to know about how to plan spaces, and architects need to know about how to integrate building services. This ability to work across disciplines helps with coordination and lowers the chance of design conflicts.

Think about safety all the time -- In healthcare and other safety-critical fields, put reliability and fail-safe design ahead of saving money on the first cost. For overhead equipment, make sure that integral or redundant attachments are used. For all life-safety systems, make sure that there is backup power. Also, make sure that emergency systems work as they should by testing them regularly and doing simulation exercises.

ACKNOWLEDGEMENTS

The authors acknowledge the contributions of the many site engineers, project managers, regulatory officials, and facility operators whose practical insights have informed this paper. Specific recognition is due to the project teams at the UNY supermarket café (Tseung Kwan O The MetroCity Phase 2), Golden Corn Restaurant (Tsim Sha Tsui), and the unnamed hospital where the operating theatre lamp incident occurred, as these cases provided valuable learning opportunities. The authors also thank the peer reviewers whose constructive criticism—particularly regarding methodological clarity and critical analysis—has strengthened this revised manuscript.

REFERENCES

1. Architectural Services Department. (2017). General Specification for Air-Conditioning, Refrigeration, Ventilation and Central Monitoring & Control System Installation in Government Buildings of the Hong Kong Special Administrative Region. Hong Kong: Government Printer.

2. ASHRAE. (2020). Standard 55: Thermal Environmental Conditions for Human Occupancy. Atlanta: ASHRAE.
3. ASHRAE. (2021). Standard 170: Ventilation of Health Care Facilities. Atlanta: ASHRAE.
4. British Standard Institute. (2019). BS EN 13501-1 Fire classification of construction products and building elements - Classification using data from reaction to fire tests. London: BSI.
5. Buildings Department. (2004). Code of Practice for Demolition of Buildings. Hong Kong: Government Printer.
6. Buildings Department. (2012). Code of Practice for Structural Use of Concrete. Hong Kong: Government Printer.
7. Buildings Department. (2019). Design Manual: Barrier Free Access. Hong Kong: Government Printer.
8. Buildings Department. (2021). Code of Practice for Precast Concrete Construction. Hong Kong: Government Printer.
9. Chan, E. T. (2022). A Guide to Swimming Pool Maintenance and Filtration Systems: An Instructional Know-How on Everything You Need to Know. Partridge Publishing Singapore.
10. Chartered Institution of Building Services Engineers. (2016). Guide B2: Ventilation and Ductwork. London: CIBSE.
11. Chartered Institution of Building Services Engineers. (2020). Guide A: Environmental Design. London: CIBSE.
12. Electrical and Mechanical Services Department. (2020). Code of Practice for the Electricity (Wiring) Regulations. Hong Kong: Government Printer.
13. Home Affairs Department. (2023). A Guide to Licence Application. Hong Kong: Government Printer.
14. Environmental Protection Department. (2025). A Guide to the Control on Import and Export of Waste. Hong Kong: Government Printer.
15. Fire Services Department. (2022). Code of Practice for Minimum Fire Service Installations and Equipment. Hong Kong: Government Printer.
16. Food and Environmental Hygiene Department. (2025). A Guide to Application for Restaurant Licences. Hong Kong: Government Printer.
17. Hu, R., Liu, Y., Shin, S., Huang, S., Ren, X., Shu, W., & Luo, X. (2020). Emerging materials and strategies for personal thermal management. Advanced Energy Materials, 10(17), 1903921.
18. Molavi-Taleghani, Y., Ebrahimpour, H., & Sheikhbardsiri, H. (2020). A proactive risk assessment through healthcare failure mode and effect analysis in pediatric surgery department. Journal of Comprehensive Pediatrics, 11(3), e56008.
19. Osennyaya, A., Gura, D., Khakhuk, B., Dyakova, N., & Lytus, M. (2022). Automation of Monitoring of Unauthorized Buildings. In International School on Neural Networks, Initiated by IIASS and EMFCSC (pp. 713-721). Cham: Springer International Publishing.
20. Panaras, G., Gropca, R., & Papadopoulos, G. (2022). Ventilation requirements and energy aspects: the case of hospitals. In IOP Conference Series: Earth and Environmental Science (Vol. 1123, No. 1, p. 012042). IOP Publishing.
21. Park, H. E., Go, S., & Song, Y. H. (2024). Airflow and pressure design review of modular negative pressure wards. Buildings, 14(6), 1623.