Emergency Responder Radio Systems

Chip Chapman, RCDD

Integrated Building Systems

Learning Objectives

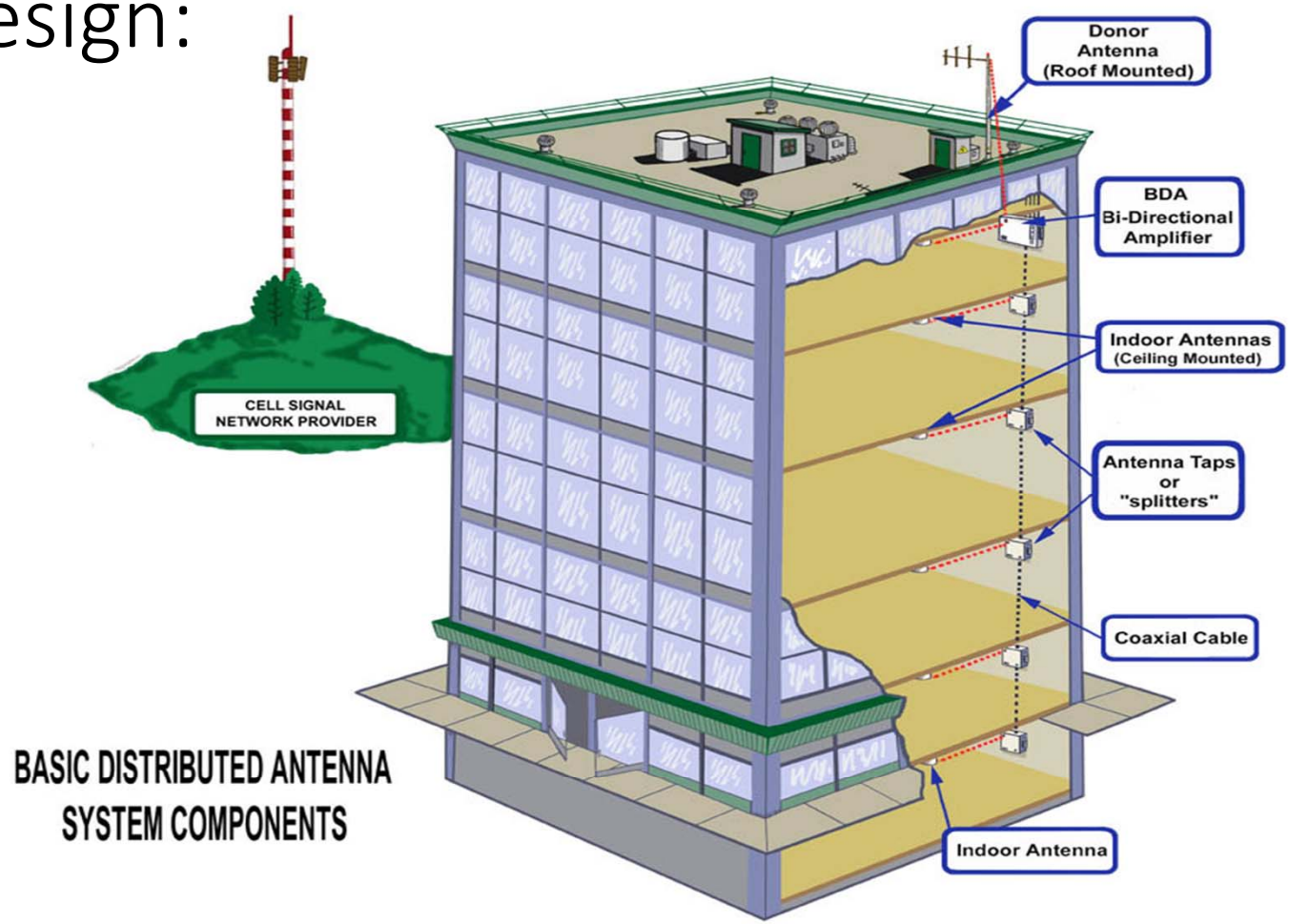
1. Understand the National Fire Protection Association (NFPA), and Ohio Fire Code (OFC) requirements for in-building communications coverage.
2. Identify the major differences between a distributed antenna system (DAS) for public safety versus cellular service.
3. Learn how radio frequency testing is conducted for ERRS, what standards must be met for installation of a corrective system
4. Describe best-practice specifications for a ERRS, including the cabling, RF design, power, and pathway survivability.
5. What opportunities may be available to your company in your area.

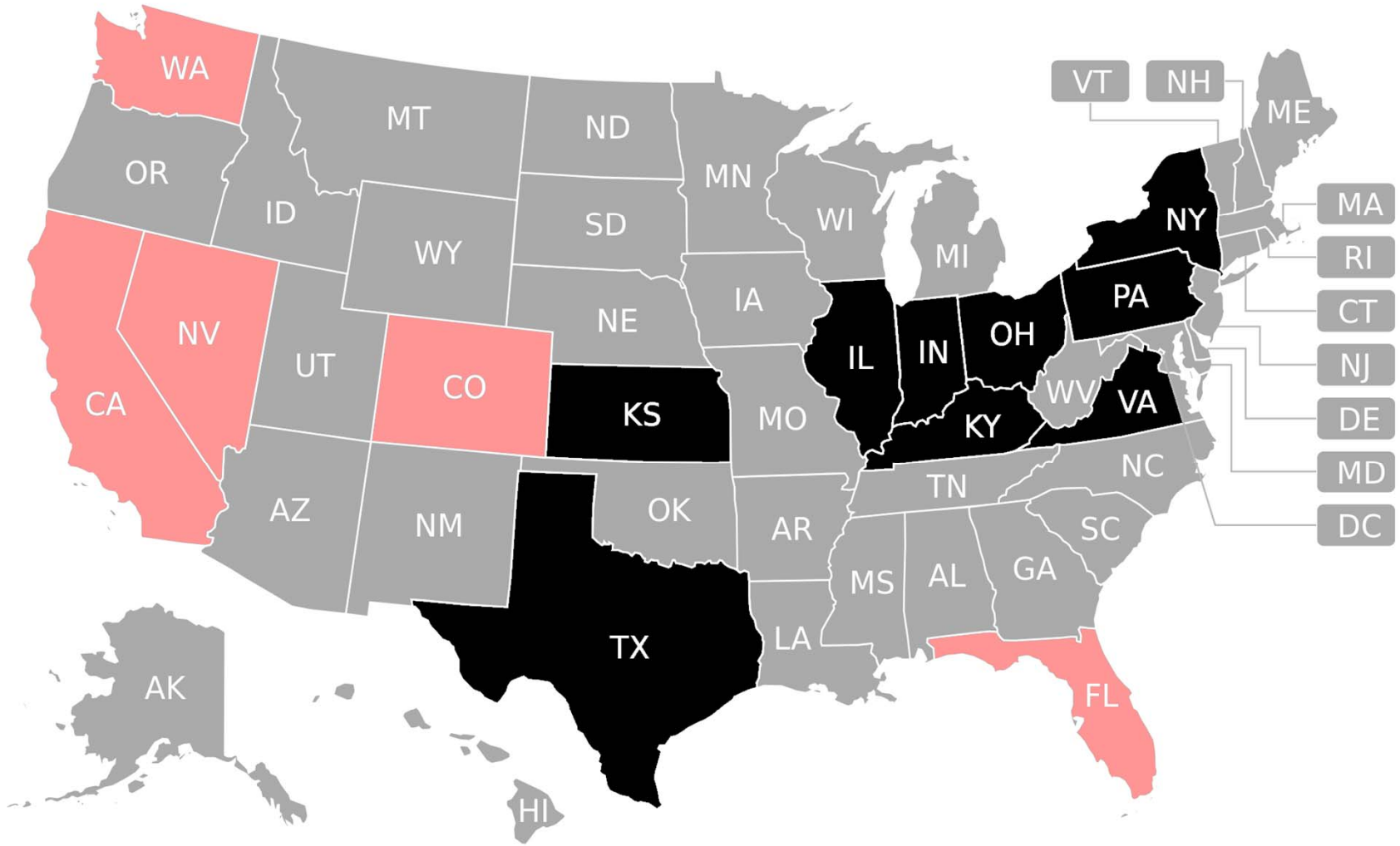

CORAL SPRINGS
PARKLAND
DEPARTMENT


PULSE

Houston Firefighter Mayday

Basic Design:

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Portage
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Allen
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Richland
Ashland
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Auglaize
Hardin
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Morrow
Holmes
Carroll
Tuscarawas
Jefferson
Shelby
Logan
Union
Delaware
Knox
Coshocton
Harrison
Darke
Champaign
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Pickaway
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Fayette
Hocking
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Ross
Athens
Hamilton
Highland
Vinton
Clermont
Pike
Meigs
Jackson
Brown
Adams
Scioto
Gallia
Lawrence

THE CITY OF COLUMBUS
DIVISION OF FIRE

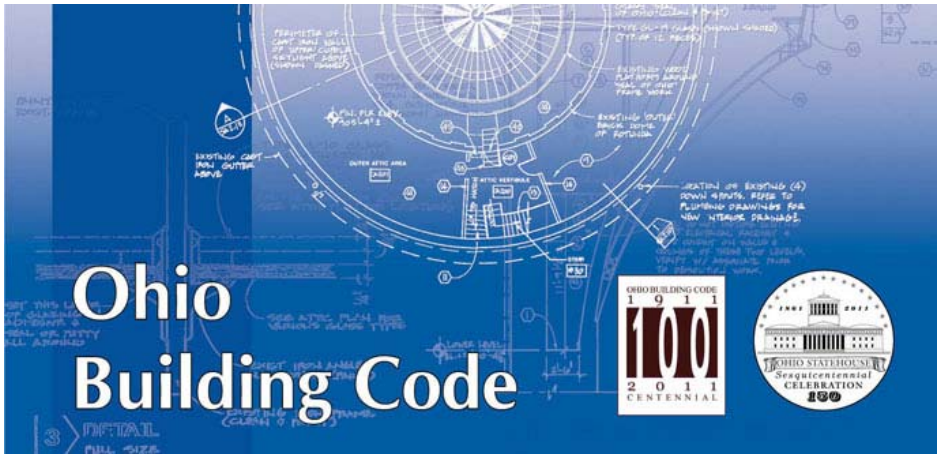
Division of Fire

ERRS Codes and Standards

- Ohio Building Code - 915
- Ohio Fire Code & IFC Code – 510
- NFPA 72
- City of Columbus Communications Guidelines
- Fire Prevention Bureau Guidelines

Ohio Building Code Section 915

915.1 **General.** Emergency responder radio coverage shall be provided in all new buildings in accordance with Section 510 of the *fire code.*



Ohio Fire Code Section 510

- 510.1 - All buildings shall have approved radio coverage for emergency responders within the building
  - This paragraph shall not require improvement of the existing public safety communication systems.
  - Exceptions:
    - 1. Where approved by the building official and the fire code official, a wired communication system shall be permitted to be installed or maintained in lieu of an approved radio coverage system.
    - 2. Where it is determined by the fire code official that the radio coverage system is not needed.

Ohio Fire Code Section 510

- 510.2 The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95% of all areas of each floor of the building meet the signal strength requirements
- 510.2.1 A minimum signal strength of -95 dBm
- 510.2.2 A minimum signal strength of -100 dBm shall be received by the agency's radio system when transmitted from within the building.

NFPA 72 Chapter 24

- **24.5.2.1.2 Approval and Permit.**
  - Plans shall be submitted for approval prior to installation.
  - At the conclusion of successful acceptance testing a renewable permit shall be issued for the public safety radio enhancement system where required by the authority having jurisdiction.

NFPA 72 Chapter 24

- **24.5.2.2.2 General Building Areas.**
  - General building areas shall be provided with 90 percent floor area radio coverage.
- **24.5.2.2.3 Amplification Components.**
  - Buildings and structures that cannot support the required level of radio coverage shall be equipped with a radiating cable system or a distributed antenna system (DAS) with FCC-certified signal boosters, or both, in order to achieve the required adequate radio coverage.

NFPA 72 Chapter 24

- **24.5.2.3 Signal Strength.**
- **24.5.2.3.1 Inbound.**
  - A minimum inbound signal strength of –95 dBm, or other signal strength as required by the authority having jurisdiction, shall be provided throughout the coverage area.
- **24.5.2.3.2 Outbound.**
  - A minimum outbound signal strength of –95 dBm at the donor site, or other signal strength as required by the authority having jurisdiction, shall be provided from the coverage area.

NFPA 72 Chapter 24

- 24.3.13.8.1 Pathway Survivability
  - Level 1, Level 2, or Level 3.
  - 24.3.13.8.1.1 The feeder and riser coaxial cables shall be rated as plenum cables.
- 24.3.13.8.3* Riser coaxial cables shall be rated as riser cables and routed through a 2-hour-rated enclosure.
- 24.3.13.8.4 The connection between the riser and feeder coaxial cables shall be made within the 2-hour-rated enclosure, and passage of the feeder cable in and out of the 2-hour-rated enclosure shall be firestopped to 2-hour ratings.

NFPA 72 Chapter 24

- **24.5.2.5.4 Signal Booster Components.**
  - FCC certification prior to installation.
  - Compatible with both analog and digital communications simultaneously at the time of installation.
- Section 24.4.2.8.5.6 of NFPA 72 also requires the radio system components to be protected by a 2-hour rated enclosure, a 2-hour rated room or equivalent as approved by the code official.
  - **Exception**: A 1-hour rated room in existing buildings equipped throughout with an approved automatic sprinkler system is considered equivalent protection.

THE CITY OF COLUMBUS
DIVISION OF FIRE

Office of the Fire Marshal
3639 Parsons Avenue
Columbus, Ohio 43207
Telephone: 614-221-3132 Ext. 7-5635

EMERGENCY RESPONDER RADIO SYSTEM (ERRS)

Coverage Acknowledgment Form

All buildings shall have approved radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communication systems at the exterior of the building. This requirement is based upon Ohio Building Code OBC (2011) 915 (New Buildings) and Ohio Fire Code (2011) 510 (New and Existing Buildings). The requirements pertain to all new commercial and multi-family buildings and existing buildings based upon the following time frames established by the Columbus Division of Fire (OFC 510.3 (B):

1. New Buildings or Change of Use Group of an existing building
2. Greater than three million dollars in renovations or additions to an existing building
3. Deficiencies in existing building coverage identified through normal delivery of service

Complete the form, print and intial where indicated. Sign the last page and submit the completed form with each set of the building plans to Building and Zoning Services. Mail a copy of this form to: Columbus Fire Prevention Bureau - ERRS, 3639 Parsons Ave., Columbus, Ohio 43207.

Check all that apply:

Job Site Information:

Today's Date

☐ Change of Use ☐ Project Cost Over 3 Million
☐ New Building ☐ High Rise

Certified Address	Zip	Working in Unit/Ste./Flr.	Tax District/Parcel Number

# of Stories Above Grade	# of Stories Below Grade	Gross Sq. Ft. Working Area	Construction Type	Use Group

Use of Building:

Describe Project/Work:

Property Owner of Record:

Property Owner Name	Street Address	City	State	Zip

Telephone Number	Extension	Fax Number	E-Mail Address

Contractor:

Company/Contractor Name	Street Address	City	State	Zip

Telephone Number	Extension	Fax Number	E-Mail Address

Applicant: ☐Contractor ☐Owner ☐Other (please provide contact information below)

Name (Contact Person)	Street Address	City	State	Zip

Telephone Number	Extension	Fax Number	E-Mail Address

By initialing the items below, I certify that I understand that the above listed building must have approved radio coverage for emergency responders prior to receiving a final certificate of occupancy.

_____ Intial A. I have read and understand the Columbus Division of Fire Emergency Responder Radio System Guidelines.

_____ Intial B. I understand that an an initial radio signal strength (Spectrum Analysis) and clarity study is required to be submitted to the Columbus Division of Fire (CFD) once the building is "closed in" 70%-80% completed.

_____ Intial C. I understand if more than one block on a given floor is over the -95db threshold or any critical area has poor coverage ERRS will be required to be installed before a final certificate of occupancy is issued.

_____ Intial D. I understand that if a system needs to be installed I may need zoning approval for the location of the outside antenna.

_____ Intial E. I undrstand that the Columbus Division of Fire must provide plan approval before installing the ERRS.

_____ Intial F. I understand that Fire Alarm and Electrical Permits may also be needed from the Building Department.

2019 BICSI FALL Conference & Exhibition
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EMERGENCY RESPONDER RADIO SYSTEM (ERRS)
Coverage Acknowledgment

Agent for Owner:
☐Tenant ☐Architect/Engineer ☐Attorney ☐Plan Service Firm ☐Other _____

Name (Contact Person)	Street Address	City	State	Zip

Telephone Number	Extension	Fax Number	E-Mail Address

I am the ☐Owner ☐ Agent for the Owner of this ☐4(or more) family dwelling ☐Commercial

Print Full Name _____ Date _____ Signature _____

Publication Updated: April 15, 2017

THE CITY OF COLUMBUS
DIVISION OF FIRE

Fire Prevention Bureau
Emergency Responder Radio System
Permit Application

3639 Parsons Avenue, Columbus, Ohio 43207, Phone: 614-645-7641
ALL FEES ARE NON-REFUNDABLE • Please type or print all information

Official Use Only: Application No.:_____ Payment Amount:_____

JOB SITE INFORMATION:

Certified Address _____ Zip _____ Unit/Space/Floor (*if applicable*) _____ Tax District/Parcel Number _____

Building Use: _____ Tenant Name:_____

TYPE OF WORK:
Change of Use ☐Y ☐N New Building ☐Y ☐N Project Cost > 3 Million ☐Y ☐N

See Emergency Radio System Guidelines for Complete Information

1. Permits are required for any of the following work:
   - Installation of a new ERRS; Any alteration to an existing ERRS; Addition to an existing ERRS; Demolition of a ERRS
2. Initial Permit fees based on one hour of plan review ($125.00) and one hour of inspection time ($125.00). Total $250.00
3. The permit applicant shall be the installing contractor.
4. All installing contractors shall have a City of Columbus (BZS) registered fire protection contractor's license. When the design and plans are produced by a party other than the licensed contractor, the plans shall be stamped by a Professional Engineer.
5. Installation, alteration, or demolition of a system shall not commence prior to the approval of plans and the issuance of a permit.
6. The Columbus Division of Fire approved set of plans shall be kept at the project site until final approval of the permit, after which they shall remain in the possession of the owner.
7. Equipment shall have FCC certification prior to installation.

PROPERTY OWNER OF RECORD:

Name _____ Street Address _____ City, State, Zip _____

Telephone Number/Ext. _____ Fax Number _____ E-Mail Address _____

CONTRACTOR:

Company/Contractor Name _____ Contact Name _____

Street Address _____ City, State, Zip _____

Telephone Number/Ext. _____ Fax Number _____ E-Mail Address _____

NOTES:
- One (1) inspection per Inspection Fee; Additional Inspections: $125.00 Each
- Cancellations: You must notify Fire Prevention Bureau Plan Review staff at 614-645-8673 prior to 8:00 a.m. the day of the inspection or a $125.00 fee will be assessed

PLEASE NOTE: Incomplete information will result in the rejection of this submittal. *rev 1/17*

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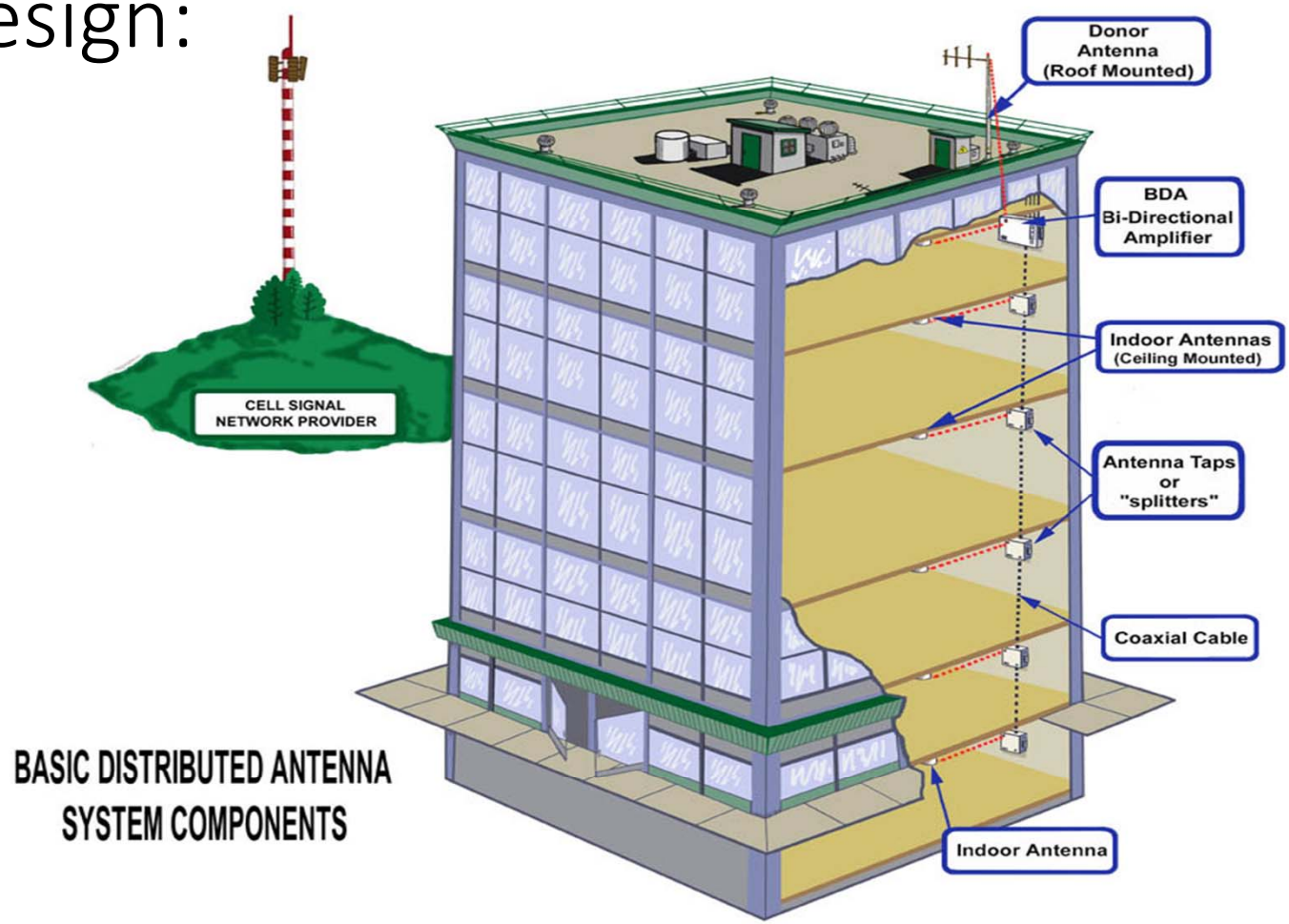
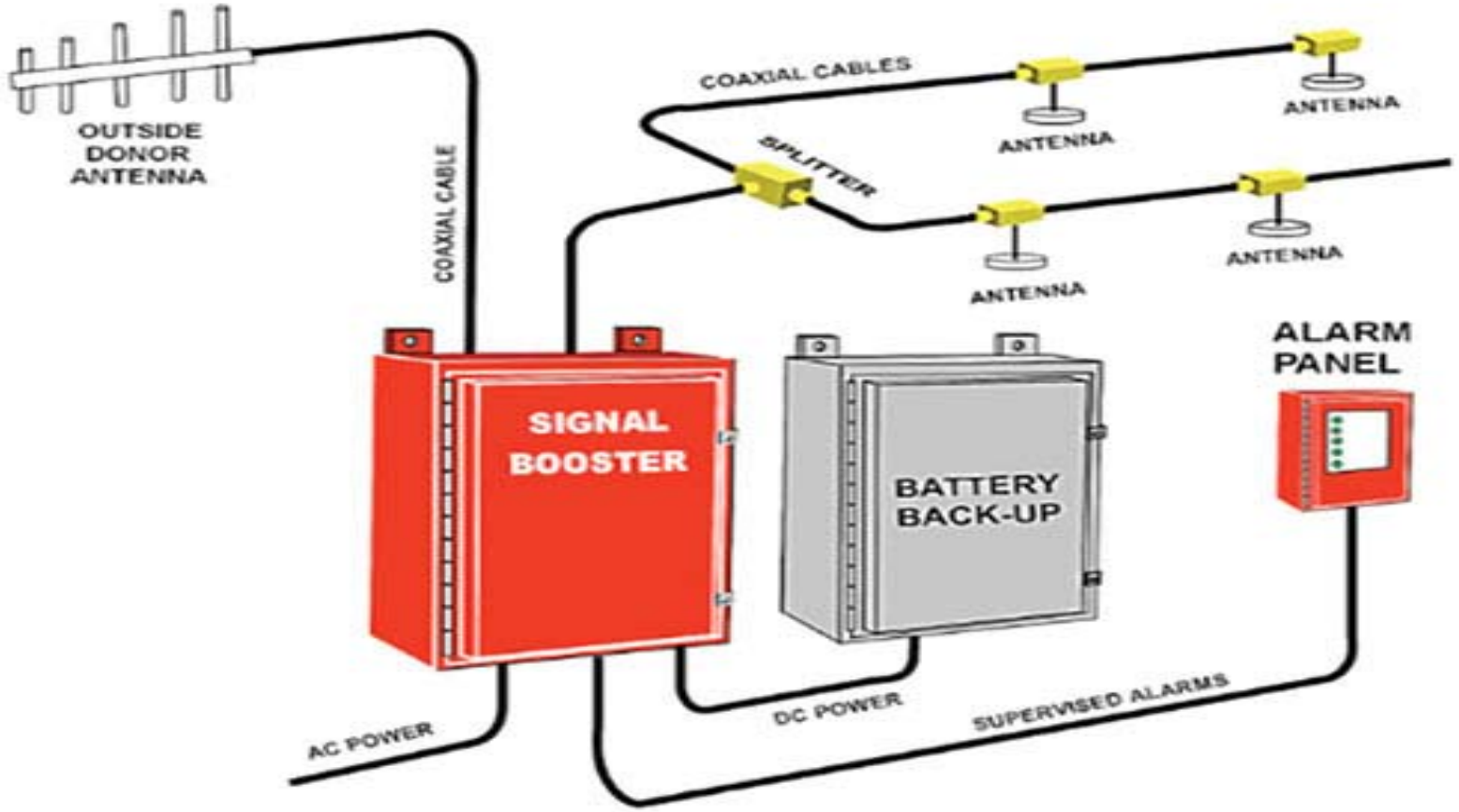
Basic Design:

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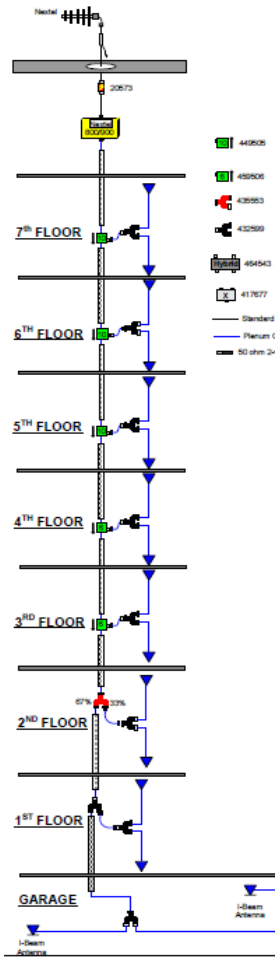
DC POWER
SUPERVISED ALARMS

RF Signal Blockers:

- Low-E glass
- Metal wall structure
- Concrete
- Other buildings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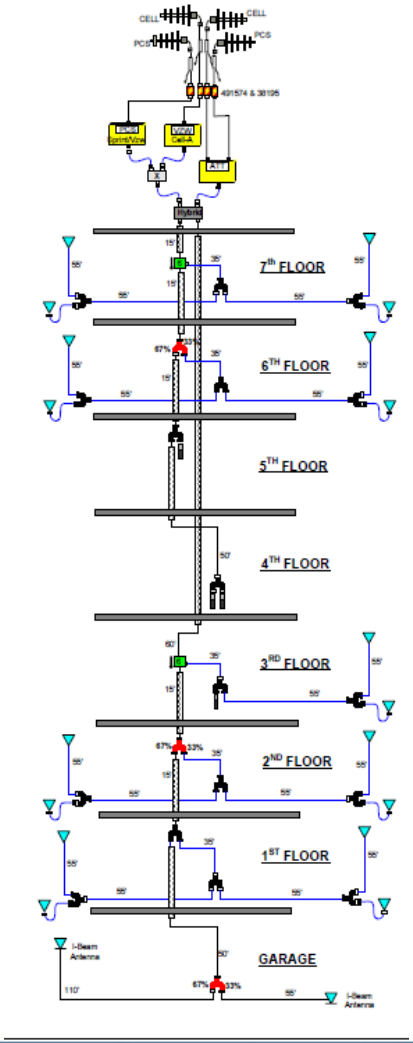
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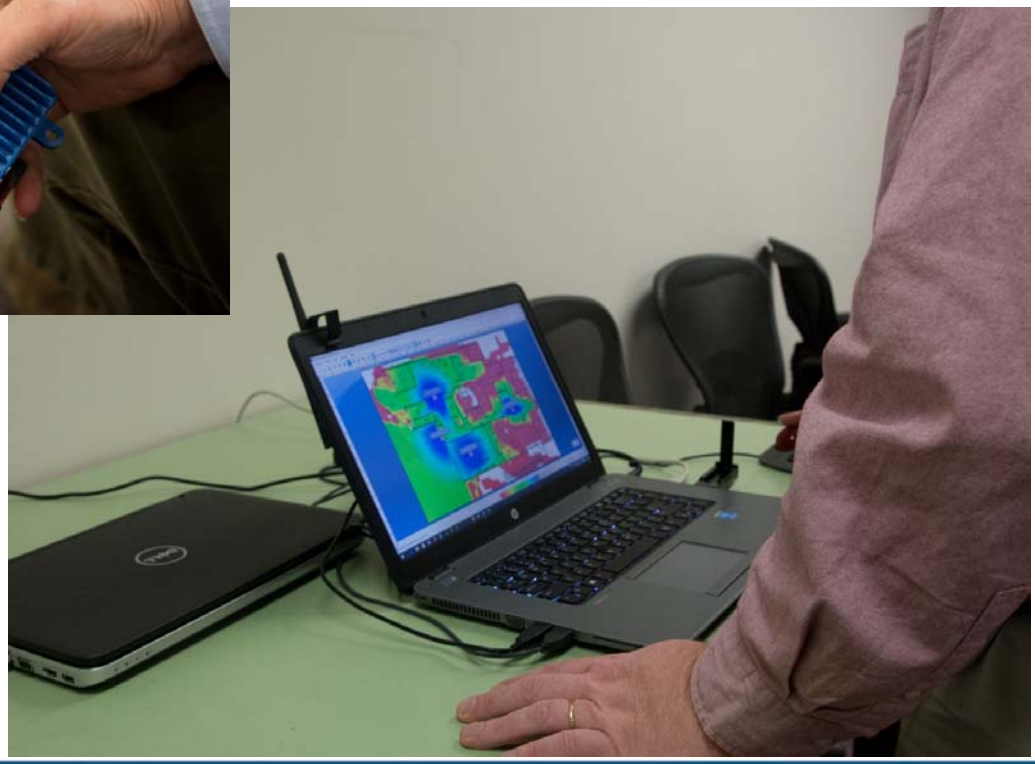
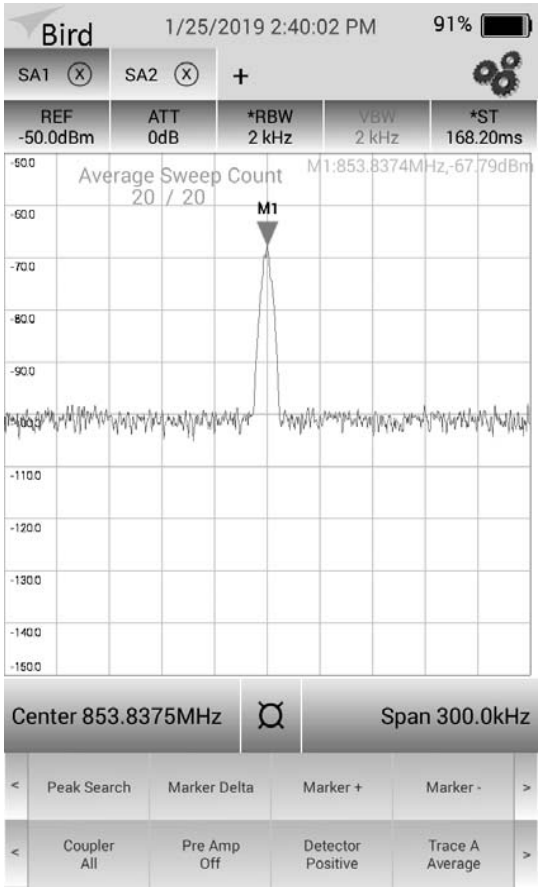
RF Testing:

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2 kHz
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*ST
168.20ms
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M1:853.8374MHz,-67.79dBm
M1
Center 853.8375MHz
Span 300.0kHz
Peak Search
Marker Delta
Marker +
Marker -
Coupler
All
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Detector
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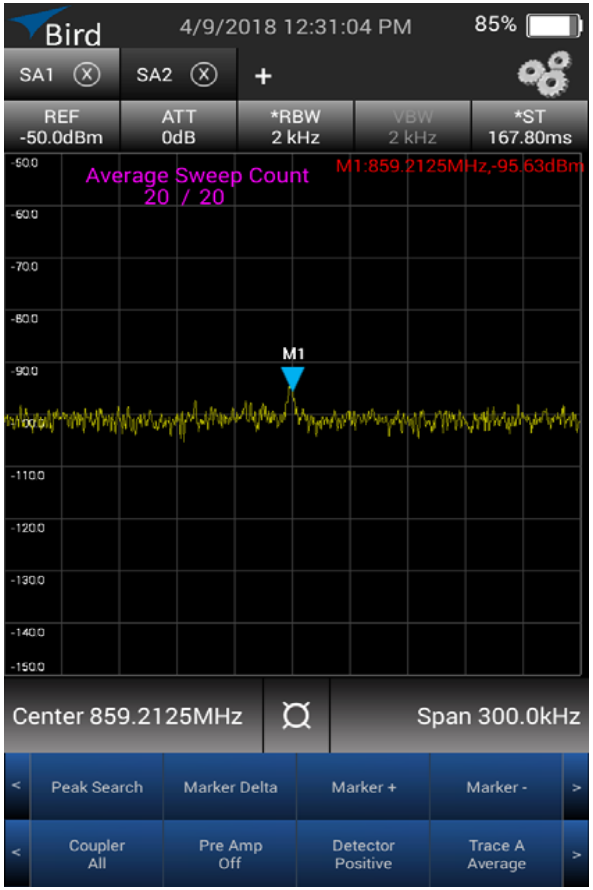
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4/9/2018 12:31:04 PM
85%
SA1
SA2
REF
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ATT
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*RBW
2 kHz
VBW
2 kHz
*ST
167.80ms
Average Sweep Count
20 / 20
M1:859.2125MHz,-95.63dBm
M1
Center 859.2125MHz
Span 300.0kHz
Peak Search
Marker Delta
Marker +
Marker -
Coupler
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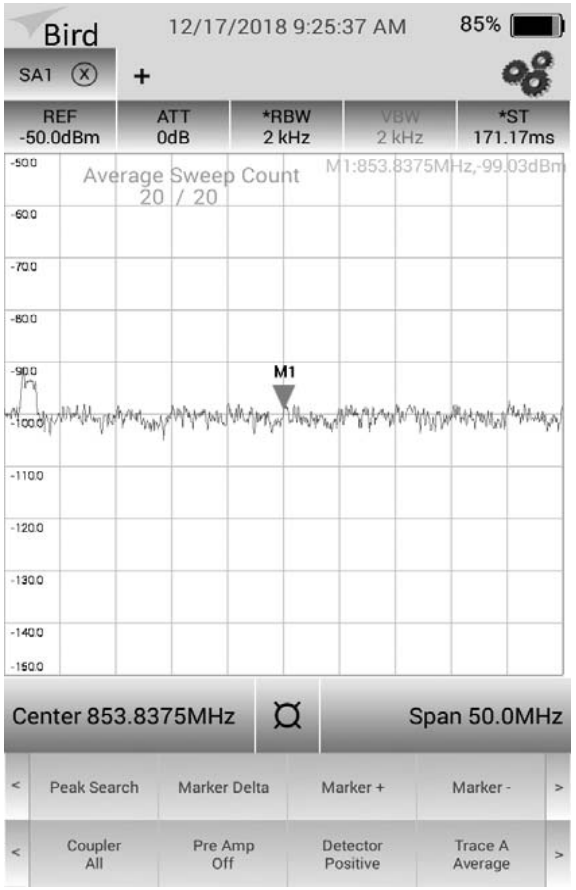
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12/17/2018 9:25:37 AM
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M1:853.8375MHz,-99.03dBm
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Center 853.8375MHz
Span 50.0MHz
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Marker +
Marker -
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ERRS
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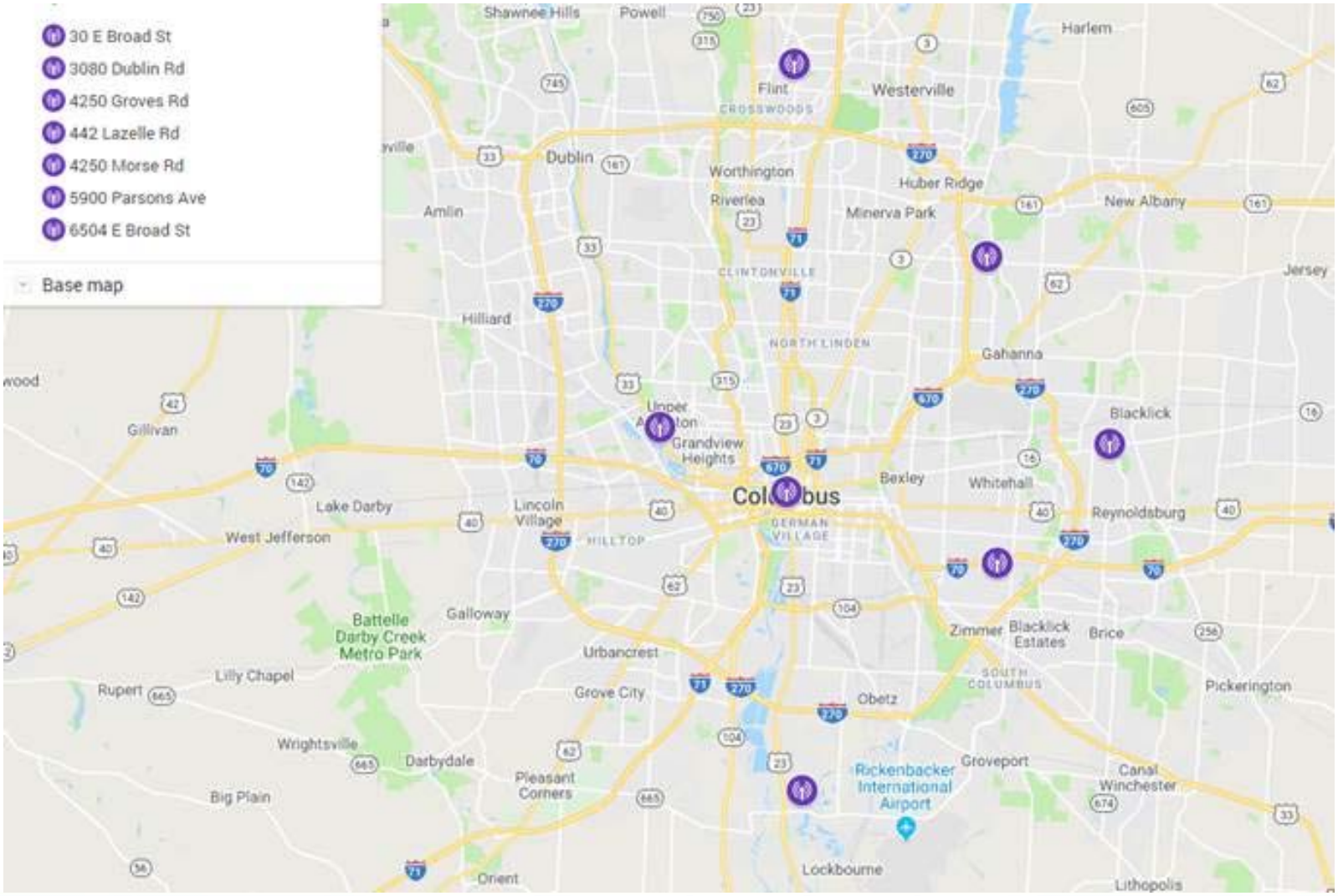
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3080 Dublin Rd
4250 Groves Rd
442 Lazelle Rd
4250 Morse Rd
5900 Parsons Ave
6504 E Broad St
Base map
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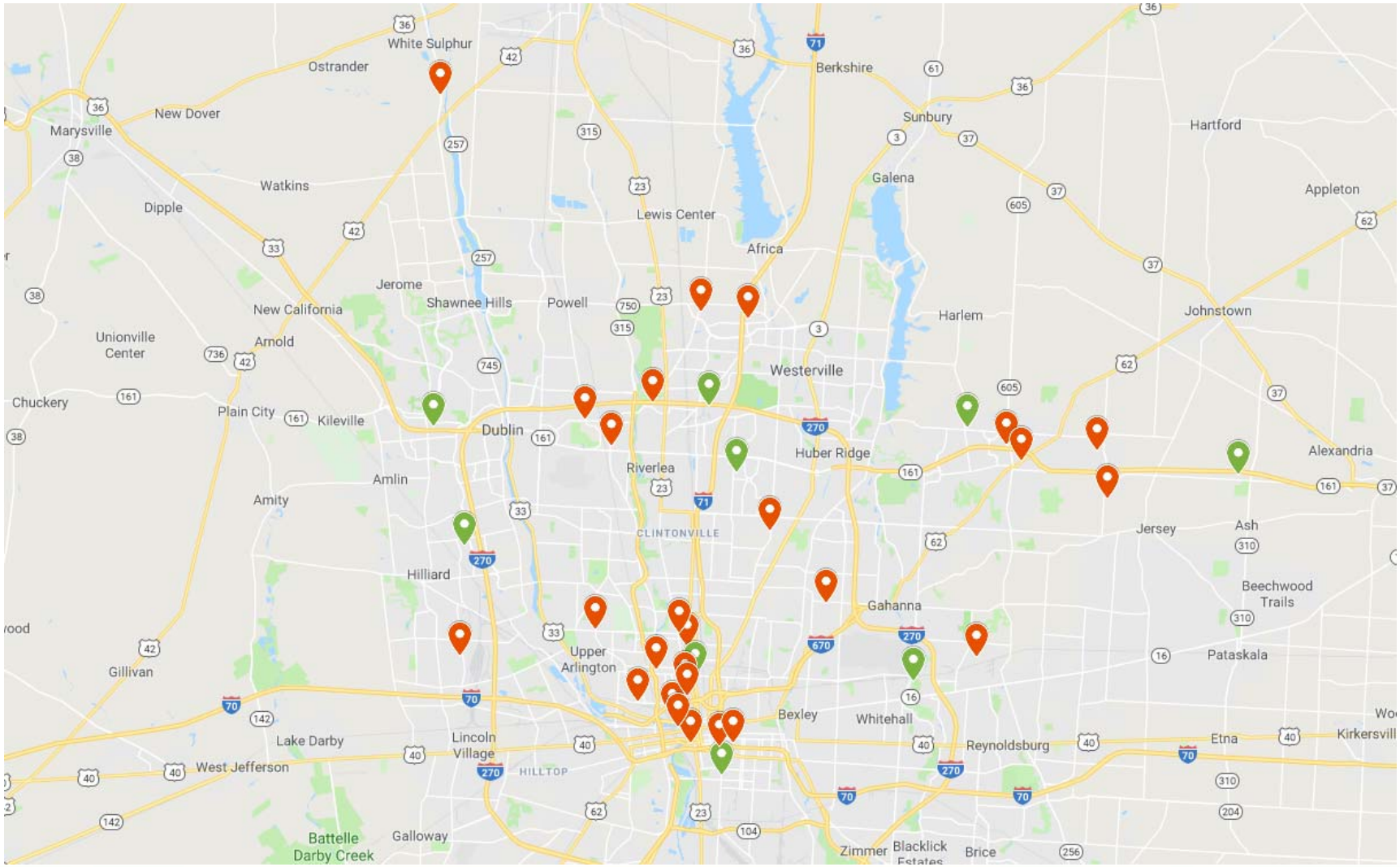
Harlem
Flint
Westerville
CROSSWOODS
Dublin
Worthington
Riverlea
Huber Ridge
Minerva Park
New Albany
Amlin
CLINTONVILLE
Jersey
Hilliard
NORTH LINDEN
Gahanna
Gillivan
Upper Arlington
Grandview Heights
Blacklick
Bexley
Whitehall
Columbus
Lake Darby
Lincoln Village
Reynoldsburg
West Jefferson
HILLTOP
GERMAN VILLAGE
Battelle Darby Creek Metro Park
Galloway
Zimmer
Blacklick Estates
Brice
Urbancrest
Lilly Chapel
Rupert
Grove City
SOUTH COLUMBUS
Pickerington
Obetz
Wrightsville
Darbydale
Groveport
Canal Winchester
Pleasant Corners
Rickenbacker International Airport
Big Plain
Orient
Lockbourne
Lithopolis

Courthouse Challenge:

Downtown Density:

Suburban Sightline:

Suburban Sightline: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Berkshire
Sunbury
Hartford
New Dover
Marysville
Watkins
Galena
Appleton
Dipple
Lewis Center
Africa
Jerome
Shawnee Hills
Powell
Harlem
Johnstown
New California
Unionville Center
Arnold
Westerville
Chuckery
Plain City
Kileville
Dublin
Huber Ridge
Alexandria
Riverlea
Amlin
Amity
CLINTONVILLE
Jersey
Ash
Hilliard
Beechwood Trails
Gahanna
Upper Arlington
Pataskala
Gillivan
Bexley
Whitehall
Lake Darby
Lincoln Village
Reynoldsburg
Etna
West Jefferson
HILLTOP
Battelle Darby Creek
Galloway
Zimmer
Blacklick Estates
Brice

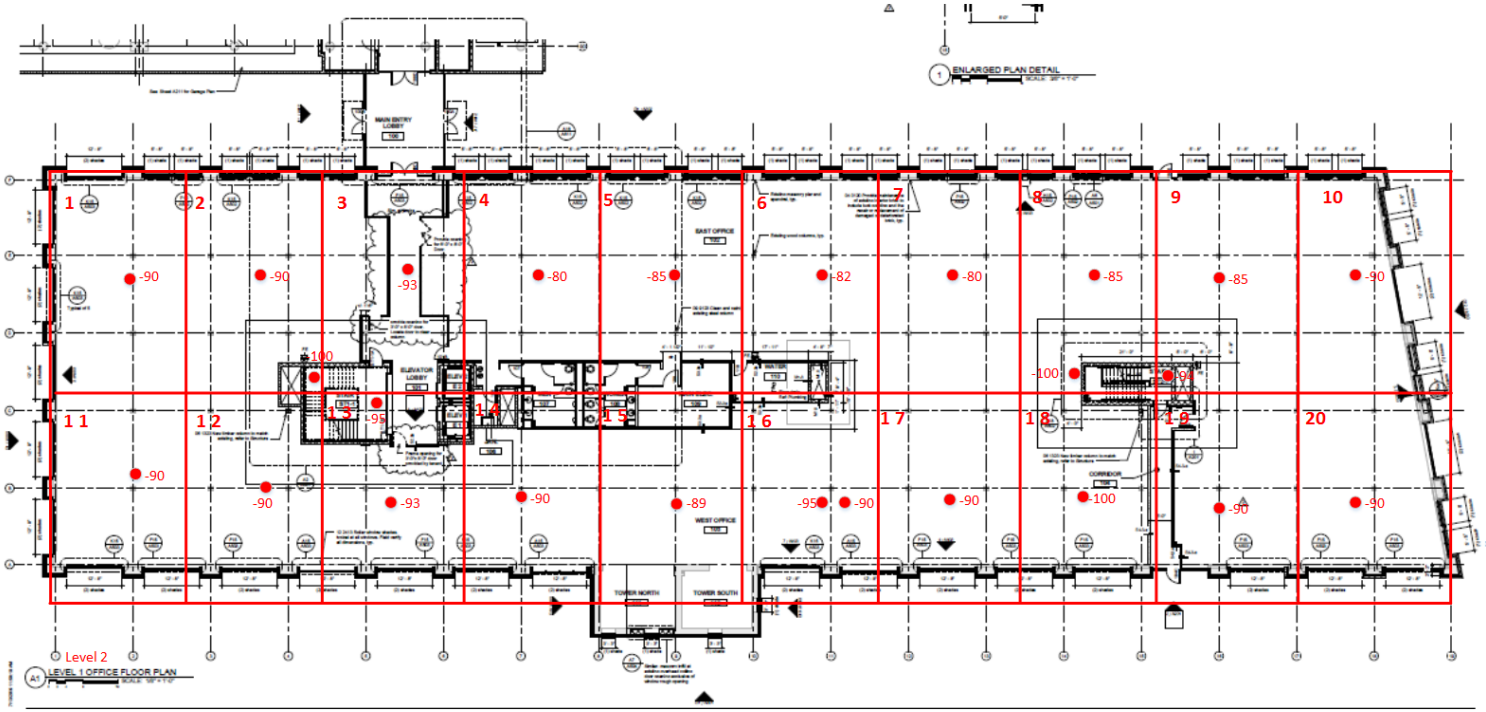

Agnone Morrison
& Associates
Eye M.D.s

Case Study: First and Main

Case Study: CCL Label

Case Study: Buggyworks

Case Study: Buggyworks



Case Study: Buggyworks

Case Study: Buggyworks

Case Study: Buggyworks

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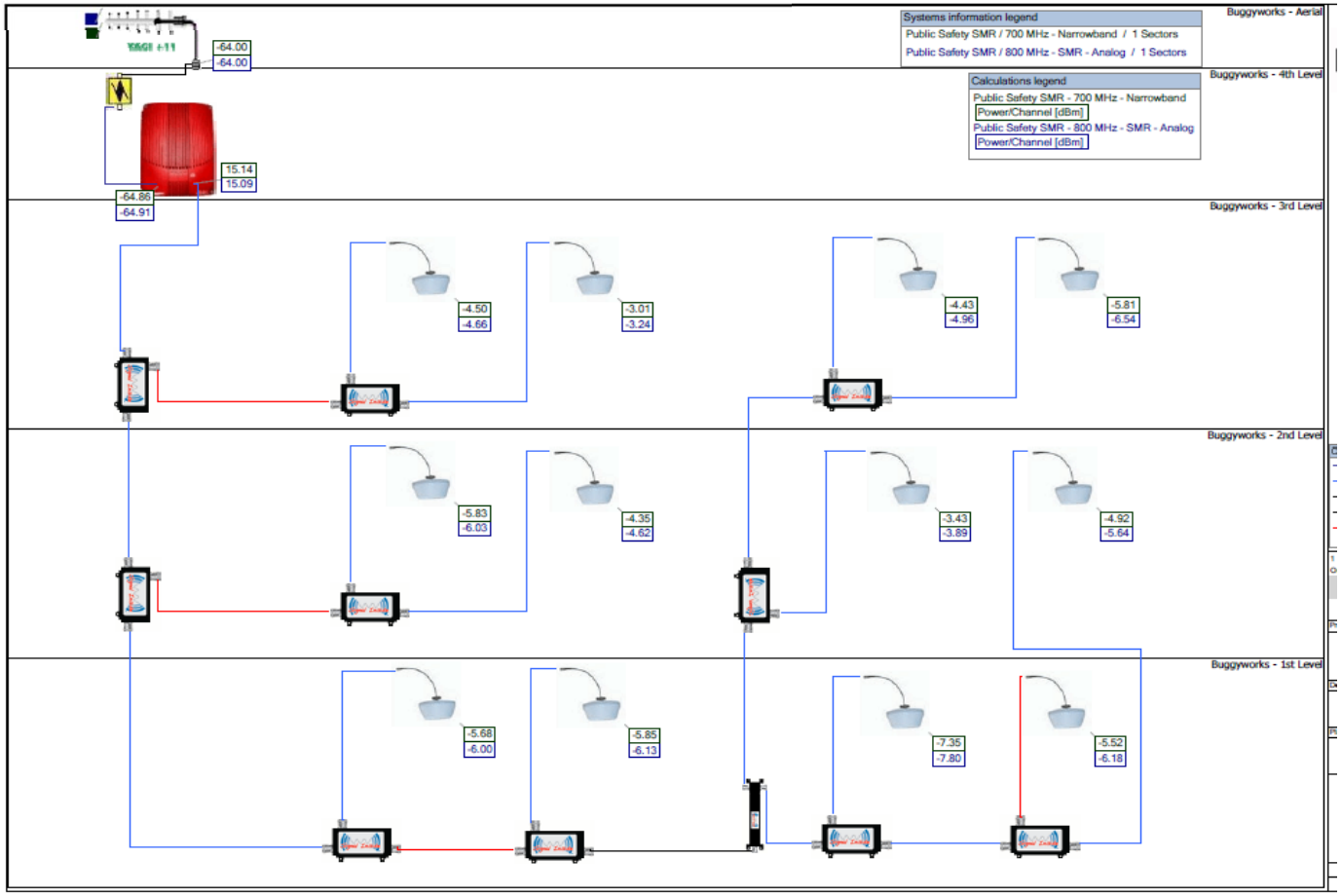
Office Level 2	-90	-100	-93	-80	-85	-82	-80	-100	-85	-90	-90	-95	-95	-90	-89	-95	-90	-100	-90	-90
Office Level 3	-85	-95	-78	-78	-80	-90	-85	-80	-80	-80	-88	-100	-90	-85	-100	-85	-100	-90	-88	-85
Office Level 4	-75	-70	-75	-70	-75	-80	-70	-70	-70	-75	-75	-80	-75	-75	-75	-78	-80	-80	-90	-80
Garage Level 1	-100	-100	-105	-95	-95	-95	-90	-88	-85	-80	-100	-90	-95	-100	-100	-95	-100	-95	-95	-85
Garage Level 2	-98	-90	-85	-85	-90	-90	-95	-90	-90	-80	-90	-98	-100	-95	-95	-90	-90	-80	-90	-78
Garage Level 3	-90	-95	-90	-95	-88	-90	-85	-80	-80	-95	-98	-93	-100	-88	-102	-80	-78	-105	-90	-80

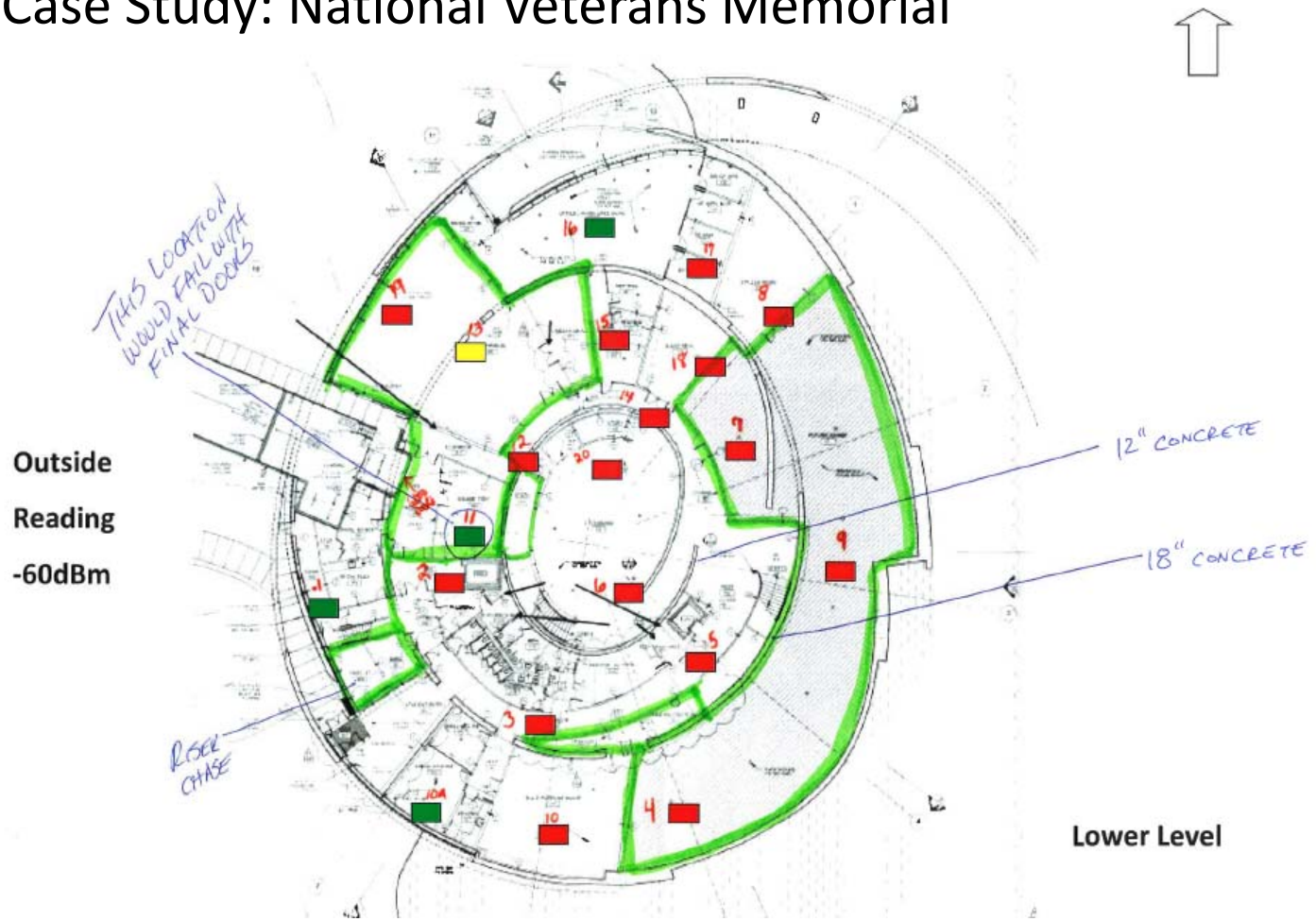
represents an average reading of -96db or worse signal strength

Case Study: Buggyworks

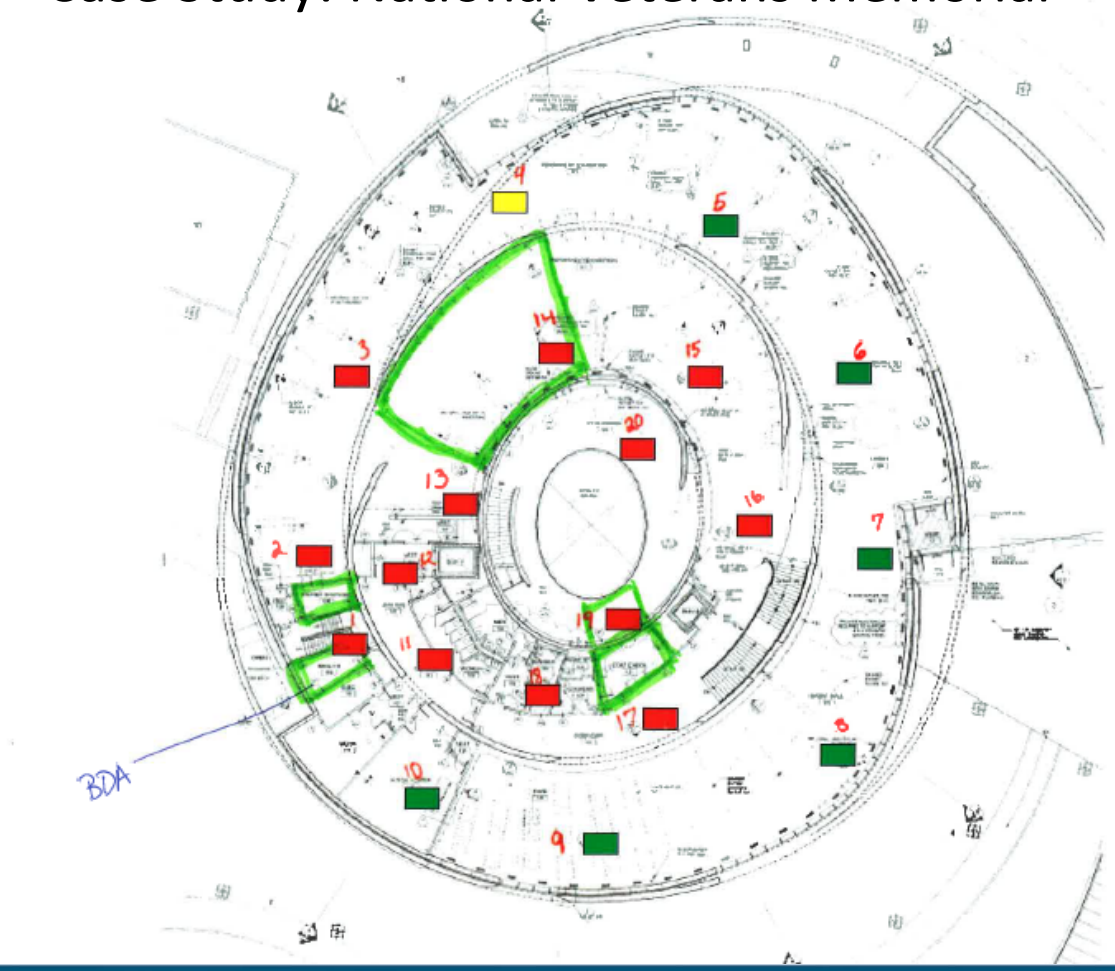


Case Study: National Veterans Memorial

Case Study: National Veterans Memorial

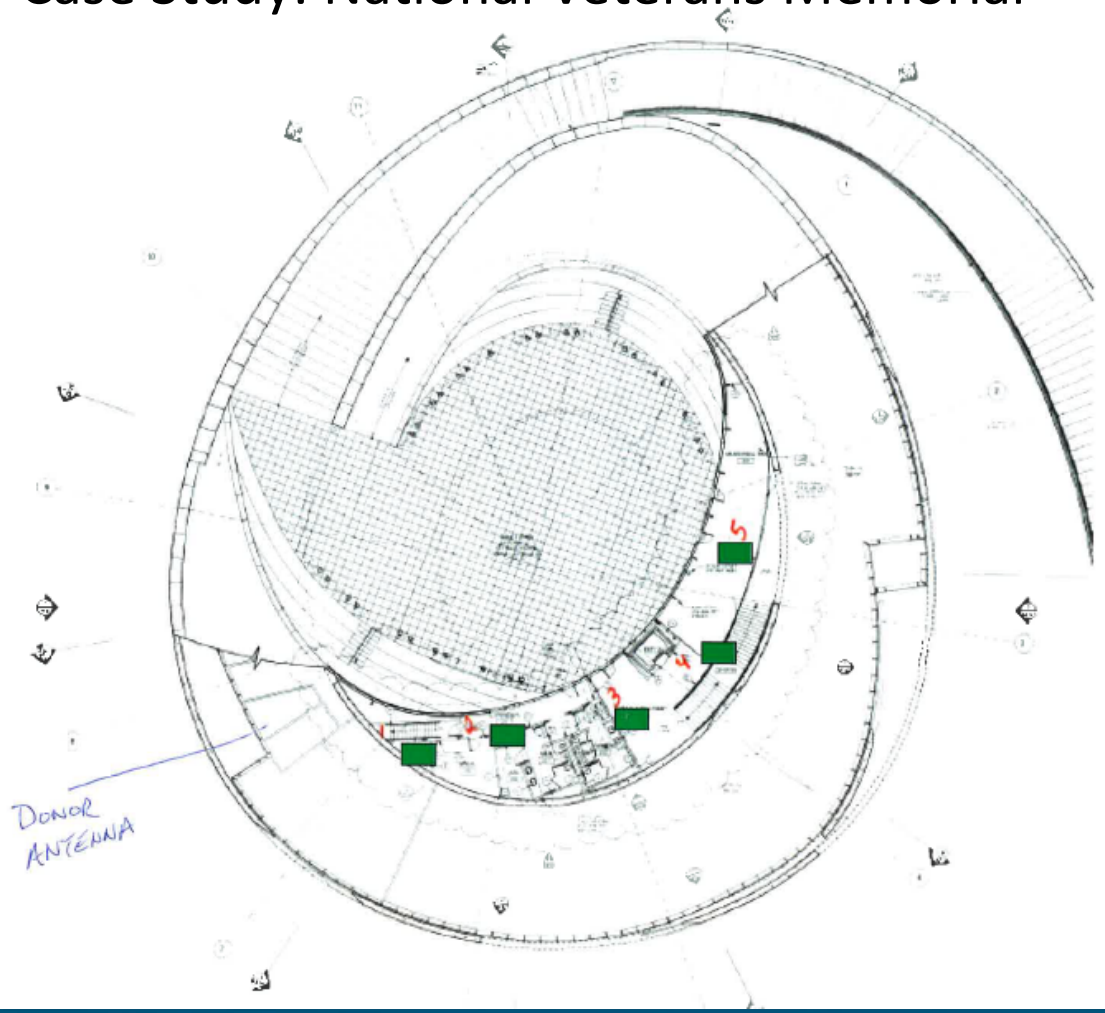


Case Study: National Veterans Memorial



Main Level

Case Study: National Veterans Memorial



Mezzanine Level

Case Study: National Veterans Memorial

Keep In Mind:

Every situation is unique:

- Proximity and sightline to tower
- Size and location of facility
- Construction (Windows, Walls, Roof & Skin)
- Budget upfront
- Can't test until core/shell complete
- Local AHJ has final say

Integrated Building Systems