

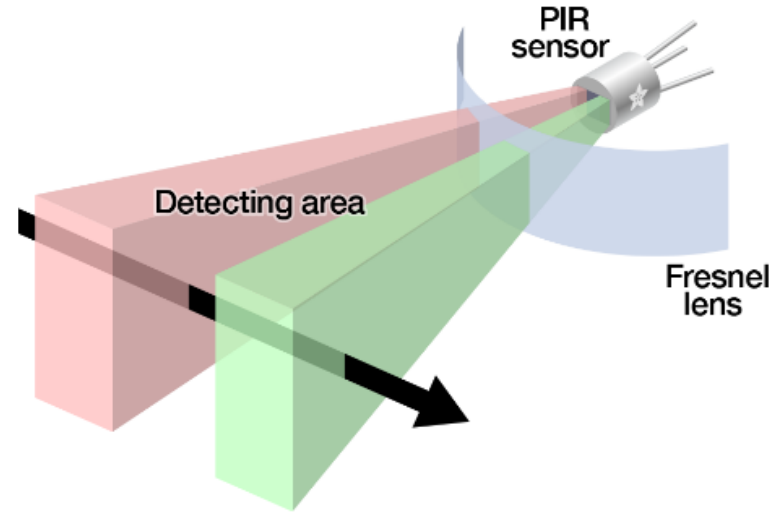
**STEINEL<sup>®</sup>**  
**PROFESSIONAL**

Design Guide

# SELF-STORAGE CENTERS & DATA CENTERS

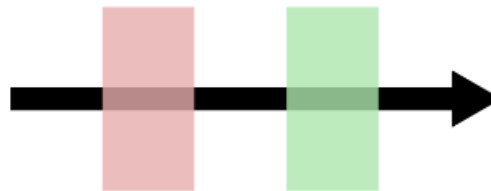
PRESENTED BY POURIA NIKNAM  
& THURSTON SELBY

# PIR (Passive Infrared) Technology

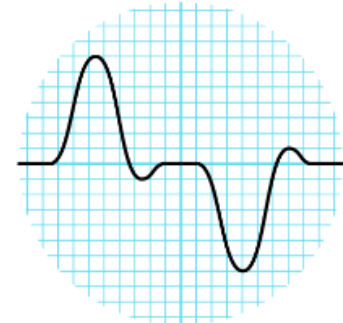


## Characteristics

- Direct line of sight detection only
- Potential to crop and limit coverage pattern and isolate detection zones
- Requires presence of heat signature in motion



Heat source movement



Output signal



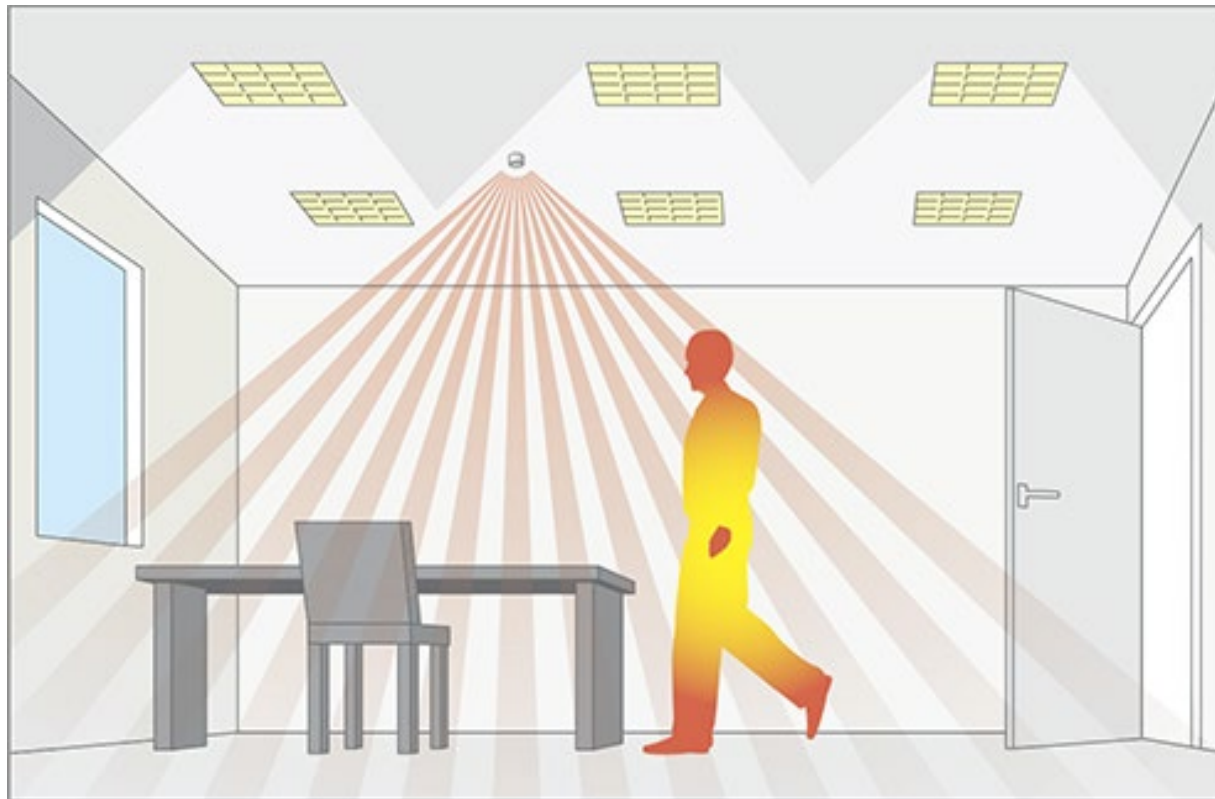
## Characteristics

- Ultrasonic waves fill the entire volume of the room
- Does not require line of site to the object in motion
- Sensitive to motion of any object including doors and door knobs, but also decorations and airflow
- Detects minor motion

# Which Technology?

## PIR is the right solution!! But why?

- Roll-up doors move due to air pressure difference on opening/closing
- Roll-up doors rattle and vibrate due to air movement in the storage center
- Server racks have strong cooling fans causing vibrations and significant air flow

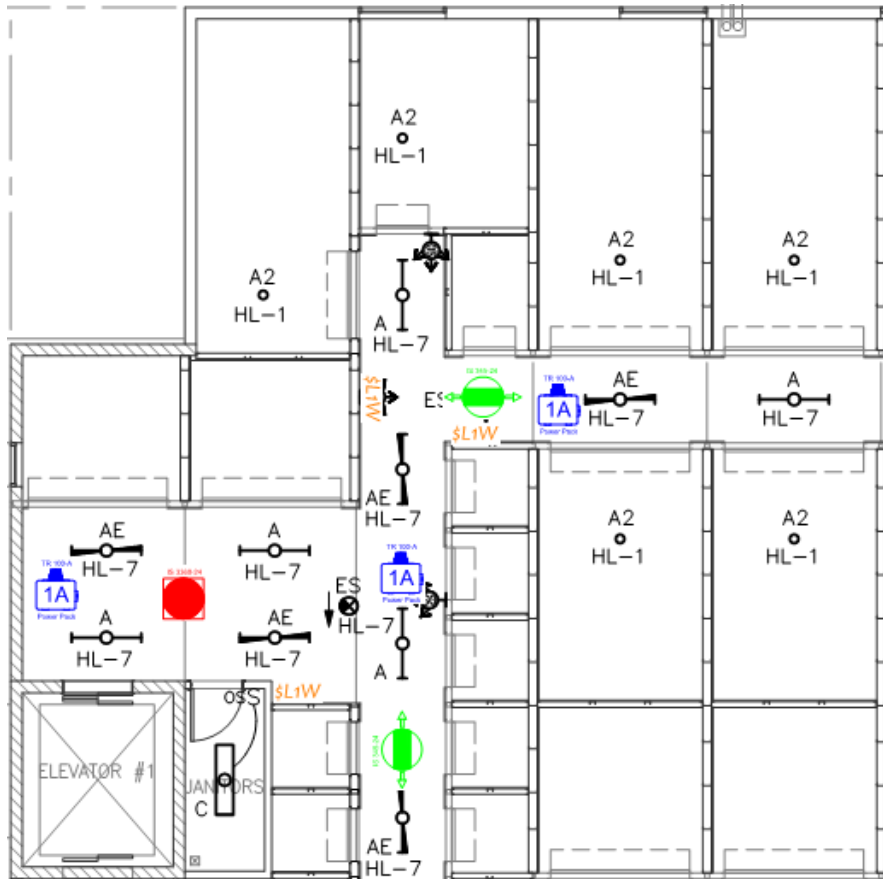


## IECC 2015 Code Compliance:

- Use of occupancy sensor provides automatic all OFF (C 405.2.1.1.1).
- All sensors to be automatic ON to meet the code (C405.2.1.1.2).
- Momentary switch is used to provide manual control of the lighting (C 405.2.1.1.3).



# Self Storage Center




**IS Series**  
Code Compliant  
Out of the Box



Product	Qty.	Description
IS 345-24	2	PIR occupancy sensor (Hallway type)
IS 3360-24	1	PIR occupancy sensor (360 degrees coverage)
TR 100-A	3	Power pack
LV-1-W	3	1 button momentary switch

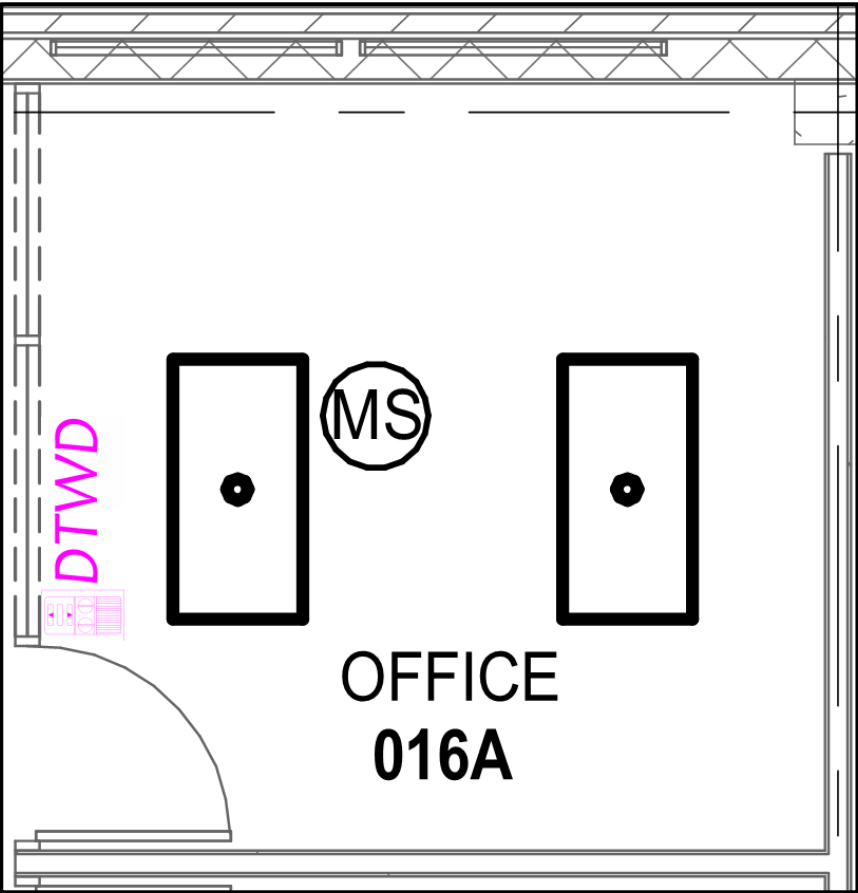
## IECC 2015 Code Compliance:

- Use of occupancy sensor provides automatic all OFF (C405.2.1.1.1).
- All sensors to be set to partial ON or manual ON to meet the code (C405.2.1.1.2).
- An override switch is used to provide manual control of the lighting (C405.2.1.1.3).





# Private Office / Meeting Room



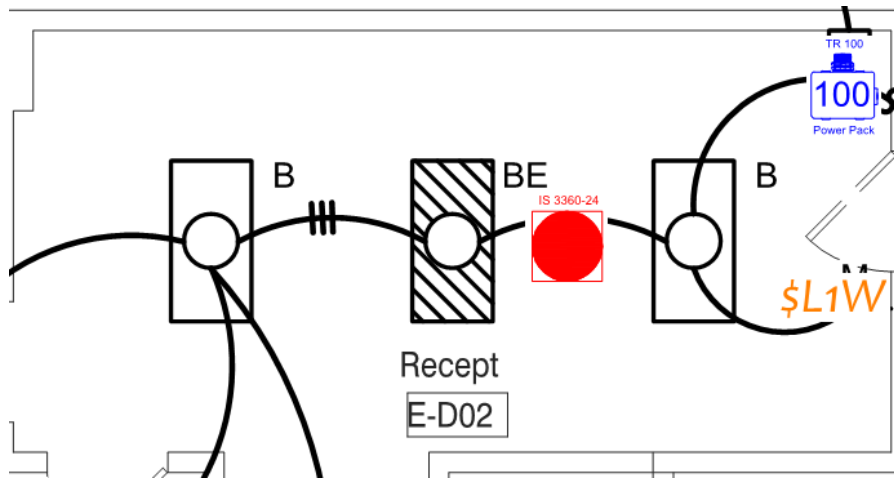
Product	Qty.	Description
DT WLS/VS DIM	1	Dual-tech occupancy/vacancy sensor with 0-10V dimming

## IECC 2015 Code Compliance:

- Use of occupancy sensor provides automatic all OFF (C405.2.1.1.1).
- All sensors to be set to automatic full ON to meet the code (C405.2.1.1.2).
- Momentary switch is used to provide manual control of the lighting except lights in daylighting zone (C405.2.1.1.3).
- In case the total wattage of general lighting in the daylighting zone is more than 150 watts, daylight-responsive control is required. This is achieved by using a DIM-24 sensor in the daylighting zone set to constant lighting to dim lights continuously from full light output to 15 percent of full light output or lower (C405.2.3).



# Open Office / Reception / Lobby



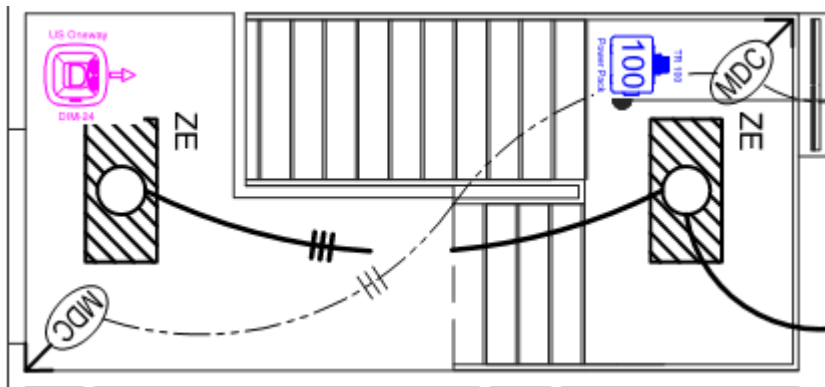
Product	Qty.	Description
IS 3360-24	1	PIR occupancy sensor set to Constant Lighting (daylighting zone)
TR 100	1	Power pack
LV-1-W	1	1 button momentary switch

## IECC 2015 Code Compliance:

- Use of occupancy sensor provides automatic all OFF (C405.2.1.1.1).
- All sensors to be automatic ON to meet the code (C405.2.1.1.2).
- Momentary switch is used to provide manual control of the lighting except lights in daylighting zone (C405.2.1.1.3).



# Staircase



**STEINEL**  
Control Pro  
Series  
IECC 2018 Compliant  
Out of the Box



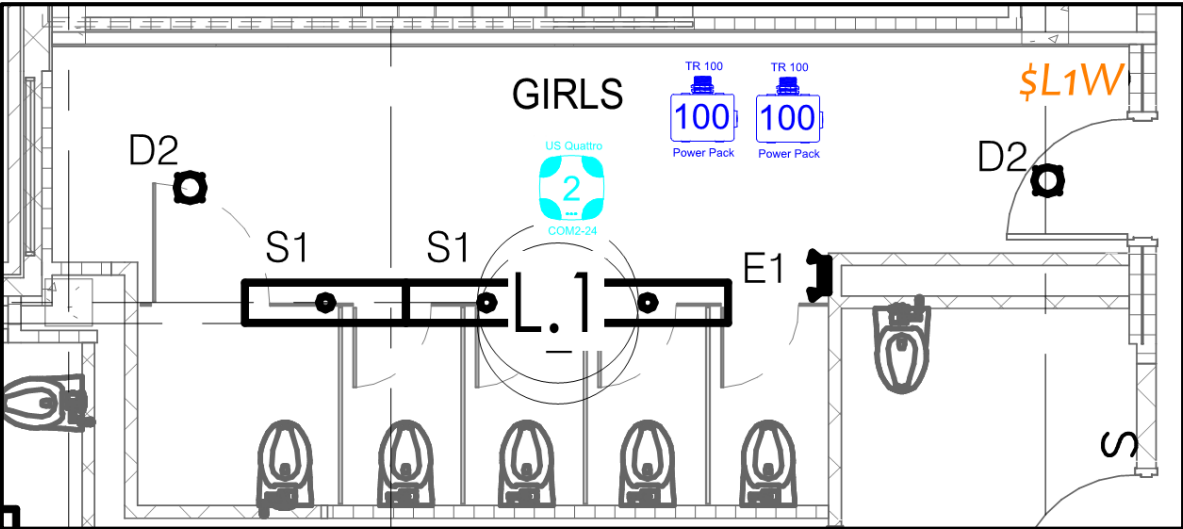
Product	Qty.	Description
US Oneway DIM-24	1	Ultrasonic occupancy sensor with 0 -10V dimming
TR 100	1	Power pack

## IECC 2015 Code Compliance:

- Use of occupancy sensor provides automatic all OFF (C405.2.1.1.1).
- All sensors to be automatic ON to meet the code (C405.2.1.1.2).
- Momentary switch is used to provide manual control of the lighting except lights in daylighting zone (C405.2.1.1.3).



# Restroom



Product	Qty.	Description
US Quattro COM2-24*	1	Ultrasonic occupancy sensor with a isolated relay
TR 100	2	Power pack
LV-1-W	1	1 button momentary switch



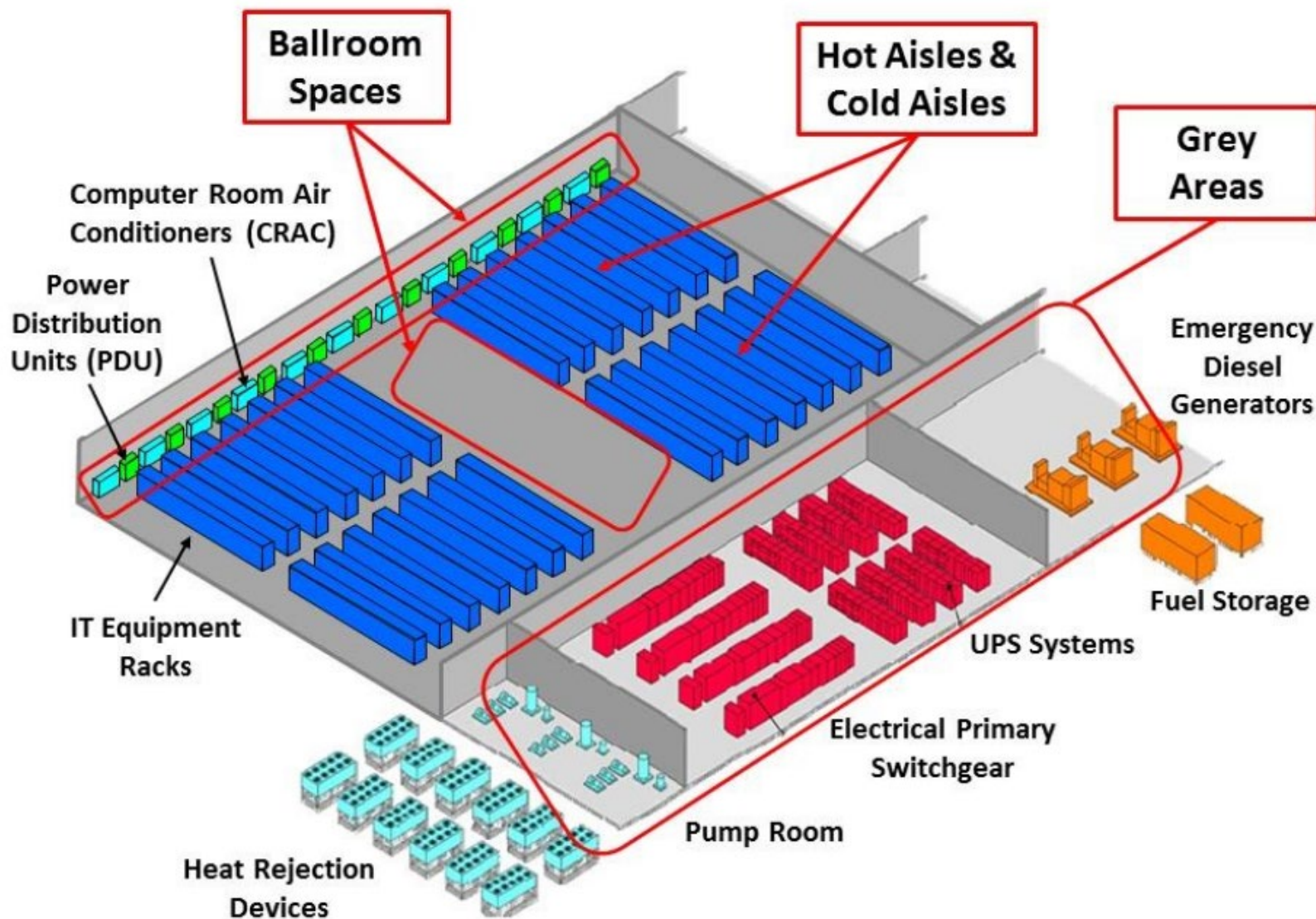


# Data Center Lighting Controls

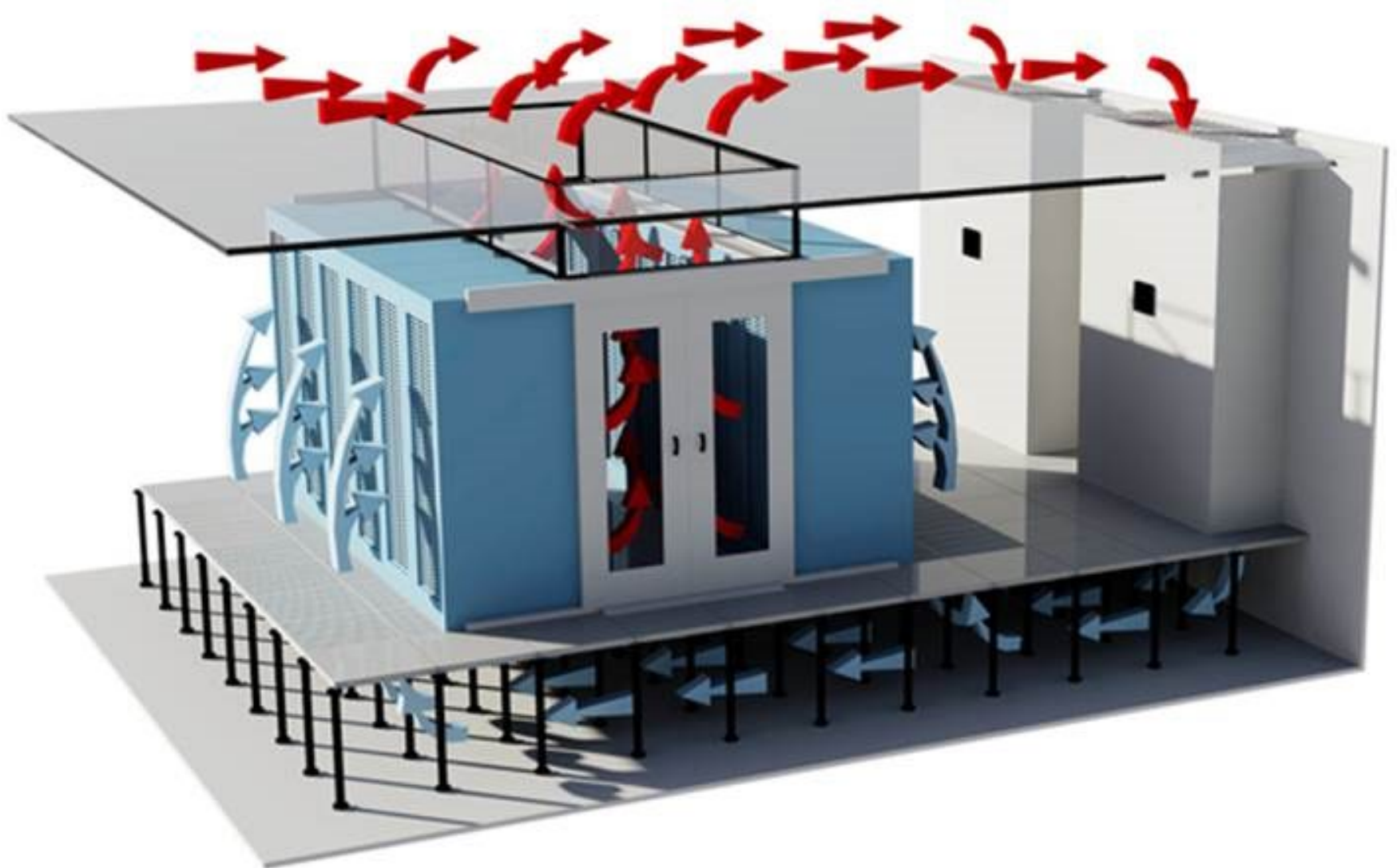




# Areas of Special Consideration

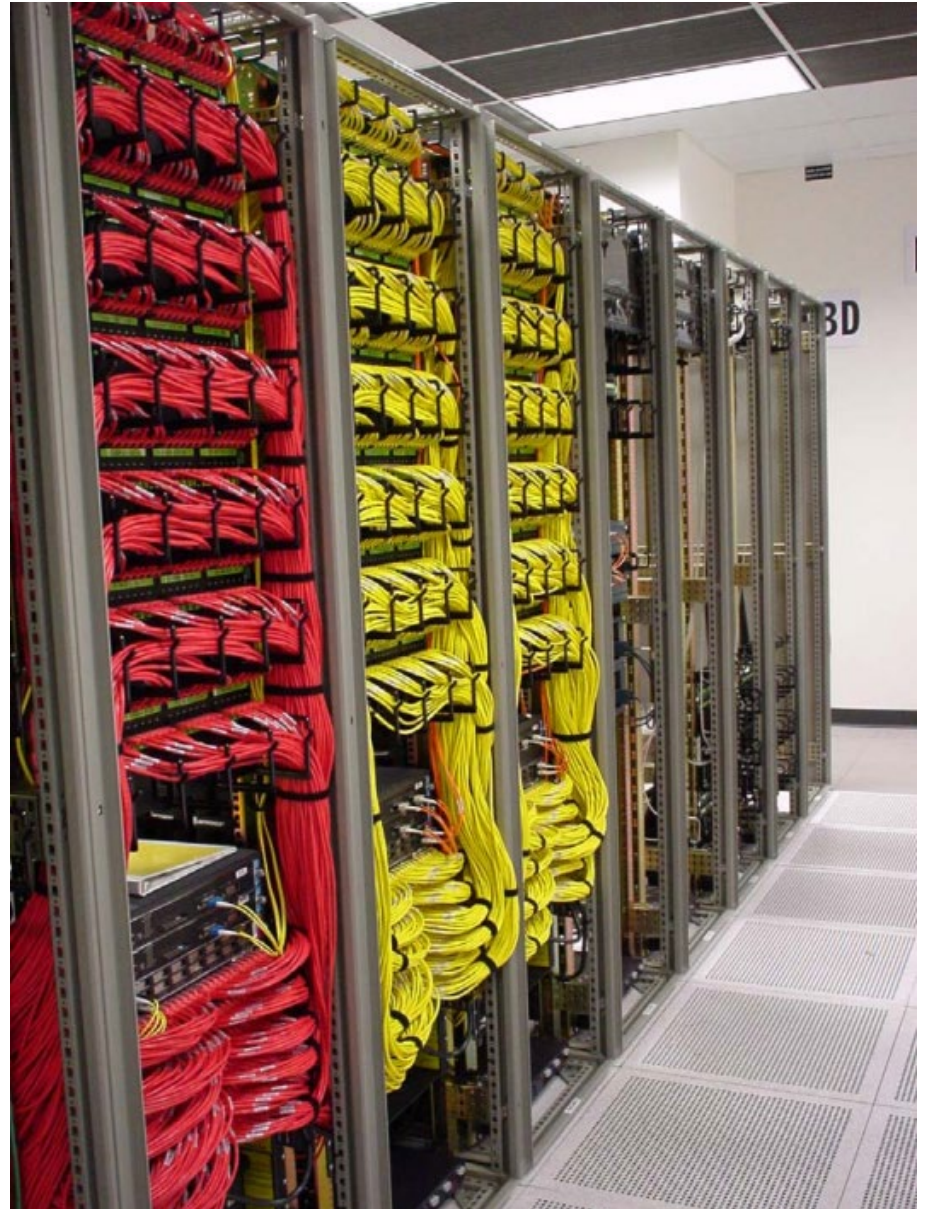
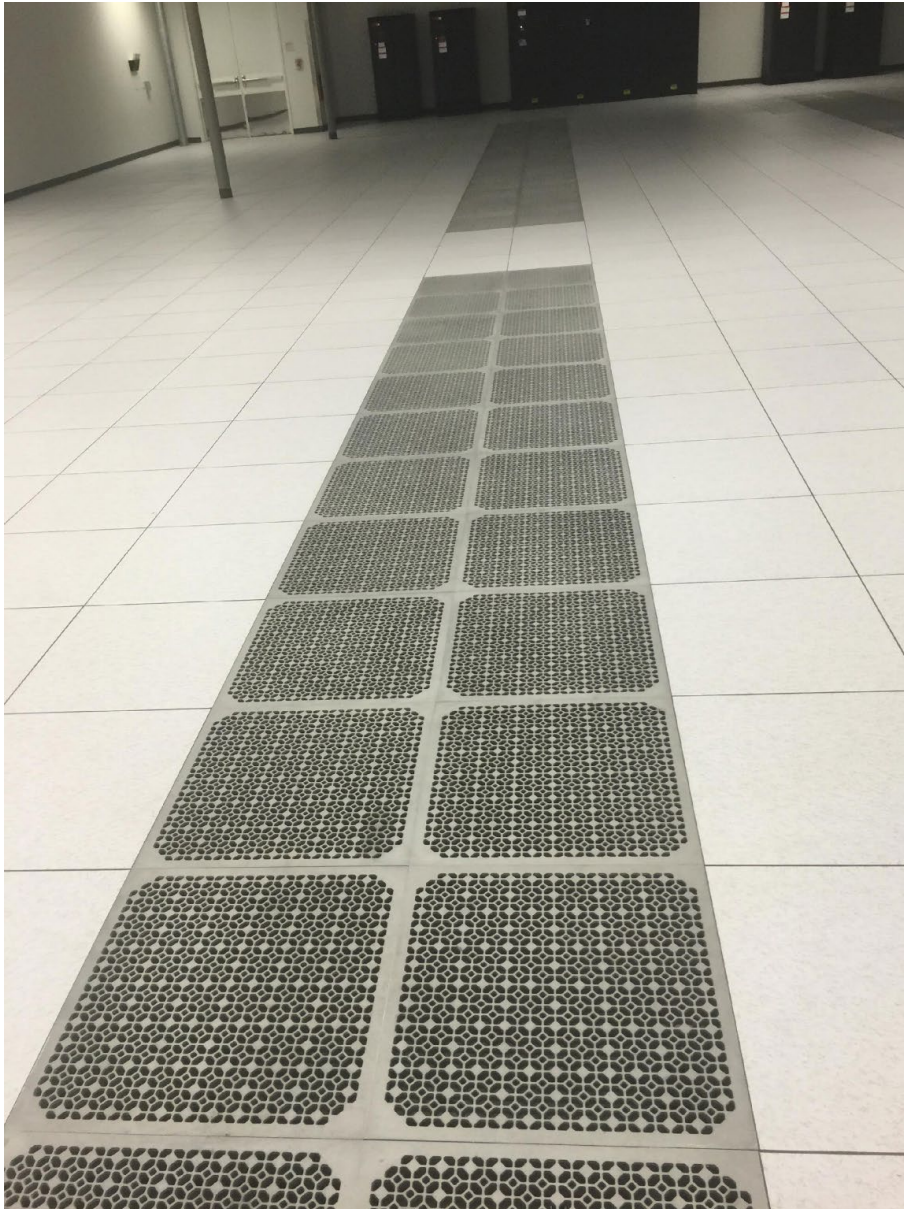


# Data Center Air Flow – Hot Aisle / Cold Aisle



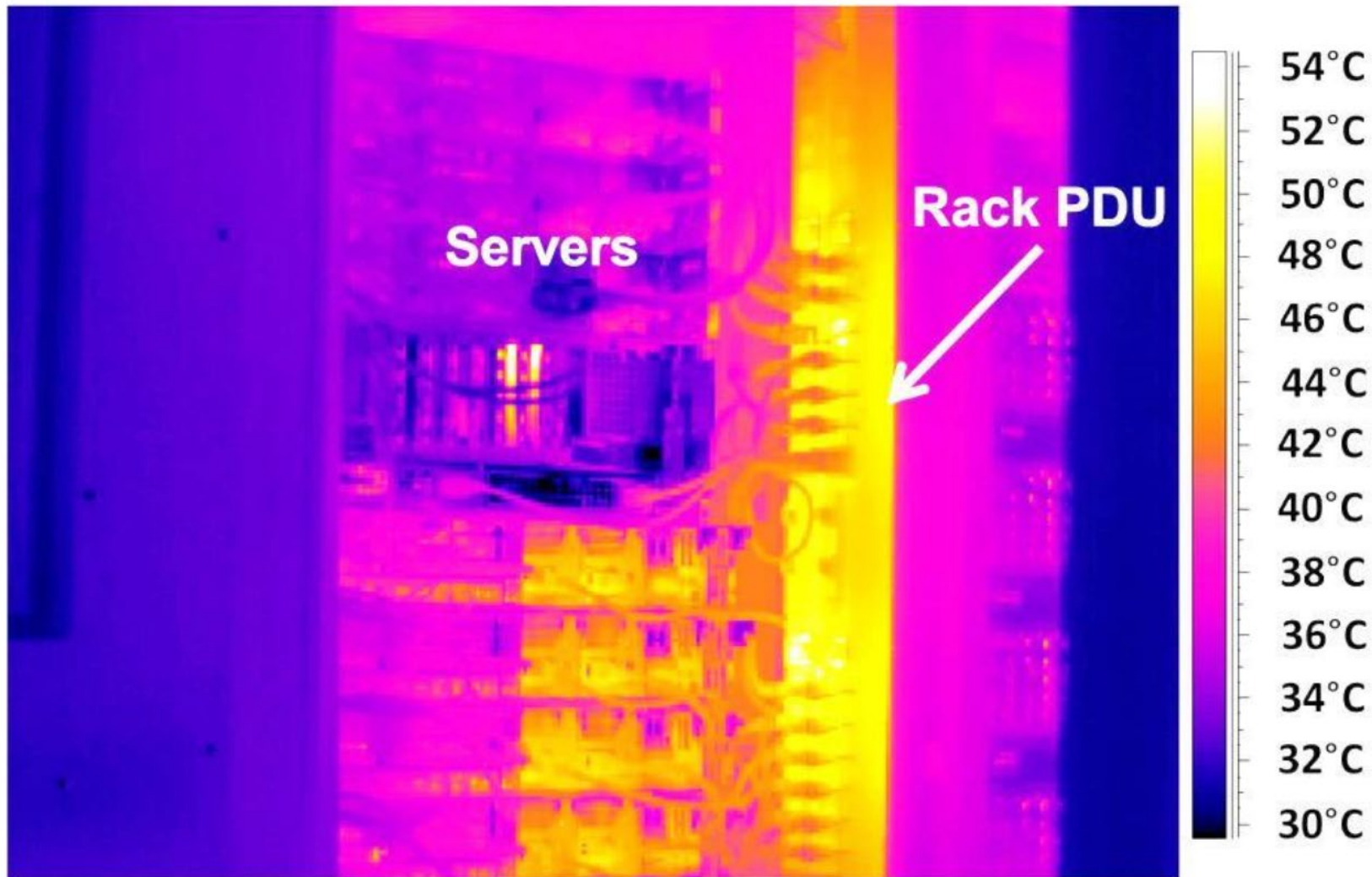


# Data Center Air Flow – Hot Aisle / Cold Aisle

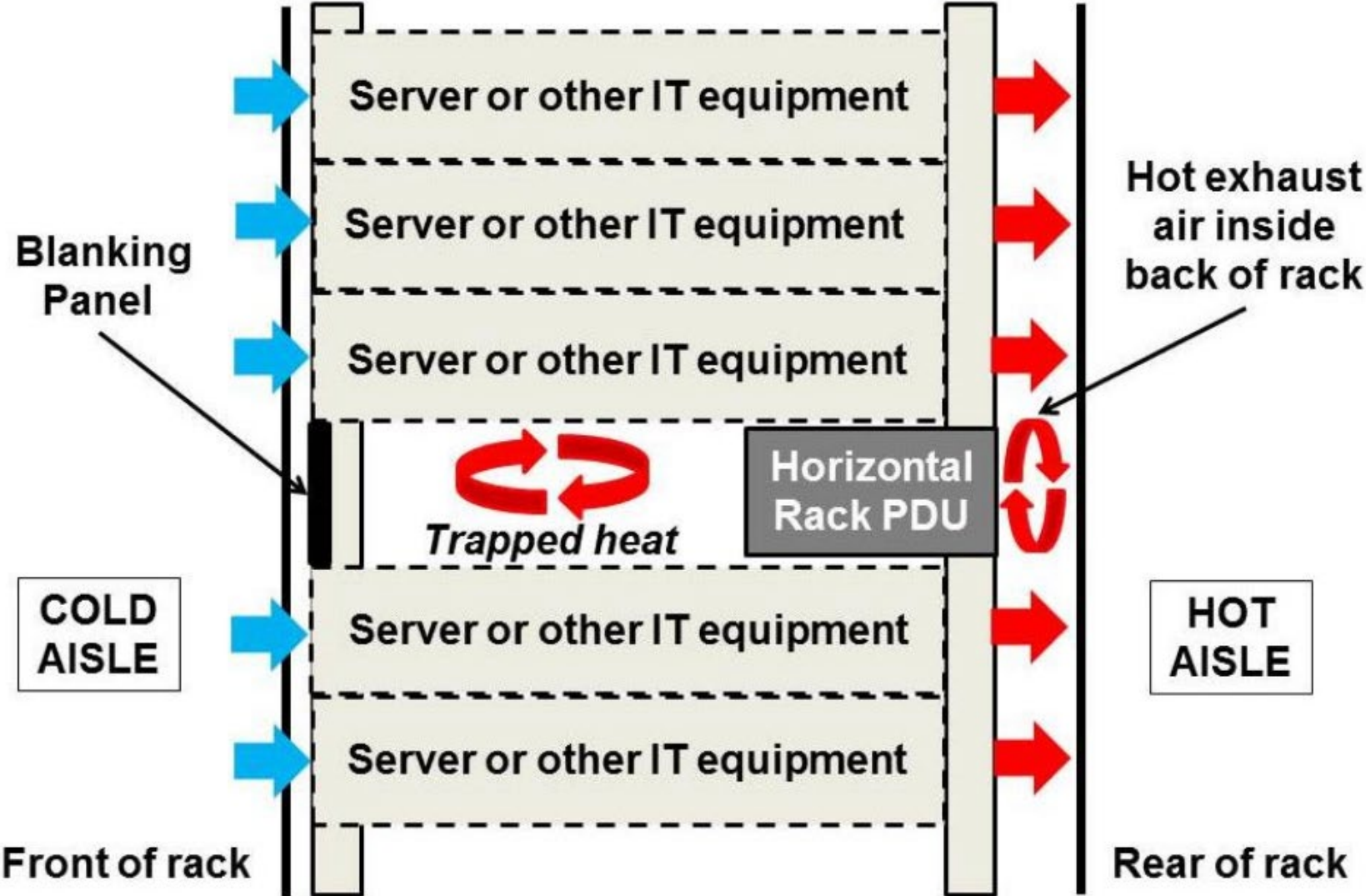




# Infrared photo of a Rack PDU (Power Distribution Unit) Typical rated for at least 60°C - Passive Cooling

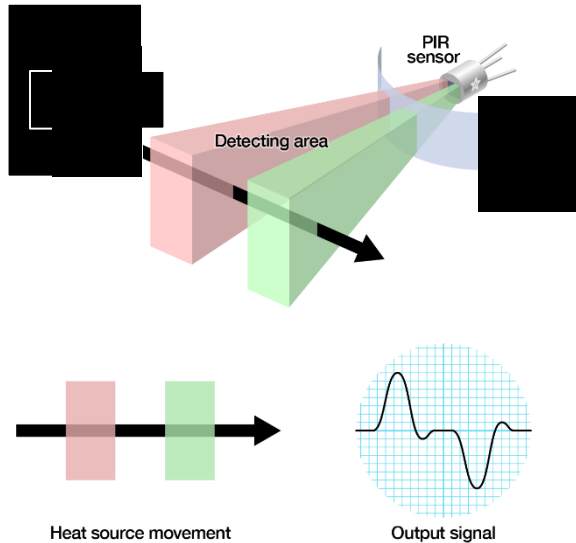


# Side View of Horizontal Rack PDU



# PIR (Passive Infrared) Technology

## Heat Signature in Detection Zones



## Technology Overview

- Two elements on a passive Pyroelectric sensor detect a heat signature focused through a lens, like a magnifying glass, and generates an output signal
- The heat signature is validated between the two elements as equally different from ambient temperature by comparing the output signals
- The same heat signature moving from one element to the other implies motion and therefore occupancy

## Characteristics

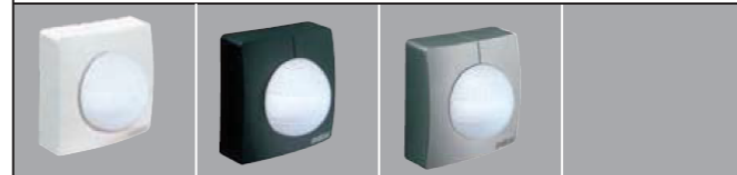
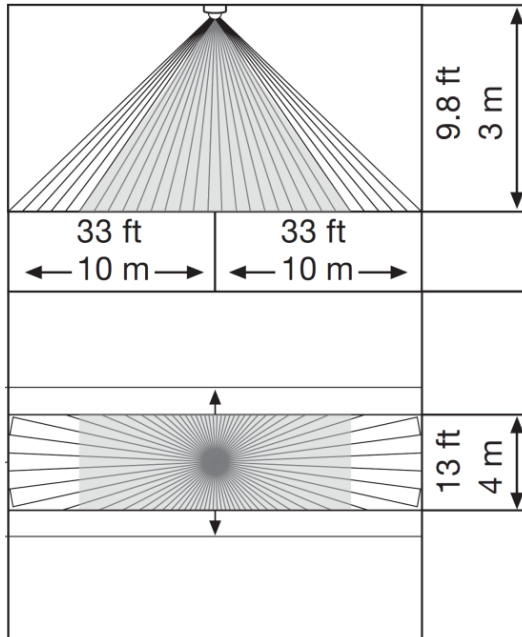
- Direct line of sight detection only
- Potential to crop and limit coverage pattern and isolate detection zone
- Requires presence of heat signature in motion

## Applications

- High Bay applications where motion detection should be isolated to specific areas
- K-12 classrooms with hanging decorations and artwork
- Small offices with limited or no obstructions
- Storage facilities with tin walls that bow and flex with changes in air temperature
- Data Centers where airflow causes air pressure changes
- Common spaces with higher ceilings

# IS 345-24

## Corridor Occupancy Sensor



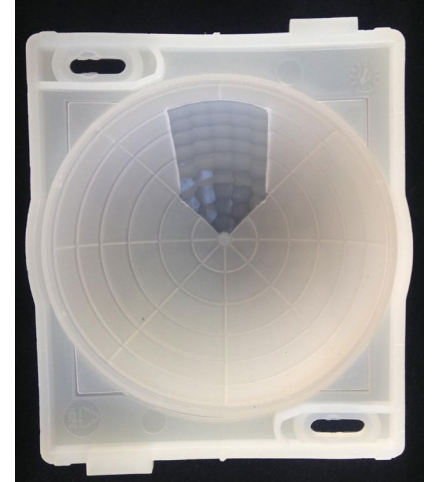
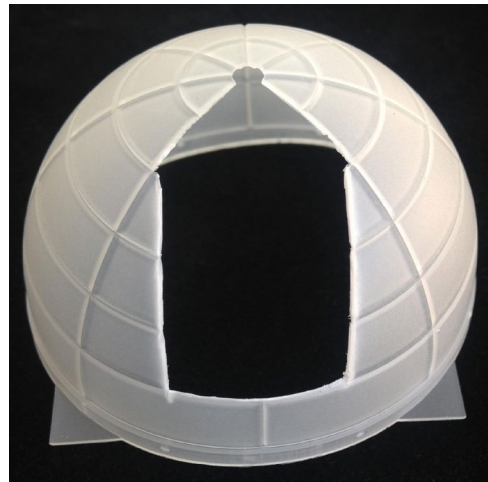
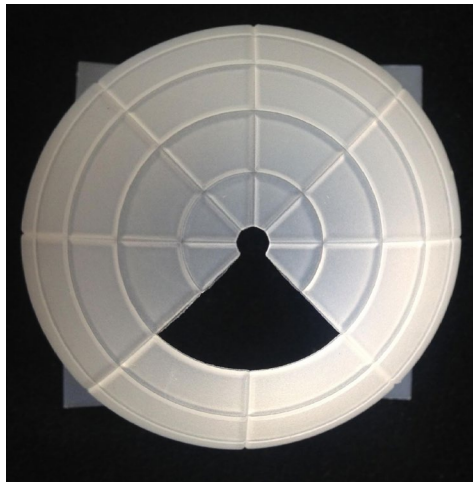
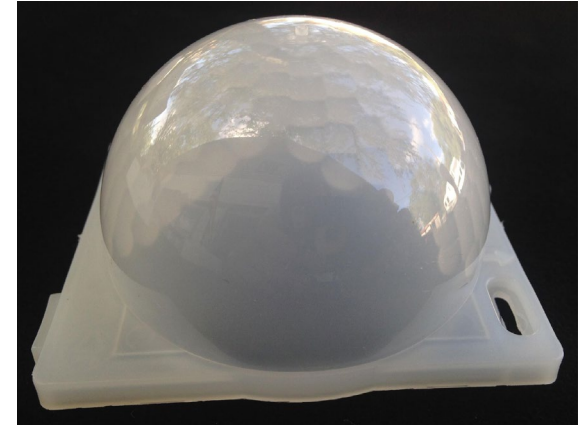
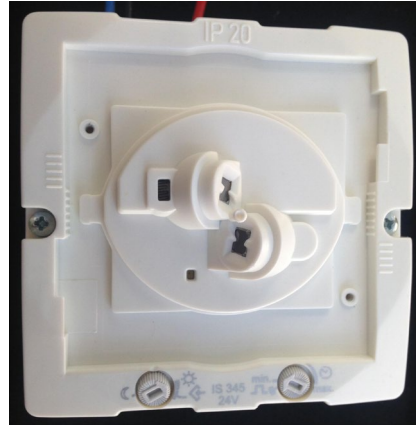
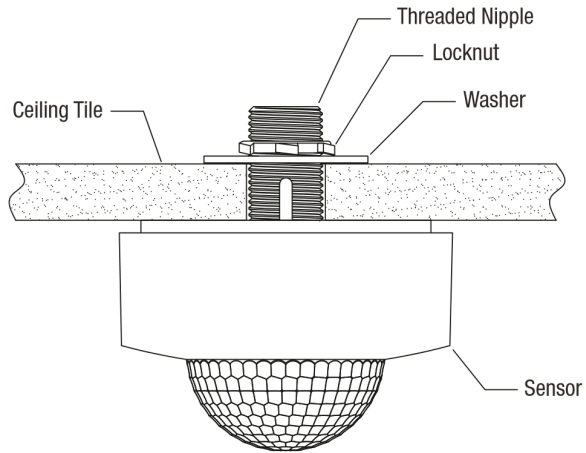
### IS 345-24 Specifications

Item No.	61134 white 61141 black decorative cover 61142 inox decorative cover
Voltage	24 VDC, 12 mA
Mounting	ceiling
Sensing Technology	passive infrared (PIR)
Time Delay Setting	5 seconds to 15 minutes
Light Level Setting	.2-200 footcandles 2-2000 lux
Environment	IP20 rated, -4°F to +122°F, -20°C to +50°C
Coverage	180° horizontal, 45° vertical, up to 40 x 13 ft radial reach, up to 65 x 13 ft tangential reach
Sensors	2 dual element infrared pyroelectric detectors
Lens Design	280 switching zones, 5 detection levels
Dimensions (LxWxD)	3.74 x 3.74 x 2.56 in 95 x 95 x 65 mm
Warranty	5 years
Certifications	C-UL-US Listed, RoHS Compliant, CA Compliant



# IS 345-24

## Corridor Occupancy Sensor





# TR 100, TR 100-A, TR 100-M

## Power Pack

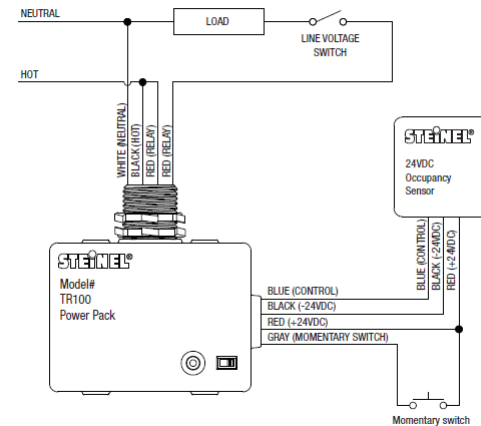


Item No.	63101
Voltage	120/230/277 VAC, 50/60 Hz
Output	24 VDC +/- 5% 250 mA (class 2)
Load	20 A @ 120/230/277 VAC 50/60 Hz - ballast and incandescent load 1 hp @ 120-240 VAC, 50/60 Hz 15 A @120 VAC, 50/60 Hz - receptacle load
Environment	IP20 rated, -4°F to +130°F, -20°C to +55°C
Dimensions (LxWxD)	2.4 x 3.2 x 1.5 in 60 x 81 x 39 mm
Threaded Nipple Dimensions	.83 x .83 in 21 x 21 mm
Warranty	5 years
Certifications	C-UL-US Listed RoHS Compliant, UL 2043 Plenum Rated

### Key Features:

- Convenient mode switch selects either manual ON or automatic ON operation
- LED status indicator
- Switching is performed at, or close to, the zero-cross of the AC waveform in order to improve relay performance
- 1/2 inch threaded nipple and two lock nuts are used to secure to a standard 1/2" knockout
- Low voltage momentary switch input allows for manual control in automatic or manual mode
- Switching Power Supply provides up to 250mA of 24VDC to low voltage controls
- 15 A receptical load control rated

### Wiring



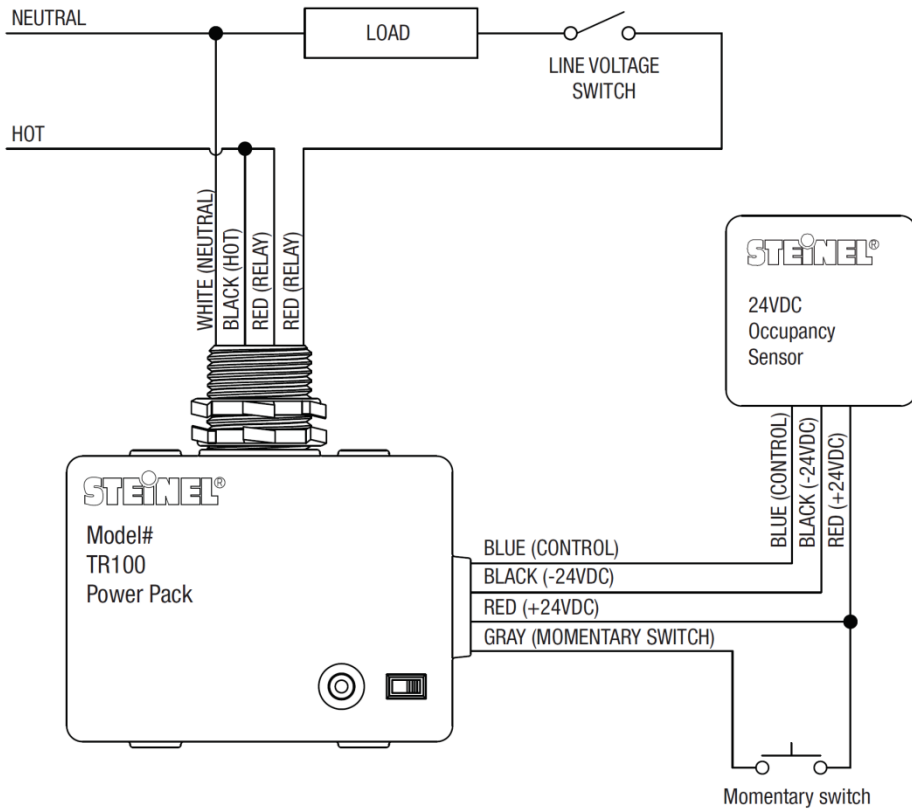


# Power Packs

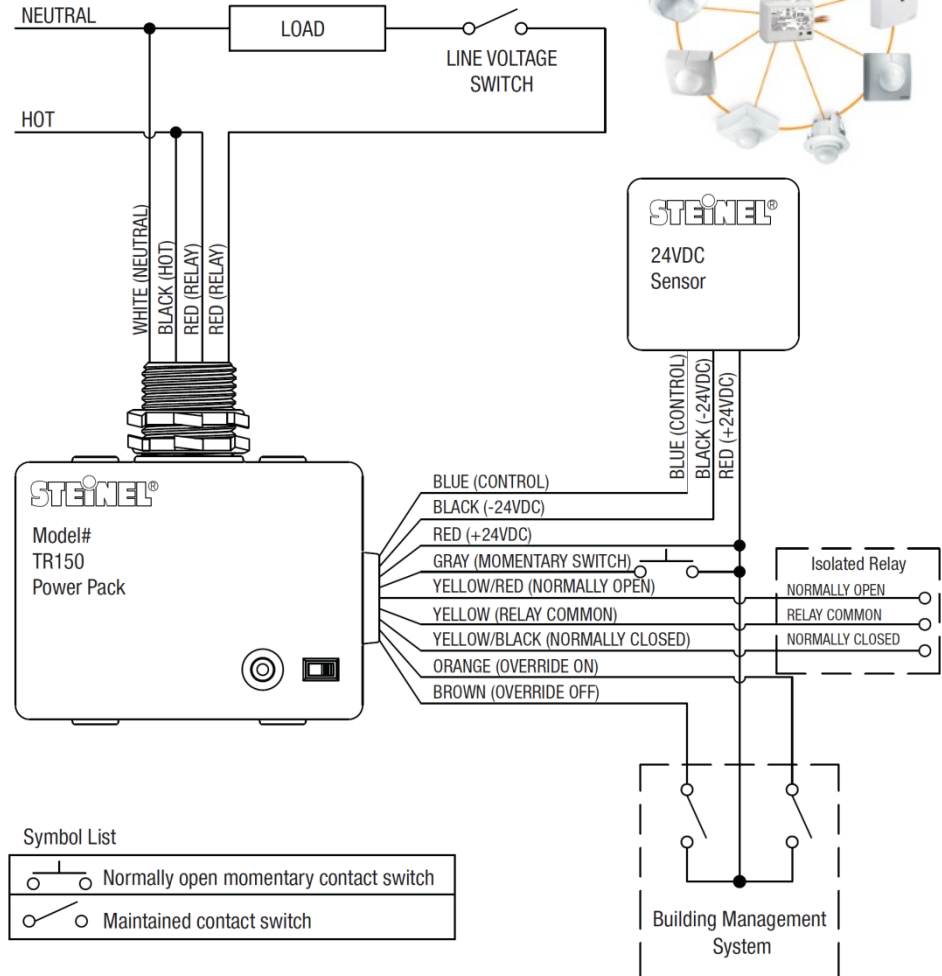
## Lighting & Receptacle Control



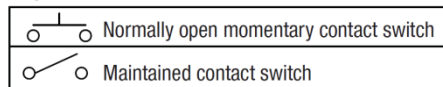
### TR 100



### TR 150



#### Symbol List



# Code Requirement & Compliance

## **IECC 2018 Code Compliance:**

The same type of design is also specified for aisle or warehouse

C405.2.1.2 Occupant sensor control function in warehouses. In warehouses, the lighting in aisle ways and open areas shall be controlled with occupant sensors that automatically reduce lighting power by not less than 50 percent when the areas are unoccupied. The occupant sensors shall control lighting in each aisle way independently and shall not control lighting beyond the aisle way being controlled by the sensor.

## **California Title 24 Code Compliance:**

The same type of design is also specified for library stack aisles. (130.1, (c), 6, B)

In aisle ways and open areas in warehouses, lighting shall be controlled with occupant sensing controls that automatically reduce lighting power by at least 50 percent when the areas are unoccupied. The occupant sensing controls shall independently control lighting in each aisle way, and shall not control lighting beyond the aisle way being controlled by the sensor.

## ANSI/TIA 942 -A: Telecommunications Infrastructure Standard for Data Centers

### 6.4.4.4 Lighting

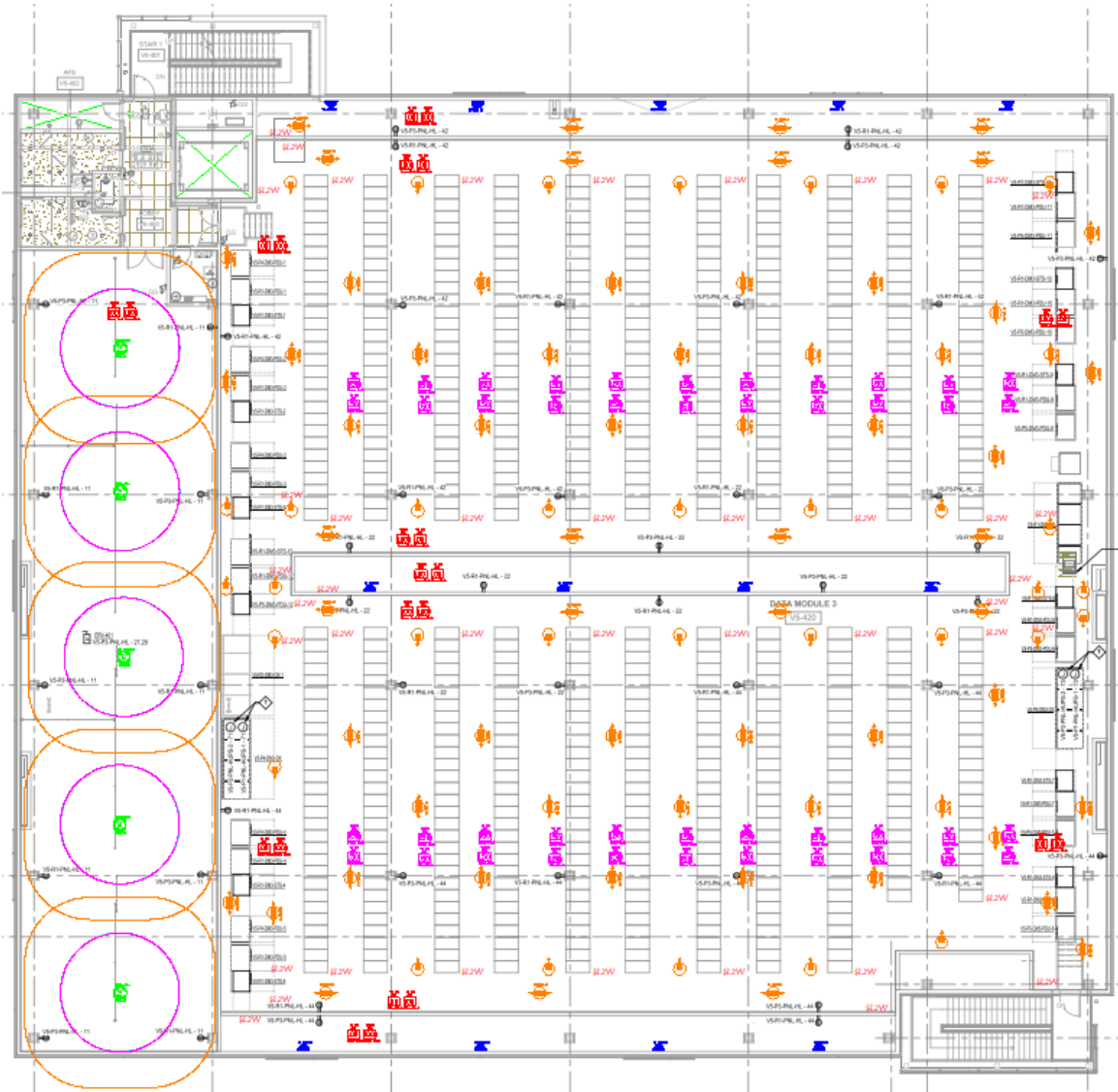
Lighting fixtures should be located above aisles between cabinets rather than directly above cabinets or overhead cable pathway systems. Emergency lighting and signs shall be properly placed per authority having jurisdiction (AHJ) such that an absence of primary lighting will not hamper emergency exit.

It is recommended that a three-level lighting protocol be used in data centers depending on human occupancy:

- **Level 1:** data center unoccupied - lighting should be sufficient to allow effective use of video surveillance equipment.
- **Level 2:** initial entry into the data center - motion sensors should be used to activate lights in the immediate area of entry and be programmed to illuminate aisles and passageways. Sufficient lighting should be provided to allow safe passage through the space and to permit identification via security cameras.

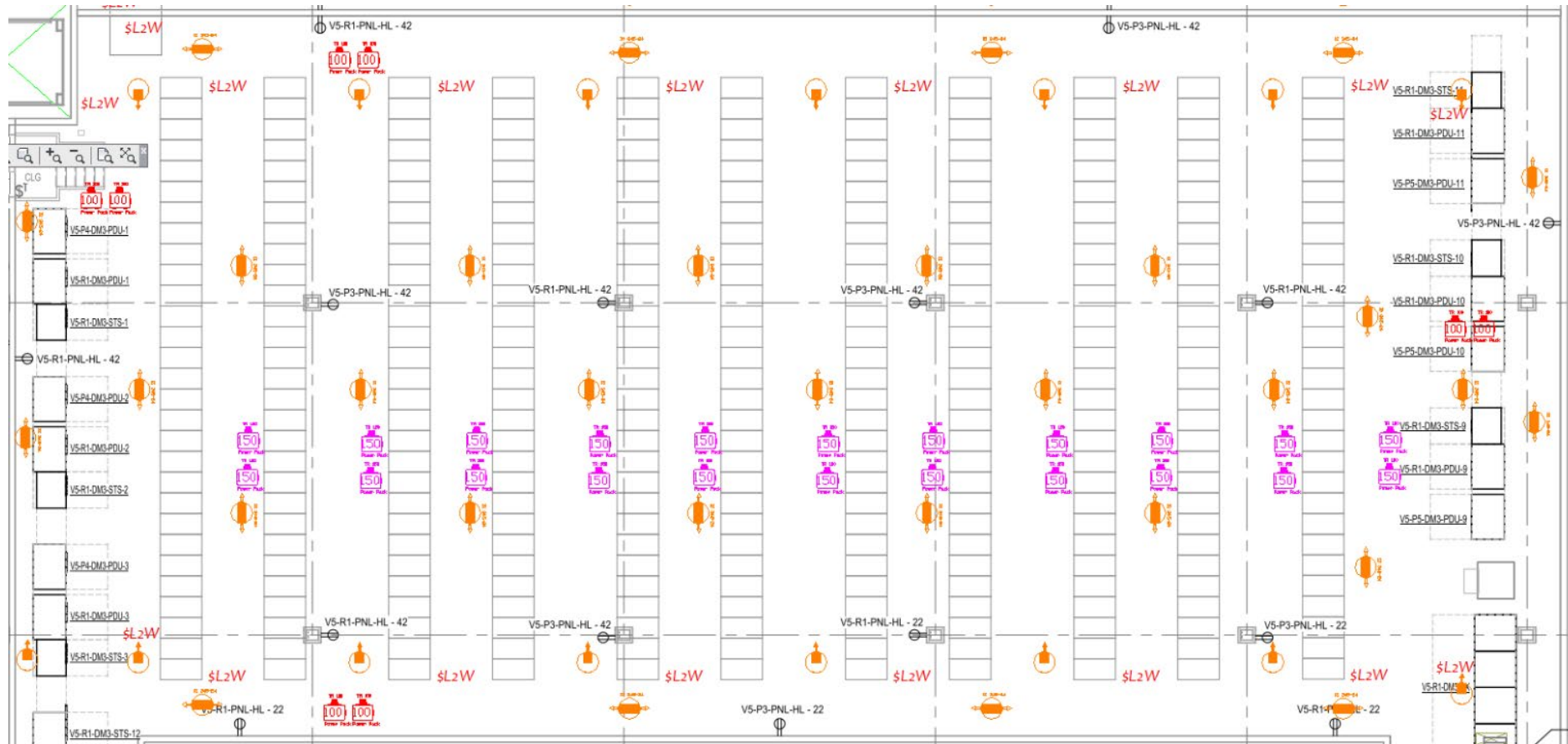
- **Level 3:** occupied space - when the data center is occupied for purposes of maintenance or interaction with equipment, lighting shall be 500 lux in the horizontal plane and 200 lux in the vertical plane, measured 1 m (3 ft) above the finished floor in the middle of all aisles between cabinets. In data centers larger than 230 m<sup>2</sup> (2500 ft<sup>2</sup>) zone lighting is recommended that provides Level 3 in the immediate area of work and Level 2 in all other zones.
- **Optional override:** lighting in all zones at level 3. To allow improved energy efficiency and control, energy efficient lighting (e.g., LED) should be considered as an option to implement the three-level lighting protocol, depending on human occupancy and function in data centers.

# Typical Data Center ....





# Typical Hot & Cold Aisle Server Area Redundant Service



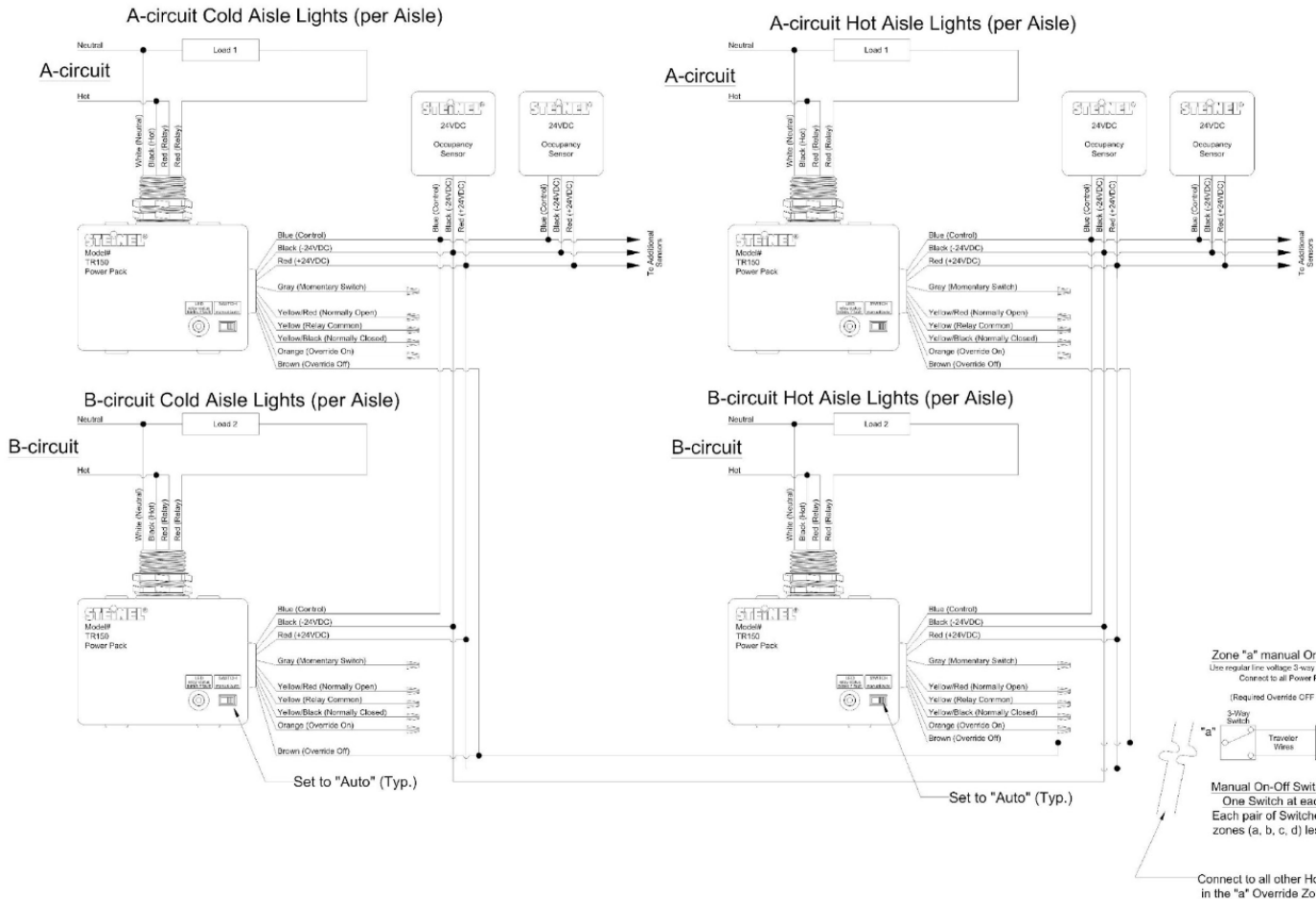
# Typical Hot & Cold Aisle Server Area Redundant Service, Override Switch

## Cold Aisle and Hot Aisle - Wiring Diagram

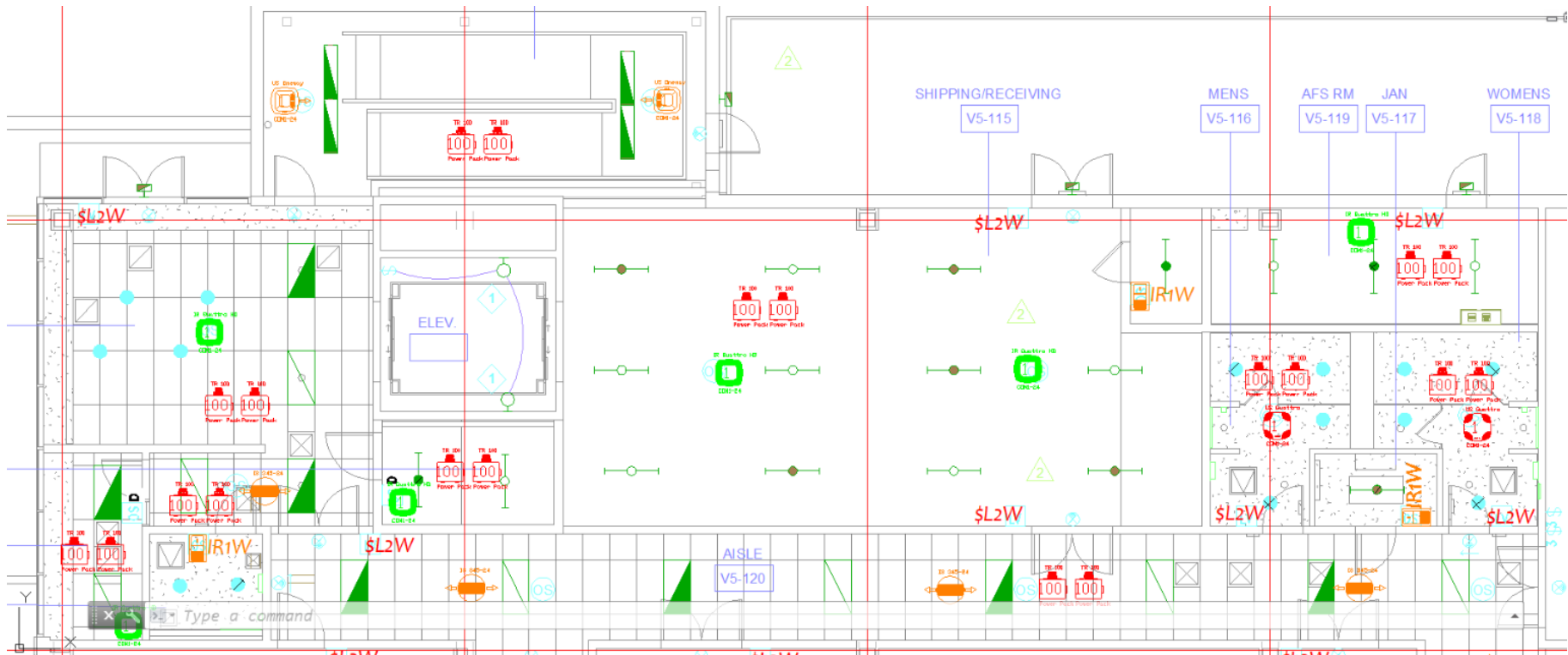
Zone "a" illustrated; Zones b, c, d are similar

Wiring is typical for one pair of Cold/Hot Aisles in one (1) of four (4) zones  
Refer to Control Layout Drawing for # of Aisles per Zone and Zones boundaries  
(There are four (4) Override Zones: a, b, c, and d in the Data Hall on each floor)

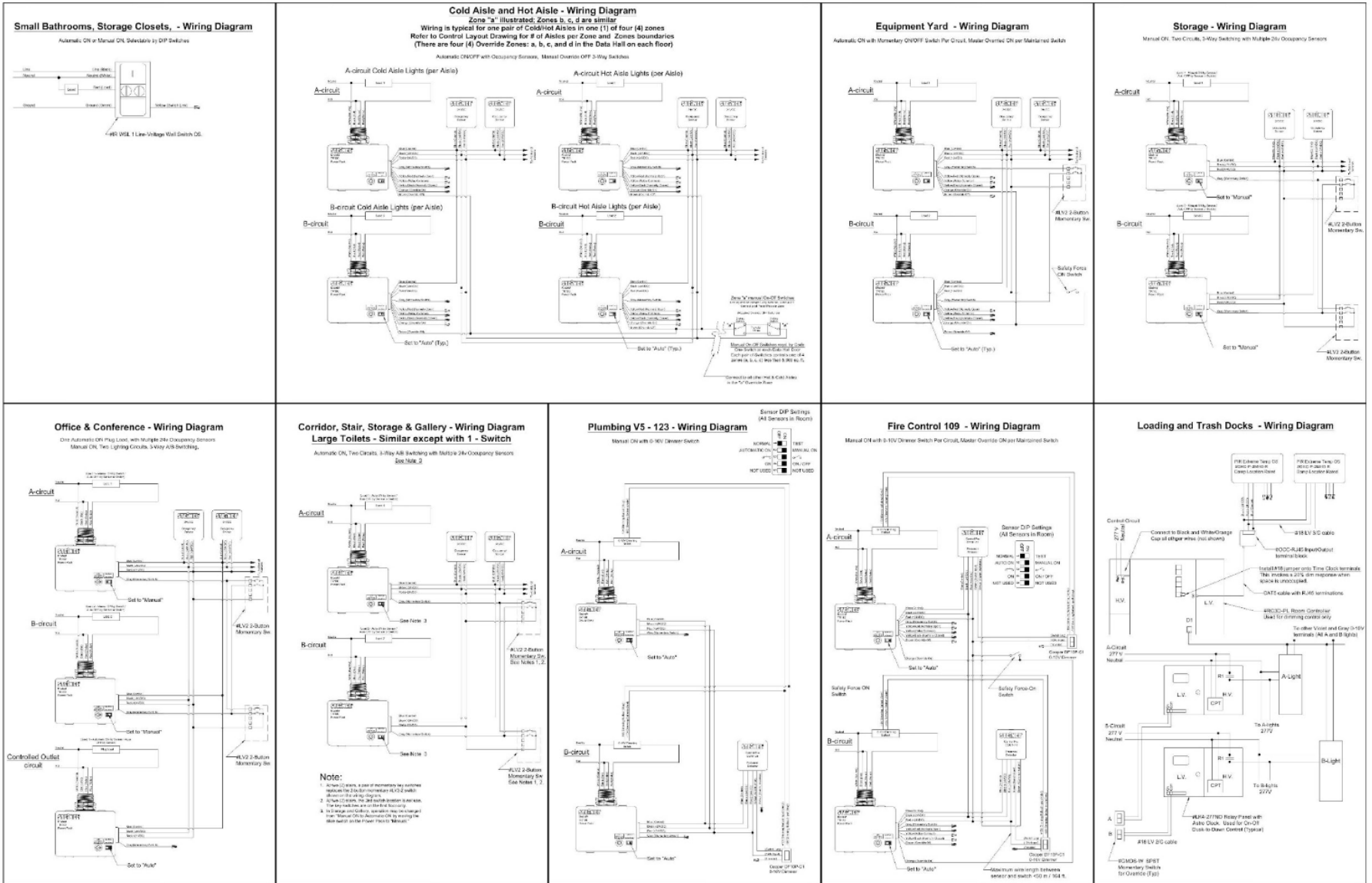
Automatic ON/OFF with Occupancy Sensors, Manual Override OFF 3-Way Switches



# Typical Office, Hallway, Bathroom .... Redundant Service



# Typical Office, Hallway, Bathroom .... Redundant service



# Thank You

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