# Smart Building Concept & its Dimensions

# Agenda

- **Smart buildings-** Definitions & its outcomes
- How can a building be made Smarter?
- Dimensions of Smart Building

# Smart Building- Definition

- A Smart building uses **information and communication technologies**, and other means to **improve quality of life, efficiency of operation and services and competitiveness**, while ensuring that it **meets the needs of present and future generations** with respect **to economic, social and environmental aspects**. (*National Building Code 2016*)

# Smart Building- Definition

- A smart building is any structure that **uses automated processes to automatically control the building's operations** including heating, ventilation, air conditioning, lighting, security and other systems.
- A smart building uses **sensors, actuators and microchips,** in order to **collect data and manage it according to a business' functions and services**. This infrastructure helps owners, operators and facility managers **improve asset reliability and performance, which reduces energy use, optimizes how space is used and minimizes the environmental impact of buildings**.


HVAC
Maintenance
Services
Fire Detection &
Alarm
Security &
Access Control
Lighting Control
& Retrofit
Smoke Control
Digital Video
Indoor Air Quality
Services
Energy Supply & Load
Management
Intrusion
Detection
Water Management
Environmental Control
Mechanical
Maintenance &
Retrofit
Energy Information
Management
Asset Locator
On-Site Technical Service
Enterprise
Systems
Integration

# Dimensions of Smart Building

- The building need to focus on following three dimensions for becoming smart.
  - **Greenness:** Environmentally sustainable components of a building ( Energy Sources, Temperature control, Electricity Control etc)
  - **Safety:** Safeguard the building, its occupants, users and owners (Security for People/ vehicle/ Material, Fire Safety, Gas leak, Worker Safety, Disaster response)
  - **Productivity :** Enhanced comfort and productivity for users and owners ( Indoor Air & water quality, Circulation People/ vehicle/ Material, Connectivity, Energy Quality)

# How can a building be made Smarter?

We can convert a building in to a smarter building by working on following:

- **Greenness:** Focus on **conservation and efficient use** of **natural resources**.
- **Safety:** Focus on **fire detection and notification**. Given the need to manage **access and information security** in the offices, need to improve **surveillance and intrusion monitoring**. Improve **access control and screening systems for people and vehicles**. Improve **disaster response, worker safety and personal protection, and gas and water leakage detection** and notification systems

- **Productivity:** Focus on **indoor environment comfort, quality and control systems**. Improve productivity and user experience by making **wireless communication and data infrastructure seamless and available across the building**. Improve **people, vehicle, and cargo movement management systems**.

# Measures under the vertical “Greenness”

# Aim of Green building

The aim of a green building design is to :

- minimize the demand on **non-renewable resources** and maximize **the utilization efficiency** of these resources, when in use
- maximize the **reuse and recycling**
- maximizes the use of **renewable sources of energy**.
- maximizes the use of **efficient building materials and construction practices**

# Aim of Green building

So, a green building design :

- uses **minimum energy** to power itself
- uses **efficient equipment** to meet its lighting, air-conditioning, and other needs
- uses **efficient waste and water management** practices
- provides **comfortable and hygienic indoor working conditions.**

# Benefits of Green building

- Consume **40% to 60%** (depending on the range of measures adopted) **lesser electricity** as compared to conventional buildings.
- Attempt to work towards on-site energy generation through **renewable energy utilization** to cater to its energy needs.
- Consume **40% to 80%** (depending on the range of measures adopted) **lesser water** as compared to conventional buildings.
- Generate **lesser waste** by employing waste management strategies on site.

# Benefits of Green building

- Generate **lesser pollution** both during construction as well as while in use
- Ensure proper **safety, health and sanitation facilities** for the labourers (during construction) and the occupants (while in use)
- Restrict the use **of high ODP** (ozone depleting potential) substances in their systems as well as in finishes.
- Offer higher **image and marketability**

# Measures under the vertical “Safety”

# Electronic Access Control (EAC)

- EAC is important for **overall personal safety and the protection** of physical and intellectual property.
- EAC devices can include **locks, integrated electronic devices controlling a single door or room, or a complex system of interconnected electronic devices controlling a zone, building, or campus.** So, the Access to private or secured spaces can be controlled in a great variety of methods.

# Electronic Access Control (EAC)

- In addition, the user often has **multiple levels of access required within a space**. This access level may be required **to change during the course of the day, week, or month.**
- In contrast to a lock-and-key system, a modern **computer-supported control system** can meet these and many other user goals. This system employs **programmable EAC**. **Time-of-day and day-of-the-week access levels** can be applied to all personnel who have authorized entry.

# Electronic Access Control (EAC)

- In a shared communication environment, the **EAC data travels along with other building systems and data networks packets** on the same physical network. This is often accomplished through **an Ethernet connection.** It also may use **building automation networks.**

# CCTV Surveillance

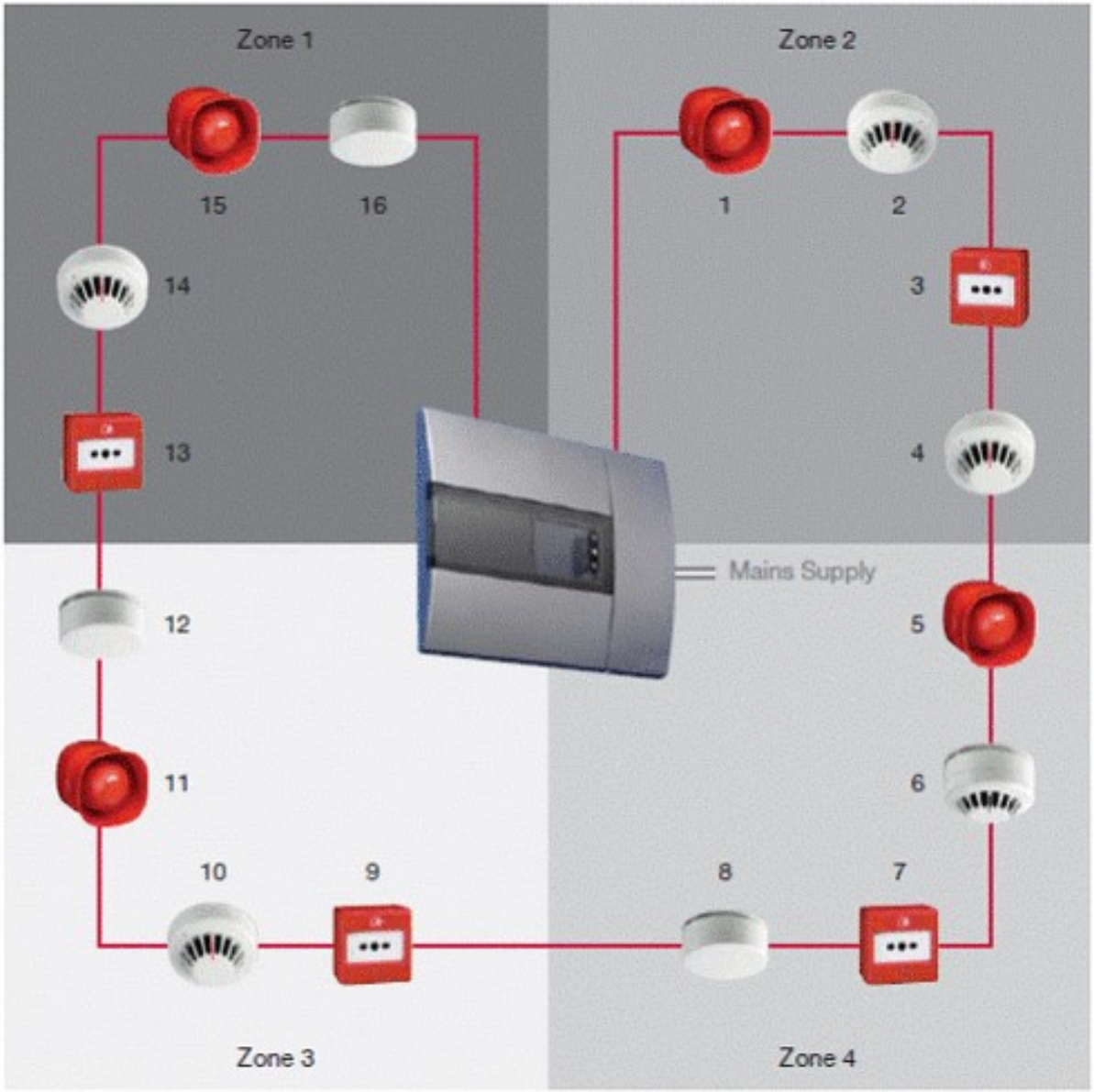
- CCTV (closed-circuit television) is a TV system in which signals are **not publicly distributed** but are monitored, primarily **for surveillance and security purposes**. CCTV relies on strategic placement of cameras, and observation of the camera's input on monitors somewhere.
- Because the cameras **communicate with monitors and/or video recorders across private coaxial cable runs or wireless communication links**, they gain the designation "closed-circuit" to indicate that access to their content is limited by design only to those able to see it.

# CCTV Surveillance

- In addition to traditional capture devices that operate within the visible band of the electromagnetic spectrum, other technologies **provide unique viewing capabilities using IR, thermal & film cameras.**
- **IP surveillance** is a digitized and networked version of CCTV. In an IP surveillance system, an IP camera **records video footage** and the resulting content is distributed over an IP (Internet protocol) network.

# Fire Safety with Addressable and programmable Fire Alarm system

- An addressable fire alarm system is **made up of a series of fire detectors and devices that are connected back to a central control panel**.
- With addressable systems, each d**evice has an address or location**, enabling the exact detector that was triggered **to be quickly identified**.
- One of the **biggest advantages** of addressable fire alarm systems is that they **can be configured so that a specific action** triggers a specific response. So, it quickly determines the **actual location of fire.**


Zone 1
Zone 2
15
16
1
2
14
3
13
4
Mains Supply
12
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8
7
Zone 3
Zone 4

# Fire Safety with Addressable and programmable Fire Alarm system

- This system also **reduces false alarms** as it allows **air to be monitored** through the detectors, so if air is contaminated for example **with dust (**which can activate some fire alarm systems) then **a 'pre-fire' warning is triggered**. This allows investigation to take place, so any issues can be rectified before a full scale false activation of the system takes place.
- Further, an addressable fire alarm **system is more reliable than the conventional one.**

# Measures under the vertical “Productivity”

- In the vertical **“Productive”,** different measures with a view of **making building productive and enhancing the user experience by making wireless communication and data infrastructure seamless** etc. may be taken. The foremost measure is Building Management System (BMS).

# Building Management System (BMS):

- A BMS, also known as **a building automation system** (BAS), is a computer-based control system installed in buildings **that controls and monitors the building's mechanical and electrical equipment** such as ventilation, lighting, power systems, fire systems, and security systems.

# Building Management System (BMS):

- A BMS consists of **software and hardware**; the **software program**, usually configured in a hierarchical manner, can be proprietary, using such protocols as C-Bus, Profibus, and so on.

- The following services may be managed from BMS:
  - Window / split Air-conditioners with sensors
  - Illumination (Lighting) controls with occupancy sensor
  - Electrical power control
  - Addressable Fire Alarm system
  - CCTV & Access control
- The possible benefits will include the following:
  - Effective monitoring and targeting of energy consumption & energy Efficiency
  - Precise control of AC and lighting  parameters
  - Increased staff productivity
  - Improved equipment reliability and life
  - Improved diagnosis and maintenance

# Open & non-propriety platform for Wireless BMS

- As an **open, non-proprietary, high-performance, and secure** building automation platform, the IP500® standard is being used.
- It is the **only wireless technology standard** to ensure **maximum interoperability** by **using and supporting the main industry norms and by clearly specifying all interfaces**.

# Secure Networking and Control of Different Disciplines

- Different **networked sensors, actuators, and other smart devices** in different disciplines make up the total network.
- By using **IPv6 (the Internet of Things) and BACnet**, the IP500® standard is the ideal platform **solution for wireless networking and control in the areas of Access control, Fire & smoke alarms, lighting and climate control** etc.

# Maximum Flexibility and Ease of Installation

- The IP500® standard not only simplifies the **servicing and maintenance of smart buildings**; it also ensures **maximum flexibility** in the use of different components.
- Furthermore, **no special network or system know-how** is required for specific manufacturers.
- So the wireless-based solution **is ideally suited for swift and easy installation of state-of-the-art communication networks and a free choice of manufacturer**. The same applies to **mobile terminal devices and apps**, such as access cards or messaging apps that can be integrated into the system easily and securely.
- Finally, IP500® solutions are almost unlimited in their **configurability, scalability, and upgradability at any time**.

# Cost Savings

- A further benefit of interoperability is the cost saving that it provides.
- The **more different the systems and the less interoperable they are**, the higher the cost of running a building.
- Conversely, **substantial cost savings can be achieved by simplifying the basic infrastructure** by means of a uniform wireless protocol and a high level of interoperability.
- They result mainly from **uniform maintenance and operability, similar management tools and lower training costs for personnel**. That leads to a reduction in **the total costs of ownership (TCOs).**


Thank you!