

BioSpect

the business of Bio

24 years of leveraging the business of Bio
www.biospectrumindia.com

Hospitals to strengthen Mechanical, Electrical, Plumbing and Fire Protection systems

29 July 2026 | Views | By Firoj Jena, CEO of Clancy Global (Mumbai)

To create healthcare environments that are safer, more adaptable and better prepared for future public health emergencies



The COVID-19 pandemic was an unprecedented stress test for hospital infrastructure. As hospitals rapidly expanded intensive care capacity, accommodated surging oxygen demand and created isolation facilities, many building services were pushed beyond their intended limits. By exposing critical weaknesses in the Mechanical, Electrical, Plumbing and Fire Protection (MEPF) systems that underpin modern healthcare, the pandemic demonstrated that resilient healthcare depends not only on clinical expertise but also on engineering systems that are flexible, reliable and capable of responding to public health emergencies.

Engineering the Future of Healthcare

Replacing hospitals is rarely practical or economical, whereas modernising existing healthcare facilities by upgrading MEPF systems offers a cost-effective way to improve resilience, infection control and operational efficiency. Modern hospitals must be designed with the flexibility to adapt clinical spaces, increase critical care capacity and maintain uninterrupted services during emergencies. Hospital engineering systems cannot be upgraded in isolation; mechanical, electrical, plumbing and digital systems are closely interconnected, with each influencing the performance of the others. An integrated MEPF strategy therefore is essential to build futureproof healthcare systems.

Electrical Resilience

Reliable electrical infrastructure is fundamental to hospital operations, supporting life-support equipment, intensive care units, operating theatres and diagnostic services. The emphasis should be on resilience rather than simply increasing capacity. Existing hospitals should strengthen their UPS systems, emergency generators, power distribution networks and critical electrical infrastructure to ensure continuity during outages. Flexible electrical layouts, combined with Building Management Systems (BMS) and digital power monitoring, enable wards to be rapidly converted into higher-acuity spaces while supporting proactive maintenance and fault detection.

HVAC Systems and Airborne Infection Control

The pandemic established ventilation as a critical component of infection prevention. Modern healthcare HVAC systems should prioritise high indoor air quality, pressure control and operational flexibility through dedicated air-handling units, HEPA filtration where required, negative-pressure isolation rooms, independent exhaust systems and continuous pressure monitoring. Well-designed treated fresh air systems dilute airborne contaminants, while effective humidity control supports

both patient comfort and infection prevention. Together, these measures create safer healthcare environments and strengthen hospitals' preparedness for future infectious disease outbreaks.

Oxygen and Medical Gas Systems

With hospitals experiencing unprecedented oxygen demand during peak COVID-19 admissions, many facilities struggled with existing storage capacity, distribution networks and pipeline pressures. Hospitals should therefore focus on strengthening oxygen resilience through increased storage capacity, redundant supply systems, expanded pipeline networks and continuous monitoring. Medical gas systems should also be designed with sufficient flexibility to support the rapid conversion of general wards into intensive care units during future emergencies.

Plumbing and Public Health Engineering

Public Health Engineering (PHE) systems are fundamental to infection prevention and hospital resilience. Safe water supply, wastewater management, drainage and firefighting infrastructure must continue to operate reliably during periods of increased clinical demand. Hospitals should prioritise touch-free plumbing fixtures, improved water quality management, robust drainage systems and wastewater treatment that complies with current environmental and public health regulations. Modifications should be carefully integrated with existing infrastructure to minimise disruption while enhancing operational reliability.

Smarter and more sustainable

Digital technologies are transforming hospital operations by enabling real-time monitoring and proactive management of critical infrastructure. Building Management Systems (BMS), energy management platforms and smart sensors provide continuous oversight of electrical systems, HVAC performance, indoor air quality, pressure differentials and medical gas networks. Predictive maintenance, automated alarms and remote monitoring improve operational efficiency, reduce downtime and enable facilities teams to respond rapidly during emergencies. At the same time, sustainability has increasingly become a complementary objective for hospitals – modern hospital upgrades should incorporate energy-efficient HVAC systems, LED lighting, renewable energy where feasible, water conservation measures and heat recovery technologies. These interventions reduce operational costs, lower carbon emissions and strengthen the long-term resilience of healthcare facilities without compromising patient safety or clinical performance.

Looking ahead

Healthcare facilities must be primed to handle not only everyday operations but also exceptional events. Upgrading existing hospitals through an integrated MEPF strategy that combines resilient electrical systems, advanced ventilation, robust medical gas infrastructure, effective public health engineering, digital building management and sustainable design, will create healthcare environments that are safer, more adaptable and better prepared for future public health emergencies.

Firoj Jena, CEO of Clancy Global (Mumbai)