

Self-Evaluation Exercise on ELV, Communication and Security Systems

Q.1 Solution (outline only):

The three types of extra low voltage (ELV) sources are:

- Safety extra low voltage (SELV)
 - Safely separated from other circuits that carry higher voltages
 - Isolated from earth (ground) and from the protective earth conductors of other circuits
- Protective extra low voltage (PELV)
 - Has a protective earth (ground) connection, such as a computer with a IEC Class I power supply
- Functional extra low voltage (FELV)
 - Any other extra low voltage circuit that does not fulfill the requirements for an SELV or PELV circuit, such as part of the circuit uses an ELV
 - Protection requirements for the higher voltage have to be applied to the entire circuit

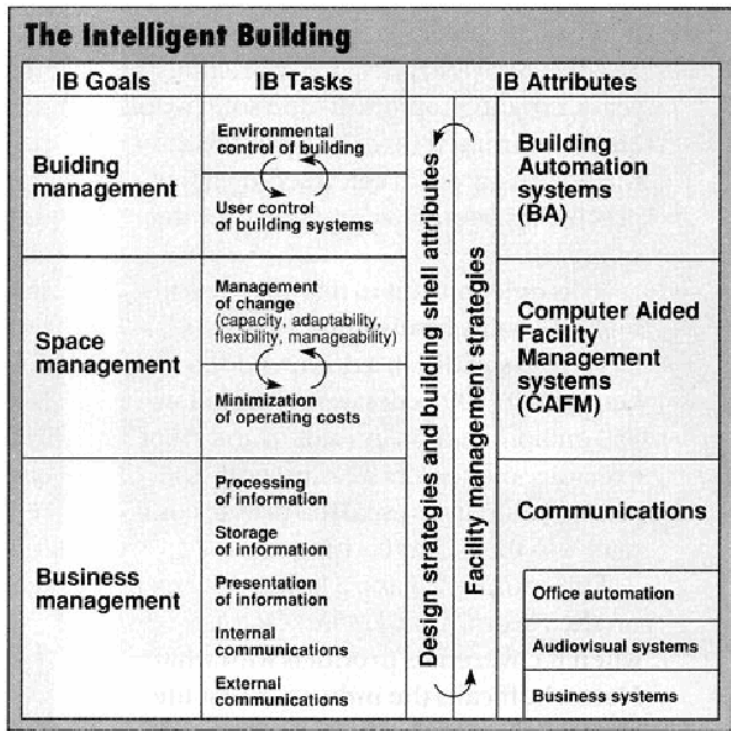
The safety principles of an ELV circuit come from:

- The extra low voltage
- Low risk of accidental contact with a higher voltage
- Lack of a return path through earth (ground) that a current could take in case of contact with a human body

Q.2 Solution (outline only):

Three main goals of IB are:

- Building management (Building automation and the physical environment)
- Space management (Building's internal space & operating costs)
 - Capabilities & flexibility of the building to accommodate changes, personal moves & connectivity
- Business management (Management of the organization's core business)



Q.3 Solution (outline only):

Design considerations for planning a general IT equipment room:

- Floor areas allowed for all equipment, staff, services, storage, etc
- Access for equipment deliveries
- Future expansion
- Preferred methods of locating services
 - Within raised floor void: power cabling, data cabling, HVAC pipework, air distribution supply, fire detection/protection services
 - Within suspended ceiling: lighting, air distribution return, fire detection/protection services
- Minimum room height, floor void, ceiling void
- Sufficient floor loadings
- Access for installing, operating and maintenance of equipment
- Environment suitable for operating the equipment; room finishes easily cleaned

Q.4 Solution (outline only):

Describe any four of the following ELV systems: (illustrate with diagrams)

- Communal aerial broadcast distribution (CABD)
- Satellite master antenna television (SMATV) systems
- Private branch exchange (PBX) telephone systems
- Public address (PA) systems
- Computer networking systems
- Fire alarms and security systems

Q.5 Solution (outline only):

OSI Seven-layer reference model: (briefly describe the functions and purposes)

- Level 1 – Physical Layer
- Level 2 – Data Link Layer
- Level 3 – Network Layer
- Level 4 – Transport Layer
- Level 5 – Session Layer
- Level 6 – Presentation Layer
- Level 7 – Application Layer

The advantages of using network methods for communication:

- Devices can be shared
- Easier to manage
- Easier to maintain
- Less expensive for equipment & software

Q.6 Solution (outline only):

The common types of transmission methods or media for communication systems are (briefly describe each of them):

- Twisted pairs (shielded or unshielded)
- Coaxial cable
- Voice grade lines
- Power line carrier (PLC)
- Radio frequency (RF)
- Microwave

- Fibre optics

Q.7 Solution (outline only):

The common parts of cabling systems are:

- Lead-in facilities, including cable entry and cable entry chamber
- Telecommunications and broadcasting equipment (TBE) Room
- Secondary TBE Room
- Vertical riser
- Horizontal distribution facilities
- Telecommunications closets
- Accommodation for subscription TV receiving system
- TV/FM outlets
- Telephone sockets
- Cables
- Rooftops

The important factors for cable selection are:

- Performance (such as bandwidth, data rate, attenuation (loss))
- Cost
- Flexibility
- Compatibility

Q.8 Solution (outline only):

Structured Cabling System (SCS) is:

- A set of cabling and connectivity products that integrates the voice, data, video, and various management systems of a building (such as safety alarms, security access, energy systems, etc.).
- SCS generally use one of the forms of twisted pair cables, sometimes in combination with other forms, to give saturation wiring to an area. It uses a radial architecture connection--back to the wiring closet.
- The closets are then interlinked so that, by suitable patching, any outlet can serve any requirement.
- Structured cabling gives flexibility as, if it has been well designed, most moves and changes can be done at the patch panel and not at the user's end.
- However, there are limitations to the ability to mix voice and data. Also patch panels use large amounts of space, and broadband or video signals need special cables.
- Key components of structured cabling:
 - Telecommunication outlets
 - Horizontal cabling
 - Patch panels and floor distributors (data hub)
 - Backbone cable

The important factors to consider when planning and designing the strategy for cable distribution and telecommunication in a modern commercial building are:

- The types of information served
- Cable types
- Cabling routes
- Capacity
- Distribution methods
- Outlet types
- Flexibility

- Allowance for future growth
- Management and maintenance issues
- Redundancy

Q.9 Solution (outline only):

The main objectives of security design are:

- Crime prevention: aim to minimise, in and around the building, risks of theft, criminal damage, vandalism, personal attack and sabotage, both during the construction of the building and throughout its life

The purposes that security and alarm systems can usually achieve are:

- Decrease the chances of a burglary
- Decrease the number of items stolen and the extent of damage done
- Create the peace of mind

Q.10 Solution (outline only):

The key concerns of security design for a commercial building are:

- Must be fully co-ordinated, at all stages of building design
- Design of physical protection, e.g. building design (e.g. landscaping, building inter-relationships, access), physical security (e.g. doors and windows)
- Design of security devices, e.g. detection, alarms, and security lighting
- Security procedure for all personnel

A good security plan should include:

- Strong window, door, and lock products
- Good security habits and lifestyles (e.g. always lock doors at night or when the house is vacant)
- Natural surveillance, e.g. neighbourhood watches

Q.11 Solution (outline only):

The important factors/concepts for security system design and planning are:

- Evaluating the Risk. Assess all possible risks such as damage by fire, water, vandalism, burglary, even terrorism, and the inconvenience suffered as a result.
- Physical Protection. The form of fencing or building elements (for instance walls, partitions, doors, windows, barriers, screens, bolts, locks, safes, and so on) which discourage and delay unauthorised entry.
- Detection. The detection method should take into consideration the assessed risk and physical protection provided to prevent the successful completion of the criminal act.
- Alarms. Such as manual, automatic, audible, visual, local, remote, broadcast or discrete. The alarm should disturb the perpetrator and/or inform the personnel responsible for security that an unauthorised act is either imminent or taking place.
- Response. The action to be taken by the personnel responsible for security.
- Maintenance and Review. Frequent testing and competent maintenance minimise the possibility of system failure.

The major elements affecting the risk of burglary in a residential building are:

- Building location and surroundings
- Building access and structural strength
- Building contents
- Occupational pattern

- Consequence of loss
- History of loss
- Existing security measures
- Recommended level of protection

Q.12 Solution (outline only):

Describe any four types of security and alarm systems below: (with suitable diagrams)

- Burglar alarm system (central or local)
- Fire alarm & detection system
- C.C.T.V. surveillance system
- Intruder detection & access control
- Intercom systems (audio/video)
- Door-phone system & interlocking system
- P.A. (panic attack) button & sound system
- Security lighting