



BACnet Success Story:

Central Permit Facility Libertyville, Illinois

Welcome to the Virtual Tour of the Building Automation System....

BACnet Success Story: Lake County Central Permit Facility, Libertyville, IL

A green building with virtually all building systems integrated into a common BACnet Internetwork.

The “Networked Controls” plan required vendors to supply their own BACnet interface to their devices. Traditional “Stick-building” was minimal. Systems were networked instead.



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Besides the BACnet Internetwork, other innovative features include a green roof and the storm water retention system.



Networked and “Stick Built” Systems on the Building BACnet Internetwork

Most systems listed below were “Networked” instead of “Stick Built”. The equipment came with a BACnet interface. This simplified the installation for the BAS Contractor. It clarified responsibilities between the trades on the job. Johnson Controls integrated the lab controls together to present the system as one “BACnet device”.

- 11 53 56 - Lab Controls
- 14 24 00 - Elevator
- 21 10 00 - Pre-Action Fire Detection
- 21 10 00 - Water-Based Fire Suppression
- 21 31 13 - Fire Pump
- 22 11 23.13 - Plumbing - DW Booster Pump
- 22 13 29 - Plumbing Sanitary Sewage Pumps
- 22 14 29 - Plumbing Storm Pumps
- 23 21 23 - HVAC Pumps
- 23 34 16 - Return Fans & VSD
- 23 34 23 - Exhaust Fans & VSD
- 23 36 00 - VAV Boxes
- 23 52 13 - Boilers - Electric
- 23 52 16 - Boilers - Condensing

- 23 64 26 - Chiller
- 23 65 00 - Cooling Tower
- 23 73 13 - AHUs
- 23 81 23 - Data Center Cooling units
- 23 82 19 - Fan Coil Units
- 23 84 13 - Humidifier
- 26 09 23 - Lighting Controls
- 26 14 13 - Low Voltage Switchboards
- 26 32 13 - EM Generator
- 28 31 00 - Fire Alarm System
- 28 35 00 - Refrigerant Monitor

Networked and "Stick Built" Systems on the Building BACnet Internetwork



Welcome to the
Lake County Central Permit Facility BAS



Basement

1st Floor Office

1st Floor Lab

2nd Floor Office

Penthouse



- ◆ AHU 1
- ◆ AHU 2
- ◆ AHU 3
- ◆ Boiler Plant
- ◆ Chiller Plant
- ◆ Eaton Fire Pump
- ◆ EST Fire Alarm
- ◆ Fike Panel
- ◆ Gamatronic UPS
- ◆ Lift-Net Elevator
- ◆ Lutron Lighting














Automated Logic provided
the Front End graphics
for all systems.

AUTOMATEDLOGIC
CHICAGO

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(630) 852-1700

Networked and “Stick Built” Systems on the Building BACnet Internetwork

Floor Position 1

Car In Normal Service	Normal	
Car On Independent	Normal	
Car On inspection	Normal	
Dn Direction Pilot	Normal	
Door Close Limit	Normal	
Door Open Limit	Normal	
Door Related Fault	Normal	
Operational Fault	Normal	
Power / comm	Normal	
Safety Ckt Related Fault	Normal	
Up Direction Pilot	Normal	

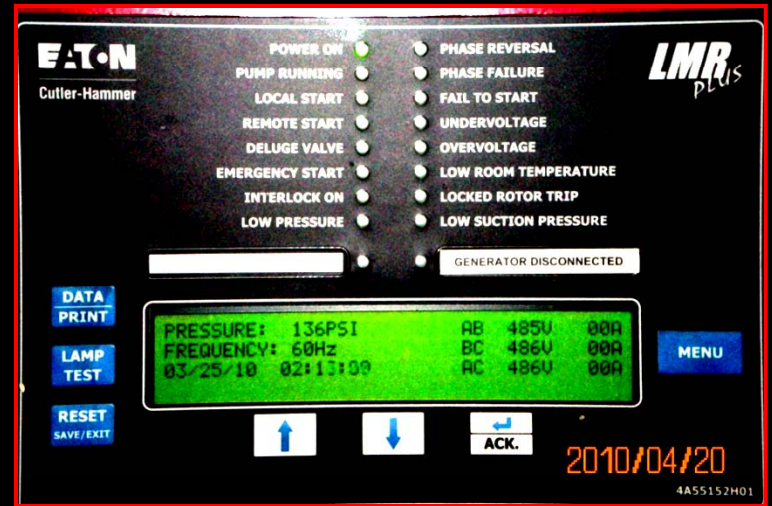
Lift-Net provided a BACnet interface to the ThyssenKrupp elevator.

There are plans to expand this interface. The elevator will be monitored remotely.

Networked and "Stick Built" Systems on the Building BACnet Internetwork

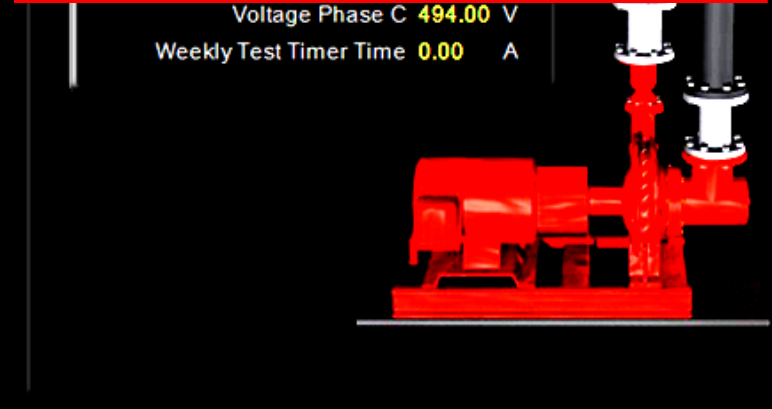
The Eaton fire pump controller is a BACnet device.

- Battery Backup Low **Normal**
- Common Alarm **Normal**
- Custom Input #1 **Normal**
- Custom Input #2 **Normal**
- Custom Input #3 **Normal**
- Custom Input #4 **Normal**
- Custom Input #5 **Normal**
- Custom Input #6 **Normal**
- Custom Input #7 **Normal**
- Custom Input #8 **Normal**
- Custom Input #9 **Normal**
- Option Relay #1 **Normal**
- Option Relay #2 **Normal**
- Option Relay #3 **Normal**
- Option Relay #4 **Normal**
- Option Relay #5 **Normal**
- Option Relay #6 **Normal**
- Option Relay #7 **Normal**
- Option Relay #8 **Normal**
- Over Frequency **Normal**
- Over Voltage **Normal**
- Phase Failure **Normal**



Zoomed in view of BACnet Interface.

- Power On **Normal**
- Pressure Transmitter Failure **Normal**
- Pump Running **Normal**
- Remote Start **Normal**
- Run Period Timer Active **Normal**
- Sequential Start Timer Active **Normal**
- Transfer Switch In Emergency **Normal**
- Transfer Switch in Normal **Normal**



Networked and “Stick Built” Systems on the Building BACnet Internetwork

Johnson Controls was responsible for the York Chiller Plant.

Zoomed in view of BACnet Interface.

Operational Code

Code	Description
3	Stopped - Remote Shutdown

Warning Code

Code	Description
1	No Warnings Present

Safety Code

Code	Description
1	No Safety Faults Present

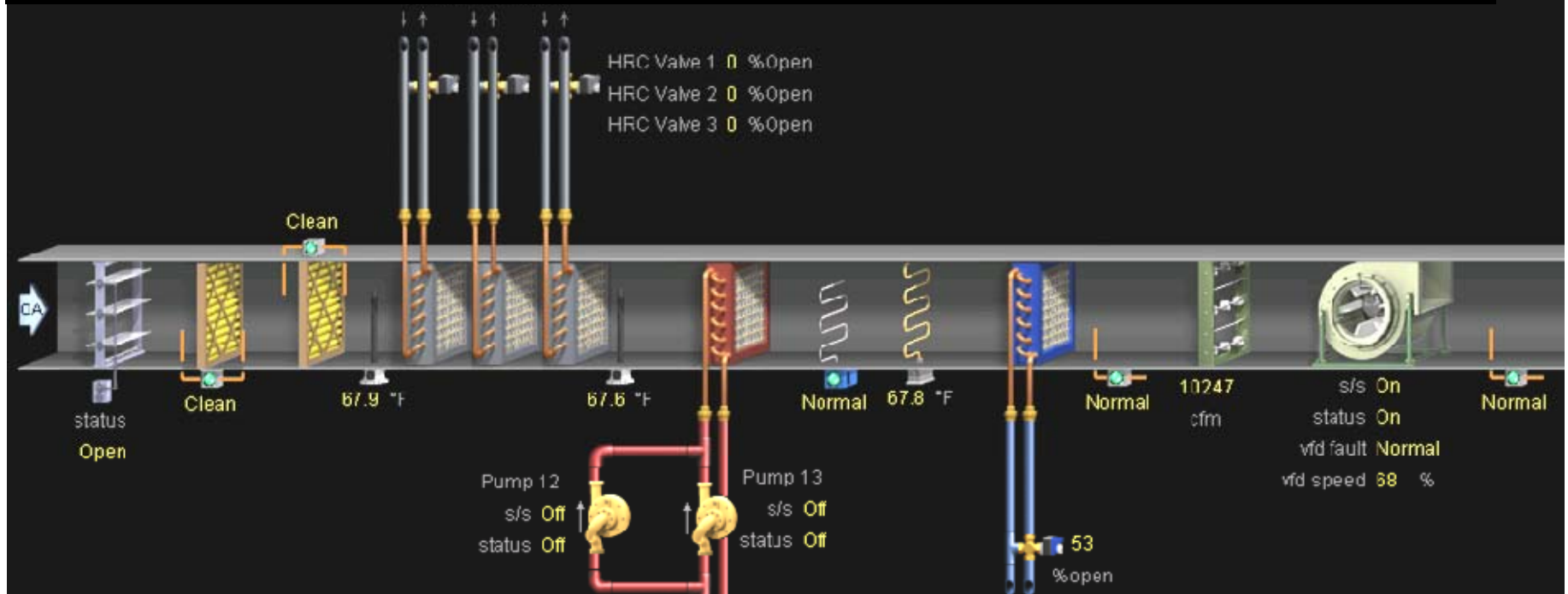
Cycling Code

Code	Description
1	No Cycling Faults Present



Networked and "Stick Built" Systems on the Building BACnet Internetwork

All three Air Handlers are on the BACnet Internetwork as a network of BACnet MS/TP devices that include the Dri-Steem Humidifiers and the ABB Speed Drives.



Networked and “Stick Built” Systems on the Building BACnet Internetwork

The Lutron lighting panel data are shown here. The occupancy sensors are on a floor plan. HVAC uses these sensors for reducing ventilation in unoccupied rooms.

Location	cmd	status	Location	cmd	status	Location	cmd	status	Location	cmd	status	Location	cmd	status
15a - CKT#1	Off	Off	25w - CKT#23	On	On	10f - CKT#56	Off	Off	20ac - CKT#78	On	On	5 - CKT#131	On	On
15b - CKT#2	On	On	25x - CKT#24	On	On	12g - CKT#57	Off	Off	22ad - CKT#79	On	On	7 - CKT#132	On	On
15c - CKT#3	Off	Off	27y - CKT#25	On	On	12h - CKT#58	Off	Off	32ae - CKT#80	Off	Off	9 - CKT#133	On	On

Zoomed in view of BACnet Interface.

Location	cmd	status
10f - CKT#56	Off	Off
12g - CKT#57	Off	Off
12h - CKT#58	Off	Off
12i - CKT#59	Off	Off
12j - CKT#60	Off	Off

2c - CKT#93	Off	Off	8j - CKT#99	Off	Off	10 - CKT#141	On	On
2d - CKT#94	Off	Off	8k - CKT#100	Off	Off	12 - CKT#142	On	On
4e - CKT#95	On	On	8l - CKT#101	Off	Off	2a - CKT#161	Off	Off
4f - CKT#96	Off	Off	8m - CKT#102	Off	Off	2b - CKT#162	Off	Off
6g - CKT#97	Off	Off	10m - CKT#103	On	On	2d - CKT#163	Off	Off
6h - CKT#98	Off	Off	10n - CKT#104	On	On	2e - CKT#164	Off	Off
8i - CKT#99	Off	Off	12o - CKT#105	On	On	4c - CKT#165	Off	Off
8j - CKT#100	Off	Off	12p - CKT#106	On	On	6f - CKT#166	Off	Off
8k - CKT#101	Off	Off	14b - CKT#107	Off	Off	6g - CKT#167	Off	Off
8l - CKT#102	Off	Off	16a - CKT#108	On	On			

Networked and "Stick Built" Systems on the Building BACnet Internetwork

75.6 °F
65.2 %rh

Occupancy sensors located on the floor plan.

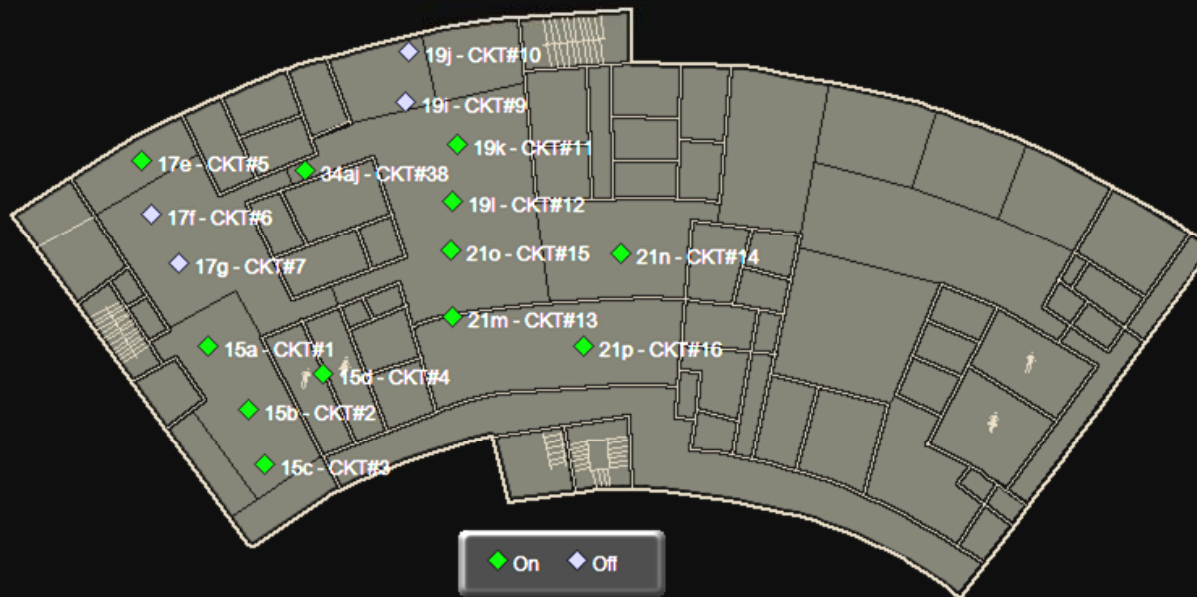
Basement

1st Floor Office

1st Floor Lab

2nd Floor Office

Penthouse



Networked and "Stick Built" Systems on the Building BACnet Internetwork

The Eaton Digitrip 1150 unit is on the BACnet Internetwork.

Accessory Bus Normal	Over Temperature Normal
Alarm Active Normal	Over Voltage Normal
Amperes Out of Balance Normal	Phase Current Loss Normal
Bad/Missing Ratng Plug Normal	Phase Rotation Normal
Bad Frame Normal	Ph Instant Overcurrent Normal
Capture Waveform Normal	Ph Invers Tim Ovr crnt Normal
Check Auxiliary Switch Normal	Power Demand Normal
Communications Normal	RAM Error Normal
Discriminator Normal	Reset Alarm Normal
Earth Fault Normal	Reset Peak Demnd Watts Normal
EEPROM Error Normal	Reset Pk Demnd Currents Normal

Apparent Energy	61000.00	LDT GFT Faults	33.00
Apparent Power	0.00	Maximum Temperature	316.39
Crest Factor Ia	0.00	Percent THD Ia	0.00
Crest Factor Ib	0.00	Percent THD Ib	0.00
Crest Factor Ic	0.00	Percent THD Ic	0.00
Crest Factor Ig	0.00	Percent THD Ig	0.00
Crest Factor In	0.00	Percent THD In	0.00
Demand Ia	0.00	PF Apparent	1.00
Demand Ia Peak	0.00	PF Displacement	0.00
Demand Ib	0.00	Reactive Power	0.00
Demand Ib Peak	0.00	Real Power	0.00
Demand Ic	0.00	Receive Date and Time 1	57612.00
Demand Ic Peak	0.00	Receive Date and Time 2	7954.00
Event Count	111.00	Receive Date and Time 3	24.00
Replaceable Unit	1.00	Reverse Real Energy	0.00
Forward Real Energy	59000.00	Secondary Status Code	7.00
Ia	0.00	Status	Open
Ib	0.00	Status Reason	1.00
Ic	0.00	Status Secondary	Not Used
Ig	0.00	Vab	0.00
In	0.00	Vbc	0.00
INST SDT Faults	24.00	Vca	0.00

Zoomed in view of BACnet Interface.

Tot Harmonic Distortion	Normal	
Trip Blocked	Normal	
Under Frequency	Normal	
Under Voltage	Normal	
Unknown	Normal	
VA Demand	Normal	



Networked and “Stick Built” Systems on the Building BACnet Internetwork

The Gamatronic UPS is on the BACnet Internetwork.

Gamatronic modbus



Alarm Is Vibrating	Off	<input type="radio"/>	Input High	Off	<input type="radio"/>
Battery Disconnect Status	Off	<input type="radio"/>	Last Battery Test	On	<input checked="" type="radio"/>
Communication Error	Off	<input type="radio"/>	Last Self Test Failed	Off	<input type="radio"/>
Communication Lost	On	<input checked="" type="radio"/>	Load Current High	Off	<input type="radio"/>
Current Sharing Fault	Off	<input type="radio"/>	On Bypass	Off	<input type="radio"/>
DC Overvoltage	Off	<input type="radio"/>	Output AC Undervoltage	Off	<input type="radio"/>
DC Undervoltage	Off	<input type="radio"/>	Output Stage Fault	Off	<input type="radio"/>
Emergency Power Off Active	Off	<input type="radio"/>	Over Temperature	Off	<input type="radio"/>
End Of Backup	Off	<input type="radio"/>	Shutdown Imminent	Off	<input type="radio"/>
Equalizing Mode	Off	<input type="radio"/>	Startup Time Stamp	On	<input checked="" type="radio"/>

Communication Error	Off	<input type="radio"/>
Communication Lost	On	<input checked="" type="radio"/>
Current Sharing Fault	Off	<input type="radio"/>
DC Overvoltage	Off	<input type="radio"/>
DC Undervoltage	Off	<input type="radio"/>
Emergency Power Off Active	Off	<input type="radio"/>
End Of Backup	Off	<input type="radio"/>
Equalizing Mode	Off	<input type="radio"/>

Last Self Test Failed	Off	<input type="radio"/>
Load Current High	Off	<input type="radio"/>
On Bypass	Off	<input type="radio"/>
Output AC Undervoltage	Off	<input type="radio"/>
Output Stage Fault	Off	<input type="radio"/>
Over Temperature	Off	<input type="radio"/>
Shutdown Imminent	Off	<input type="radio"/>
Startup Time Stamp	On	<input checked="" type="radio"/>

Warning	Off	<input type="radio"/>
Pending	Off	<input type="radio"/>
Pending	Off	<input type="radio"/>

90 %
10 AMPS
90 KVa
90 Kw

Zoomed in view of BACnet Interface.



Networked and "Stick Built" Systems on the Building BACnet Internetwork

The GE EST Fire Alarm panel data are shown here.

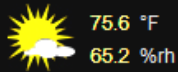
Basement Waterflow Riser	Bsmt- Mech Rm ME02 N CTR CMK	Fir1- File Rm 1167 N SMK Damper	Fir2- Records 2235 S SMK
Bsmt- Boiler Rm - Heats	Bsmt- Mech Rm ME02 N/E SMK	Fir1- File Rm 1167 W SMK Damper	Pnthse- Mech Rm ME23
Bsmt- Boiler Rm - Main Vlvs	Bsmt- Mech Rm ME02 N SMK	Fir1- N/E Exit by Rm 1234 Pull	Pnthse- Mech Rm ME23
Bsmt- Comp/Server Rm 05 East SMK	Bsmt- Mech Rm ME02 RF1 Shutdown	Fir1- Exit by Receiving Pull	Pnthse- Mech Rm ME23

Zoomed in view of BACnet Interface.

Bsmt- Corr by Mech ME002	
Bsmt- Corr by South Stair Pull	
Bsmt- Corr by West Stair Pull	
Bsmt- Elec Rm ME 03 East	
Bsmt- Elec Rm ME 03 West	
Bsmt- Elev Mech Rm Alternate	
Bsmt- Elev Mech Rm Fire Hat	
Bsmt- Elev Mech Rm Primary	

Fir1- S/E Exit by Office 1212 Pull		Security Doors Bypass S	
Fir1- S Double Doors Sec. Override		Smoke Damper Bypass	
Fir1- Secure Store 1230A SMK		1st Fir- Corr By S Stair Pu	
Fir1- Secure Store 1230A SMK		1st Fir- Corr By W Stair P	
Fir1- Sprinkler Rm Bsmt Riser Tmpr		1st Fir- E Main Entrance	
Fir1- Sprinkler Rm Fire Pump Run		1st Fir- Elec Rm ME1171	
Fir1- Sprinkler Rm Fir2 Riser Flow		1st Fir- Elec Lobby SMK	
Fir1- Sprinkler Rm Fir2 Riser Tmpr		1st Fir- IT Closet 1114 S	
Fir1- Sprinkler Rm Fir1 Riser Flow		1st Fir- IT Closed 1169 S	
Fir1- Sprinkler Rm Fir1 Riser Temp		1st Fir- Lab Storage 123	
Fir1- Sprinkler Rm Jockey Pump Valve		1st Fir- Records Rm 113	
Fir1- Sprinkler Rm ME1120 BPS Panel		1st Fir- S/E Exit By Restr	
Fir1- Sprinkler Rm Tamper		1st Fir- Sprinkler Rm ME	
Fir1- Sprinkler Rm Test Header Tmp		1st Fir- Sprinkler Rm Tar	
Fir1- Sprinkler Rm ME1120 Knox Box		1st Fir- Sprinkler Rm Tar	
Fir1- Sprinkler Rm Fire Pump Phase Reverse		1st Fir- Sprinkler Rm Tar	
Fir1- Sprinkler Rm Fire Pump Power Fail		1st Fir- Sprinkler Rm Tar	
Fir2- Water Flow Riser Visual		1st Fir- Stor/Files Rm 11	
Fir2- Corr by Rm 2242 RF2 Return		1st Fir- Stor/Record Rm	
Fir2- Janitor Closet 2226 BPS Panel		1st Fir- W Stairwell Pull	

Networked and "Stick Built" Systems on the Building BACnet Internetwork



Fire Alarm Devices located on the floor plan.

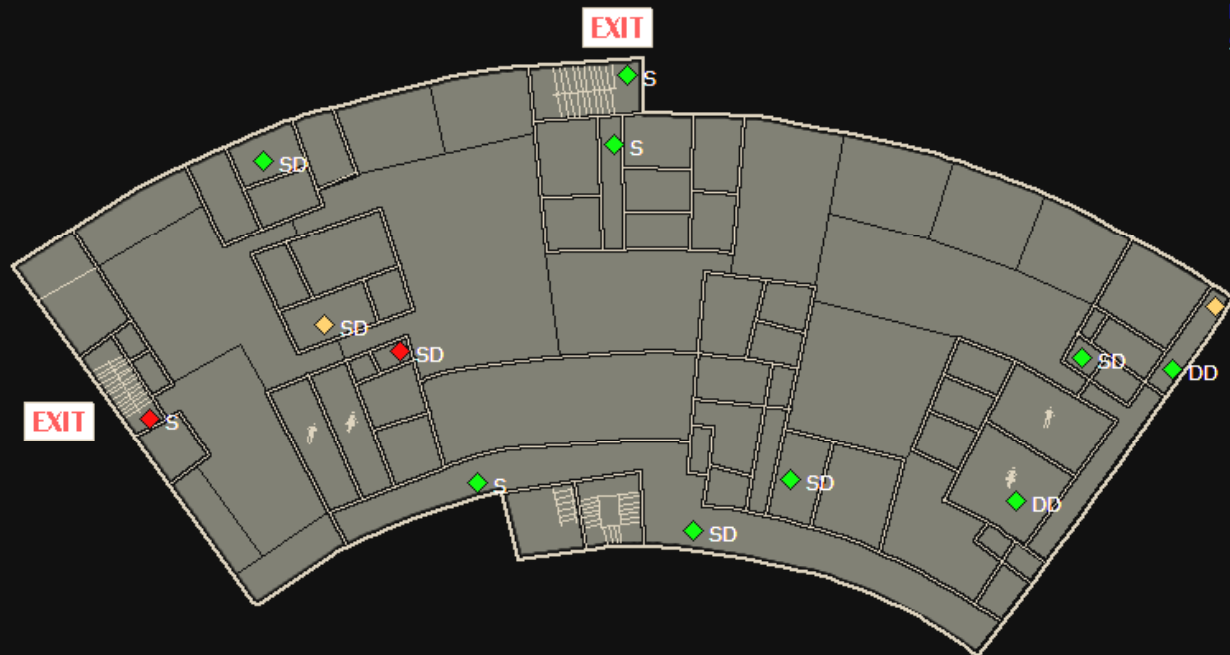
Basement

1st Floor Office

1st Floor Lab

2nd Floor Office

Penthouse



- S Smoke Pull
- DD Duct Detector
- SD Smoke Damper
- ◆ Normal
- ◆ Advisory
- ◆ Alarm