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Question: 1152

Which standard published by the National Fire Protection Association explicitly focuses on the overall standard for fire protection of Information Technology Equipment, defining building construction, equipment spacing, and emergency control requirements for data centers?

- A. NFPA 72
- B. NFPA 75
- C. NFPA 10
- D. NFPA 2001

Answer: B

Explanation: NFPA 75 is titled the "Standard for the Fire Protection of Information Technology Equipment." It specifically addresses the protection of IT equipment and data center spaces from fire hazards, covering topics such as computer room construction, fire suppression/detection requirements, HVAC controls, and Emergency Power Off (EPO) systems. NFPA 72 covers National Fire Alarm and Signaling Codes, and NFPA 2001 covers Clean Agent Fire Extinguishing Systems.

Question: 1153

A data center consumes 1,500 MWh of total facility energy during a measurement period. IT equipment accounts for 1,000 MWh. What is the PUE?

- A. 0.67
- B. 2.50
- C. 1.50
- D. 1.00

Answer: C

Explanation: Power Usage Effectiveness is calculated as:

$$PUE = \frac{\text{Total Data Center Energy}}{\text{IT Equipment Energy}}$$

Therefore:

$$PUE = \frac{1500}{1000} = 1.5$$

A PUE of 1.50 means that for every unit of energy consumed by IT equipment, the facility consumes an additional 0.50 unit for cooling, power distribution, lighting, and other infrastructure functions included in the measurement boundary.

Question: 1154

A final cabling inspection is being performed before a data center handover. Which evidence set is the most complete?

- A. Equipment serial numbers, generator fuel level, lighting schedule, and door keys
- B. Cable photographs, test results, port maps, labels, pathway records, and as-built drawings
- C. Cable colors, technician names, rack dimensions, and room temperature only
- D. Patch-cord lengths, cabinet paint color, floor tile count, and ceiling height only

Answer: B

Explanation: A complete handover package should include certification or test results, cable and port identifiers, source-to-destination records, rack elevations, pathway layouts, labeling schedules, photographs where useful, and updated as-built drawings. This information supports operation, troubleshooting, future expansion, audits, and controlled maintenance.

Question: 1155

A facility engineer replaces legacy rack PDUs with Intelligent/Metered Rack PDUs across all IT enclosures. What primary functionality does a outlet-metered intelligent rack PDU offer to improve operational capacity management?

- A. Dynamic conversion of single-phase AC input into balanced three-phase DC power for server power supplies.
- B. Automatic step-down voltage conversion from 480V to 120V at each individual receptacle.
- C. Real-time remote power consumption tracking per individual outlet socket, enabling precise phase balancing and identification of stranded power capacity.
- D. Direct integration with diesel generator fuel pumps to throttle engine RPM based on server CPU load.

Answer: C

Explanation: Intelligent/Metered-by-Outlet Rack PDUs provide granular power measurement down to the individual server plug level over an IP network connection. This enables data center operators to monitor power consumption per server, measure exact power draw during peak processing, identify ghost or underutilized servers, balance phase loads across 3-phase circuits, and safely allocate stranded power capacity without risking circuit breaker trips.

Question: 1156

According to typical data-center design practice referenced in Schneider Electric materials, what detection arrangement is recommended to prevent accidental discharge of a clean-agent system?

- A. Any single detector in alarm immediately releases the agent
- B. Heat detectors alone are used for release decisions
- C. Cross-zoned detection so that two independent detectors or zones must confirm alarm before release
- D. Manual release is the only permitted method

Answer: C

Explanation: Cross-zoning (or dual-risk) logic requires confirmation from two separate detection circuits before the pre-discharge sequence begins. This greatly reduces the probability of an unwanted discharge caused by a single faulty detector.

Question: 1157

A facility chooses clean-agent suppression for the IT room and water-based protection for adjacent general building areas. What principle does this arrangement illustrate?

- A. Clean agents are intended only for outdoor generator enclosures
- B. One suppression method must be used identically in every building area
- C. Water-based systems are prohibited in all non-IT spaces
- D. Suppression should be selected according to hazards and protected-space conditions

Answer: D

Explanation: Fire-protection design should consider the type of hazard, occupancy, equipment sensitivity, room enclosure, life-safety requirements, water risk, and applicable codes. A clean agent may be suitable for a tightly enclosed IT room, while sprinkler or water-mist protection may be appropriate in other areas. The overall system should be coordinated rather than selected by one universal rule.

Question: 1158

A facility compares VRLA and lithium-ion batteries for a constrained battery room. Which consideration generally favors lithium-ion technology?

- A. Complete immunity to thermal events under all conditions
- B. Guaranteed lower initial purchase price in every project
- C. No need for protection, monitoring, or thermal management
- D. Higher energy density and integrated state-of-health monitoring

Answer: D

Explanation: Lithium-ion batteries commonly offer higher energy density, lower footprint, lower weight, longer service life, and sophisticated battery-management information. They still require appropriate protection, monitoring, thermal controls, installation design, and maintenance. VRLA may remain attractive in some applications because of established practices and procurement considerations.

Question: 1159

Bollards are installed in front of the data-center loading dock. What is the primary purpose of this physical barrier?

- A. To serve as mounting posts for exterior lighting only
- B. To prevent vehicles from ramming or approaching the building structure
- C. To replace the need for any perimeter fencing
- D. To improve the aesthetic appearance of the building

Answer: B

Explanation: Bollards are vehicle-impact barriers designed to stop or slow vehicles that might otherwise be used to breach the building envelope or reach critical infrastructure.

Question: 1160

A clean-agent system protects an occupied technical room. The engineering team proposes increasing the agent concentration substantially without reevaluating occupant exposure. What is the primary concern?

- A. Higher concentrations always improve occupant safety because oxygen levels increase
- B. Higher concentrations automatically make enclosure leakage irrelevant
- C. Higher agent concentrations can affect human exposure and require appropriate safety evaluation
- D. Higher concentrations eliminate the need for pre-discharge notification

Answer: C

Explanation: Clean-agent system design must consider both fire-extinguishing performance and human safety. Agent concentration and potential exposure duration can affect whether a space is suitable for normal occupancy and what warning, egress, or other protective measures are required. NFPA 2001 addresses relationships between agent concentration and exposure considerations. Increasing agent quantity should therefore never be treated as an unrestricted method of improving suppression performance.

Question: 1161

A data center has a critical load of 800 kW and the design team estimates a 0.8 operating power factor for the generator load. Ignoring additional design margins, what approximate generator apparent-power rating is required?

- A. 800 kVA
- B. 1,000 kVA
- C. 640 kVA
- D. 1,250 kVA

Answer: B

Explanation: Generator apparent power can be estimated using:

$$kVA = \frac{kW}{Power\ Factor}$$

Therefore:

$$kVA = \frac{800}{0.8} = 1000\ kVA$$

The calculated requirement is approximately 1,000 kVA before applying any additional engineering margin or accounting for transient requirements. Generator selection must also consider the generator's ability to accept load steps and maintain acceptable voltage and frequency.

Question: 1162

A data center's supply-air temperature is lowered substantially to compensate for hot spots caused by poor rack arrangement. Which improvement should be attempted first?

- A. Increase latent load to match sensible load
- B. Close all cooling-unit supply fans permanently
- C. Improve airflow separation and remove bypass paths
- D. Disable return-air temperature sensors

Answer: C

Explanation: Hot spots caused by airflow mixing should first be addressed through rack orientation, blanking panels, sealing floor openings, correcting tile placement, balancing airflow, and implementing containment where appropriate. Lowering the overall supply temperature may increase energy consumption without correcting the underlying distribution problem.

Question: 1163

Which statements correctly describe humidity control in data centers? (Select All that Apply)

- A. Over-humidification or unnecessary dehumidification increases energy consumption and raises PUE
- B. Both low and high humidity can damage IT equipment (electrostatic discharge versus corrosion and condensation)
- C. ASHRAE recommends a relative-humidity range that balances these risks
- D. Humidity control is unnecessary once hot-aisle containment is installed

Answer: A,B,C

Explanation: Low humidity increases ESD risk; high humidity promotes corrosion and condensation. Maintaining the ASHRAE-recommended band avoids both extremes. Any humidification or dehumidification beyond what is required adds latent load and energy use. Containment does not eliminate the need for humidity management.

Question: 1164

A thermal design team is analyzing heat rejection methods for perimeter CRAC units in a location with extreme winter freezing temperatures (-25°C). Why are chilled water CRAH systems connected to an indoor central chiller plant with glycol loop heat exchangers preferred over standard air-cooled direct expansion (DX) CRAC units in severe winter climates?

- A. Air-cooled DX units cannot condense refrigerant when ambient air drops below 0°C .
- B. Chilled water systems convert server heat into latent moisture to humidify the building.
- C. Outdoor air-cooled condensers on DX systems risk head-pressure control failure and outdoor refrigerant migration, whereas indoor chilled water/glycol loops protect against freezing and enable full economizer operation.
- D. DX systems generate excessive static electricity at freezing temperatures.

Answer: C

Explanation: In severe freezing climates, outdoor air-cooled DX condensers suffer from extremely low head pressures, liquid refrigerant traps, and fan cycling failures unless fitted with complex winter control kits. Furthermore, DX units cannot leverage free cooling easily. Central chilled water systems utilizing indoor chillers and an outdoor water/glycol fluid cooler loop eliminate outdoor refrigerant lines, prevent coil freezing via glycol mixtures, and seamlessly integrate water-side economizers for low-cost winter cooling.

Question: 1165

A surveillance system at a data center vehicle entrance is being designed to investigate unauthorized removal of equipment. Which camera objective is most important at the loading area?

- A. Recording only the facility's exterior architectural features
- B. Viewing only the security guard's workstation area
- C. Capturing identifiable people and vehicle activity
- D. Covering only general movement through the parking area

Answer: C

Explanation:

When surveillance is intended to support investigations, the camera placement and image quality should allow people and relevant vehicles or assets to be identified. A general overview may provide useful situational awareness but may not provide enough detail to establish who entered, what vehicle was involved, or whether equipment was removed.

Question: 1166

A UPS delivers 800 kW at 96% efficiency. What input power is required, and approximately how much power is lost?

- A. Input 833.33 kW; loss 33.33 kW
- B. Input 816.67 kW; loss 16.67 kW
- C. Input 800.00 kW; loss 32.00 kW
- D. Input 960.00 kW; loss 160.00 kW

Answer: A

Explanation: Input power is:

$$P_{\text{in}} = \frac{800}{0.96} = 833.33 \text{ kW}$$

Power loss is:

$$P_{\text{loss}} = 833.33 - 800 = 33.33 \text{ kW}$$

The loss becomes heat and must be included in facility cooling and efficiency calculations.

Question: 1167

A rack receives two power feeds from separate PDUs. Each feed is individually capable of supporting the rack, but the rack's dual-corded servers are connected to only one feed. What is the principal design problem?

- A. The rack operates at a higher battery voltage
- B. The rack has unnecessary harmonic cancellation
- C. The rack has no effective use of the second power path
- D. The rack automatically becomes a 2N load

Answer: C

Explanation: Redundant PDUs do not provide effective load redundancy unless the equipment is connected to both paths. A single-corded connection or incorrect cabling can leave the rack dependent on one PDU. Dual-corded servers should be connected so that loss or maintenance of either path does not interrupt the load, subject to the equipment's internal power-sharing behavior.

Question: 1168

Which of the following correctly describe the relationship between availability and reliability in data center systems according to Schneider Electric Fundamentals of Availability? (Select All that Apply)

- A. Reliability focuses on the frequency of failures while availability also accounts for how quickly the system recovers after a failure
- B. Reliability is the ability of a system or component to perform its required functions under stated conditions for a specified period of time
- C. Availability is the degree to which a system is operational and accessible when required for use
- D. Availability is solely determined by the number of failures and ignores recovery time

Answer: A,B,C

Explanation: Reliability measures the probability that a system will perform its required function without failure for a given time under stated conditions. Availability measures the fraction of time the system is in a usable state and is influenced by both how often failures occur and how long recovery takes. Longer recovery times reduce availability even if the underlying reliability (failure frequency) remains unchanged.

Question: 1169

In a data center using Row-based cooling units placed directly between server racks, what occurs to the return air path efficiency compared to traditional perimeter room-based cooling?

- A. The overall fan power requirement increases exponentially due to localized static friction losses.
- B. Return air velocity drops to zero, requiring supplemental ceiling-mounted induction fans.
- C. The return air path is significantly shortened, allowing cooling units to capture hotter exhaust air directly at its source before it mixes with room air.
- D. Row-based units must operate at lower dew points, increasing latent dehumidification energy.

Answer: C

Explanation: Row-based cooling units are positioned inside the rack row, directly capturing hot exhaust air as it leaves the rear of servers. Because the return path is reduced from tens of feet (across the room) to mere inches or feet, hot air is captured at its highest temperature without mixing with ambient room air. High return air temperatures drastically improve cooling coil heat transfer efficiency and capacity.

Question: 1170

Outdoor air conditions are cool and sufficiently dry. A data center uses an air-side economizer to reduce mechanical refrigeration. What is the intended operating principle?

- A. Recirculate generator exhaust through the cooling units
- B. Use warmer outdoor air to increase compressor loading
- C. Use suitable outdoor air conditions for cooling while reducing compressor operation
- D. Replace all humidity sensors with power meters

Answer: C

Explanation: An air-side economizer uses suitable outdoor air to provide some or all cooling instead of relying entirely on mechanical refrigeration. It can reduce compressor energy when outdoor temperature and humidity conditions are acceptable. Proper filtration, humidity control, contamination protection, dampers, and changeover logic are essential.



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