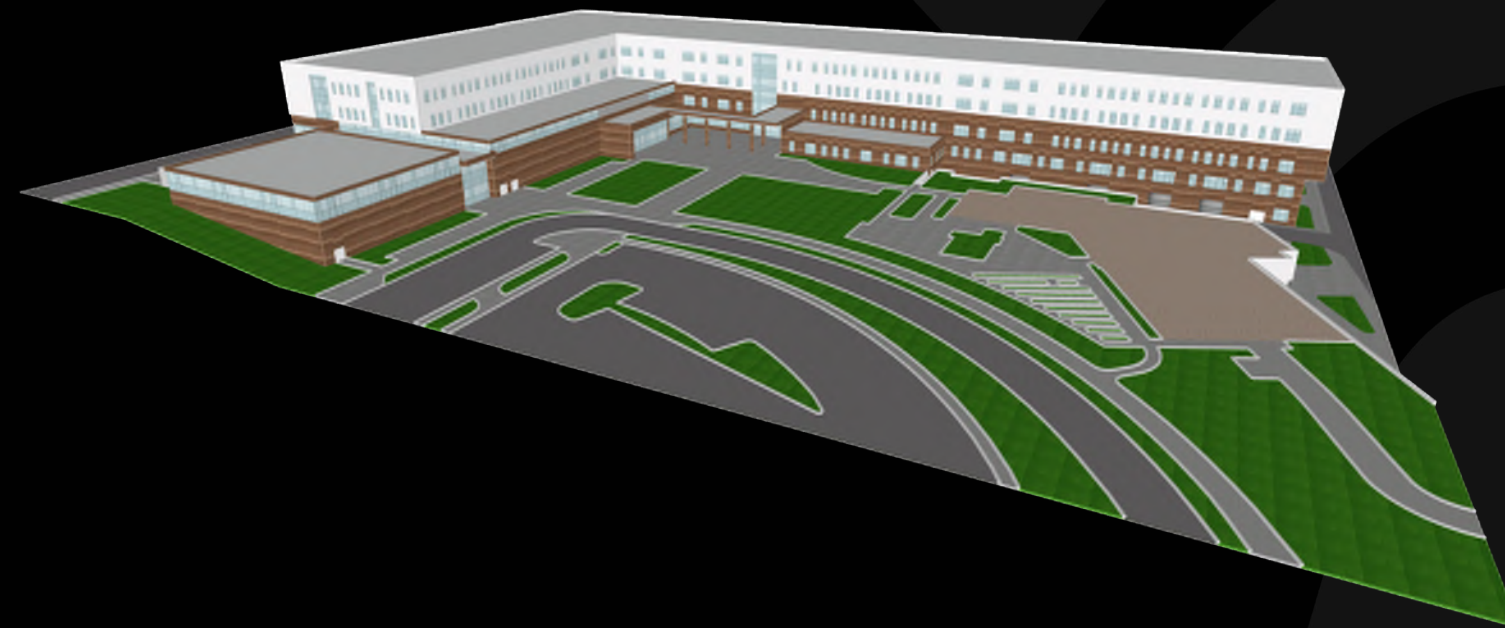


ATTN:

DATE: 07-04-2025

EMERGENCY RESPONDER RADIO COMMUNICATIONS SYSTEM PRELIMINARY REQUIREMENTS EVALUATION (07-04-25)



PROVIDER:

CASCADE

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PRELIMINARY EMERGENCY RESPONDER RADIO FREQUENCY LIST (STAMFORD, CT)						
AGENCY	LICENSE	DONOR SITE	DESCRIPTION	TX (MHz)	RX (MHz)	RADIO SERVICE
STAMFORD FIRE DISTRICT	WQGH338	XX°-XX'-X.XX" N, XX°-XX'-X.XX" W	STAMFORD FIREGROUND	XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX	XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX	PW - PUBLIC SAFETY, CONVENTIONAL
CTS UNIT	WNNM899	41°-06'-20.4" N, 073°-31'-34.3" W	STAMFORD SIMULCAST	XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX	XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX XXX.XXXXX	YE – PUBSFTY, 806-817/851-862 MHz, TRUNKED

TABLE 1: APPLICABLE EMERGENCY RESPONDER RADIO CHANNELS
TX/RX COLUMNS: TABLE 1: PRELIMINARY EMERGENCY RESPONDER RADIO CHANNELS TX/RX COLUMNS: CHANNELS HIGHLIGHTED IN YELLOW NOTED AS POTENTIAL CONTROL CHANNELS

SCOPE OF EVALUATION

1. APPLICABLE FREQUENCY AND DONOR SITE VERIFICATION

- Coordinated with Stamford Fire District and Connecticut Division of Statewide Telecommunications (CTS) Unit to request and verify applicable system types, frequencies, and locations.
- Received verbal confirmation from the Stamford Fire District that a 700 MHz system with four total channels (presumed to align with FCC Call Sign WQGH338) is required. Obtained written verification from the CTS Unit confirming that the Stamford Simulcast system (FCC Call Sign WNNM899) is applicable.
- Potential donor site locations, based on predicted line-of-sight to the building, are listed in Table 1 and further detailed in subsequent sections. System assumptions were validated through FCC call sign lookup and independent research.

2. EQUIPMENT LOCATION AND RATED PATHWAY VERIFICATION

- Reviewed architectural life safety plans to identify 2-hour rated spaces and pathways suitable for ERRCS active components and backbone equipment, based on vendor ROM (Westell).
- Determined potential head-end and remote BDA unit locations, prioritizing placement of the head-end on an upper floor to reduce donor antenna cable length. Identified horizontal backbone routing options where vertical stacking of 2-hour rated rooms was not feasible.
- Proposed the use of Rated Fiber as an alternative to constructing rated soffits, enabling compliant horizontal backbone pathways where applicable.
- Associated markups and supporting documentation related to equipment locations and rated pathway verification are included in the following sections of this report.

3. PRELIMINARY BUILDING MODEL

- Created a preliminary iBwave building materials model using architectural contract documents, incorporating building-specific details such as auditorium construction, pool and gymnasium finishes, as well as Low-E and security glazing where applicable.
- Established the building's geolocation and footprint through a KML file compatible with Google Earth, enabling future donor antenna line-of-sight, free-space path loss, and topographical analysis.
- 3D model snapshots of both the building exterior and interior are provided in the following sections of this report.

4. SAMPLE PROPAGATION MODEL

- Developed a sample preliminary iBwave propagation model based on assumed operational frequencies, identified donor site locations, Westell bill of materials, feasible 2-hour rated pathways, and the previously developed building materials model.
- Generated a model signal compliance floor plan, with associated input parameters and assumptions detailed in the following sections of this report.

5. SUPPLEMENTARY SPECIFICATION

- Developed a supplementary specification in accordance with the requirements outlined in the CTS CLMRN Interim Emergency Responder Radio Coverage Enhancement Technical Advisory Bulletin and the 2022 Connecticut State Fire Safety Code.
- Incorporated detailed sequencing of system delivery phases, including RF modeling, signal benchmarking, equipment integration, commissioning, and final acceptance testing.
- Created a Basis of Design section aligned with the proposed Westell bill of materials, ensuring compatibility with site-specific technical conditions and applicable code requirements.

EVALUATION

2.1 APPLICABLE FREQUENCIES AND DONOR SITES

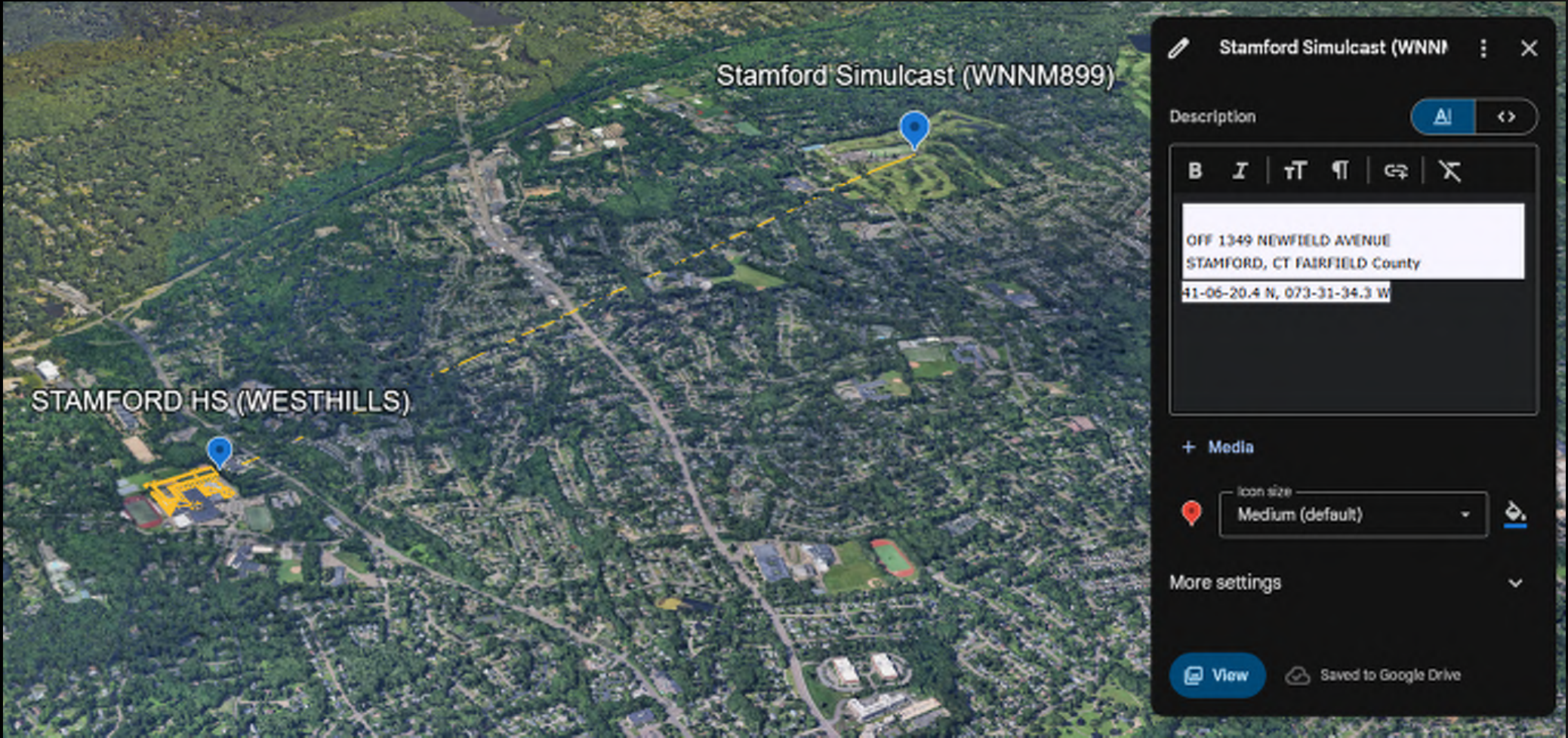


Figure 1: POTENTIAL WNNM899 DONOR SITE LOCATION

2.1 APPLICABLE FREQUENCIES AND DONOR SITES CONTINUED



Figure 2: POTENTIAL WNNM899 DONOR SITE LINE-OF-SITE

2.2 EQUIPMENT LOCATION AND 2-HR RATED PATHWAY VERIFICATION

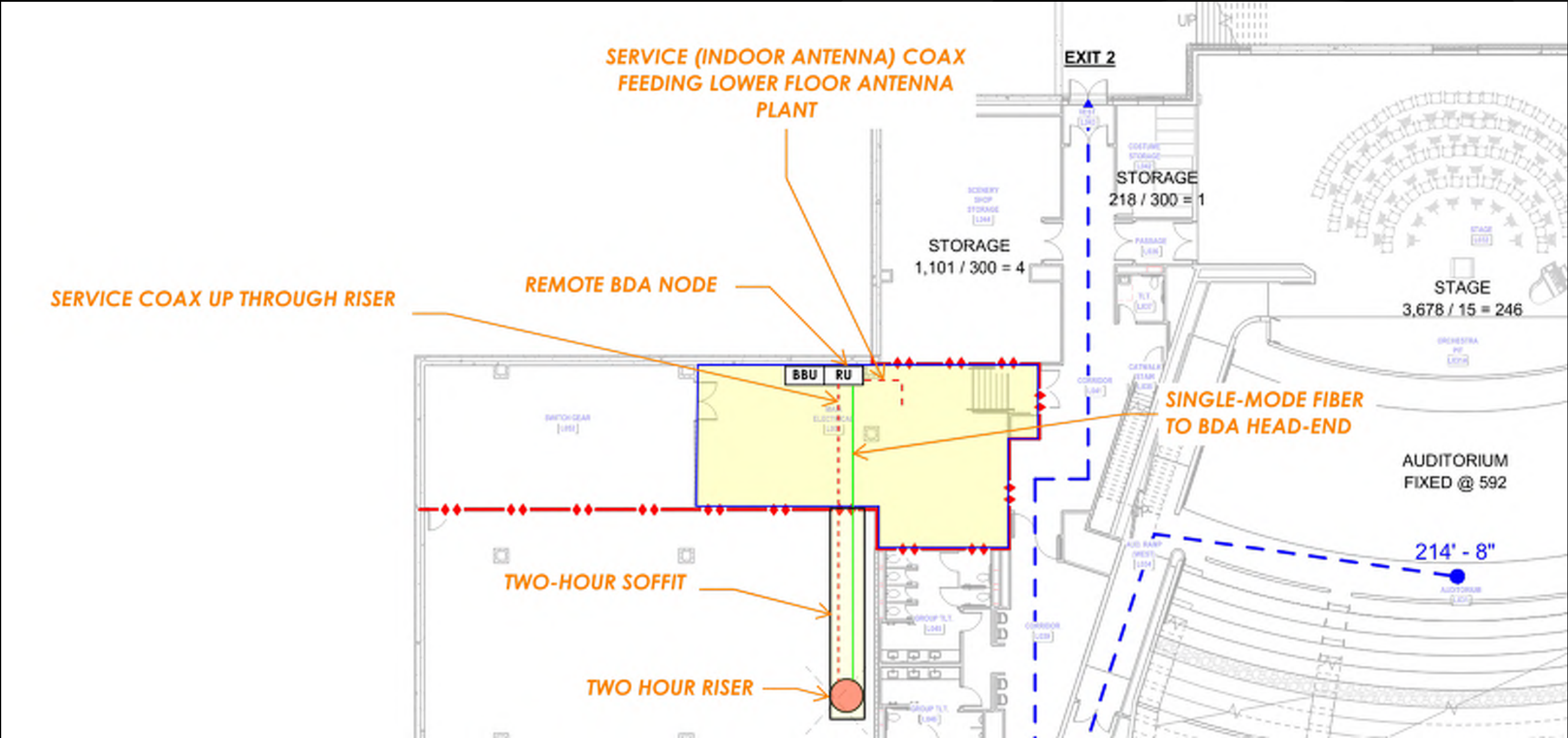


Figure 3: SYSTEM TOPOLOGY MARKUP - LOWER LEVEL

2.1 EQUIPMENT LOCATION AND 2-HR RATED PATHWAY VERIFICATION CONTINUED

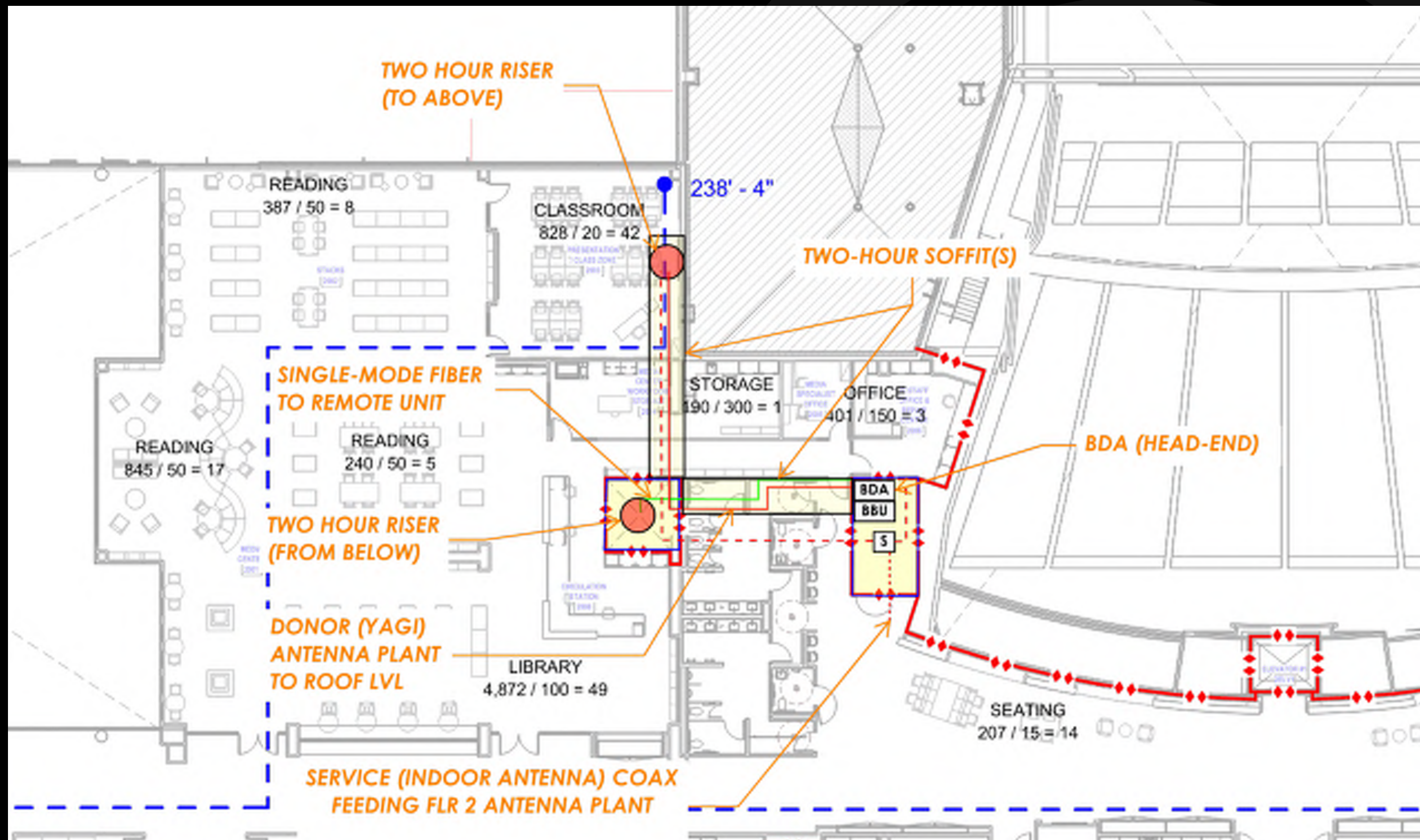


Figure 5: SYSTEM TOPOLOGY MARKUP - SECOND FLOOR

2.1 EQUIPMENT LOCATION AND 2-HR RATED PATHWAY VERIFICATION CONTINUED

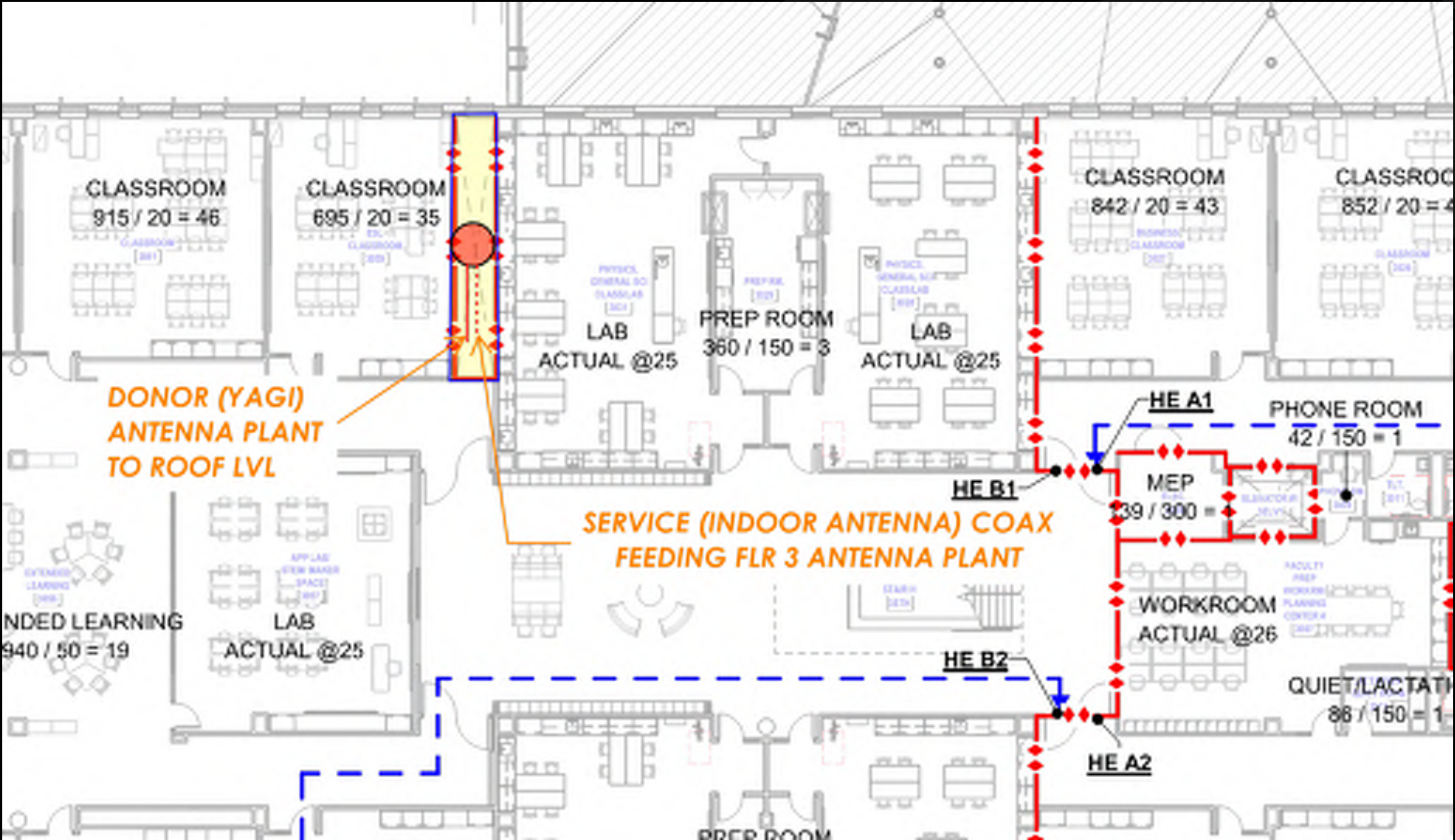


Figure 6: SYSTEM TOPOLOGY MARKUP - THIRD FLOOR

2.1 EQUIPMENT LOCATION AND 2-HR RATED PATHWAY VERIFICATION CONTINUED

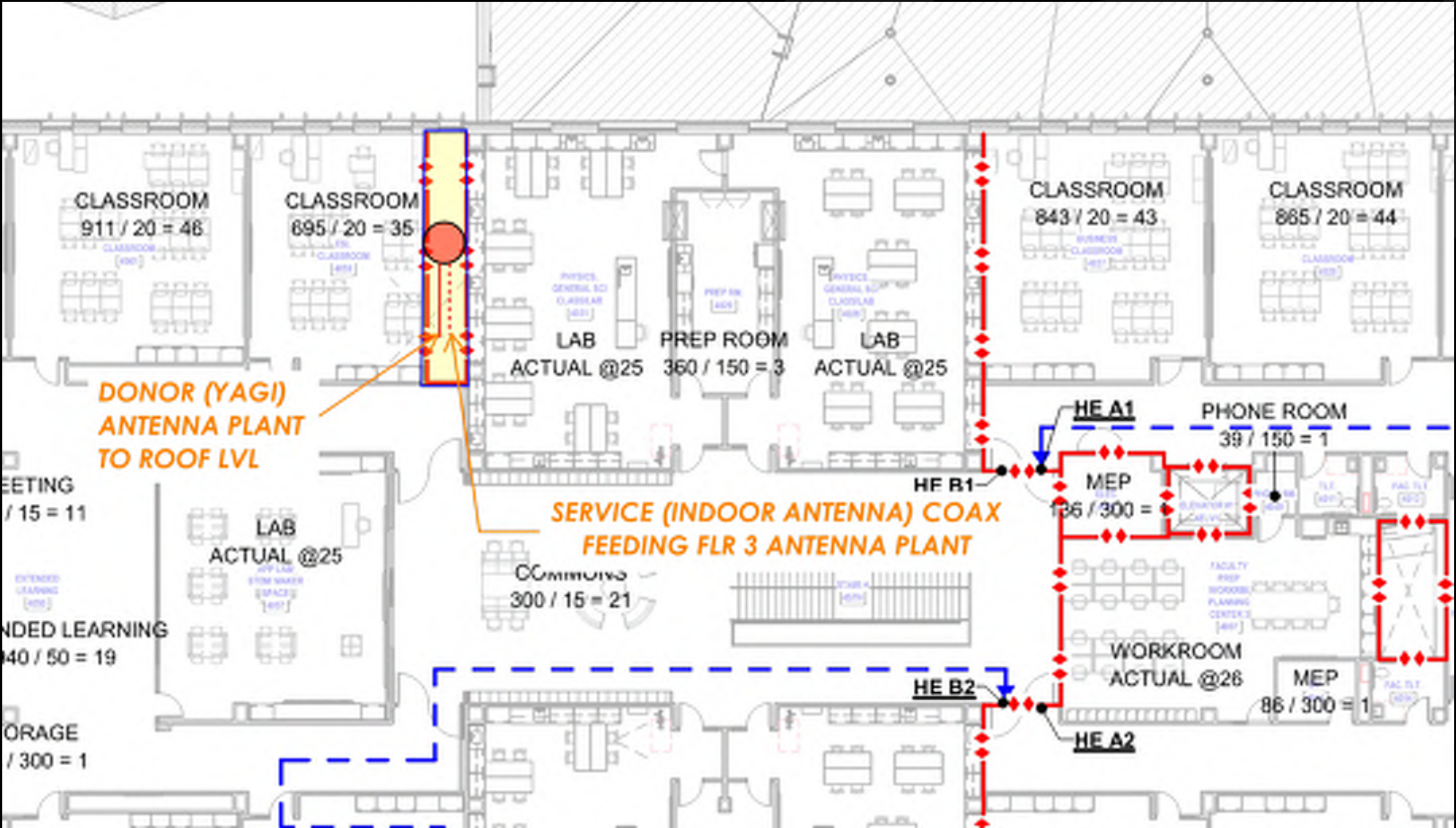


Figure 7: SYSTEM TOPOLOGY MARKUP - FOURTH FLOOR

2.3 PRELIMINARY BUILDING MODEL

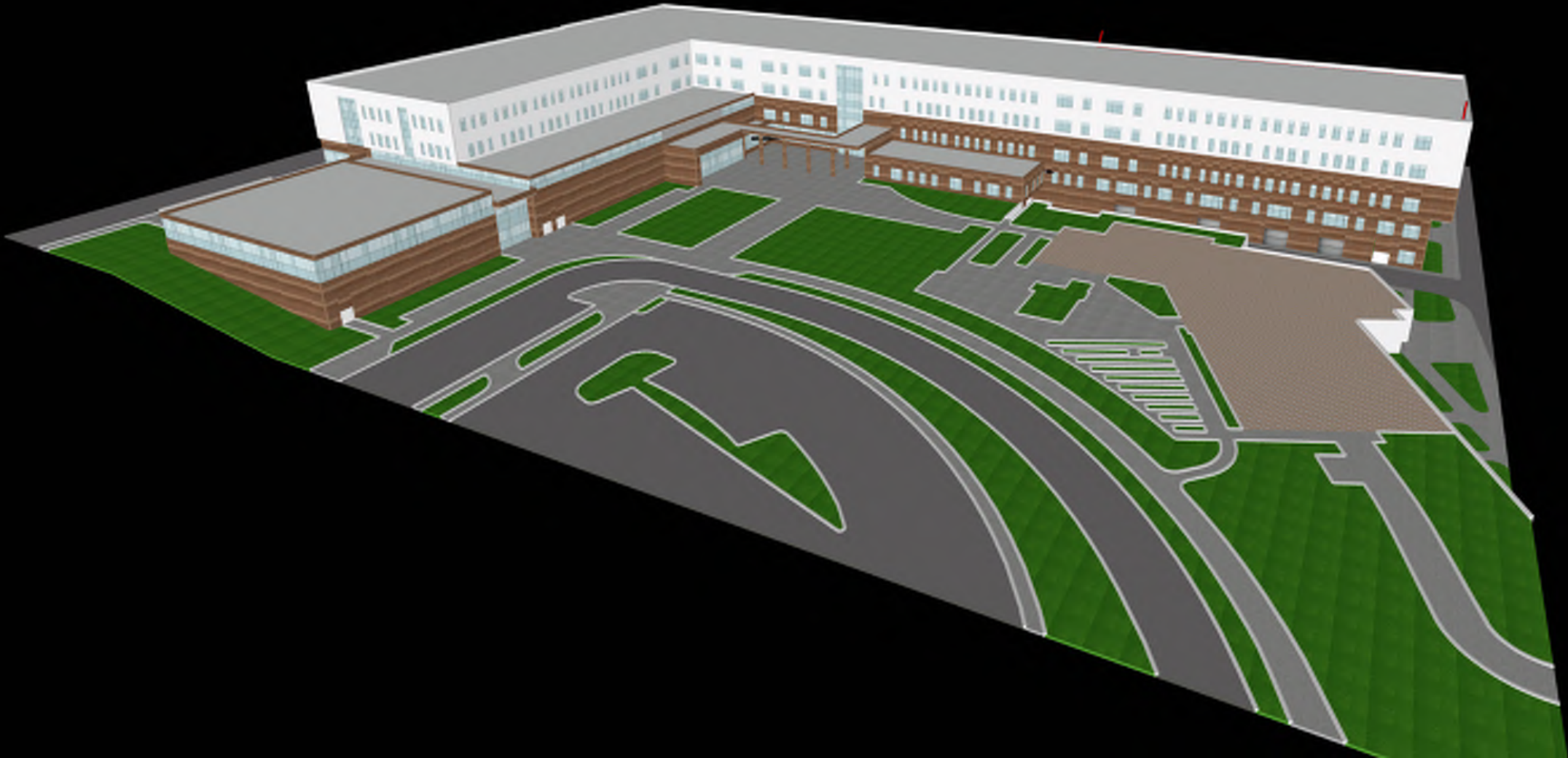


Figure 9: PRELIMINARY BUILDING MODEL (1)

2.1 PRELIMINARY BUILDING MODEL CONTINUED

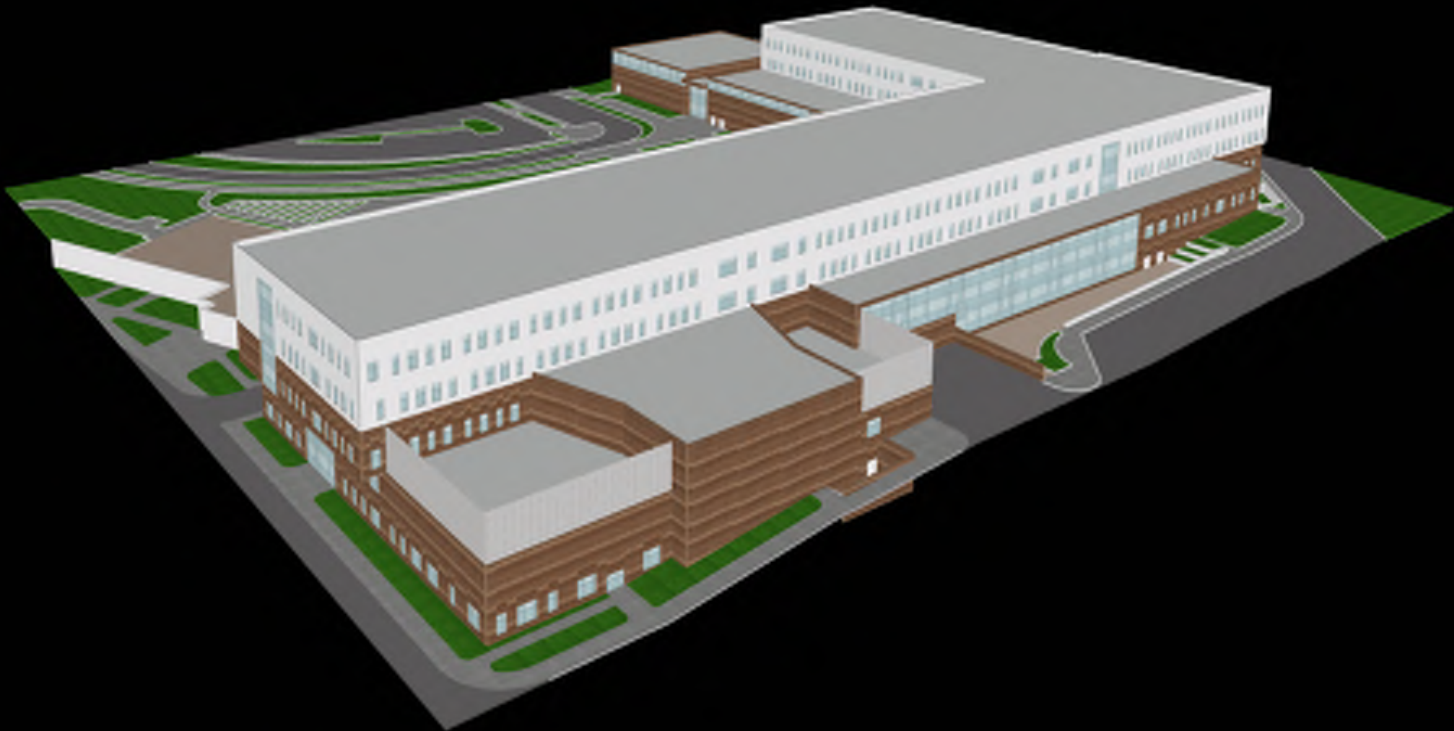


Figure 10: PRELIMINARY BUILDING MODEL (2)

2.1 PRELIMINARY BUILDING MODEL CONTINUED

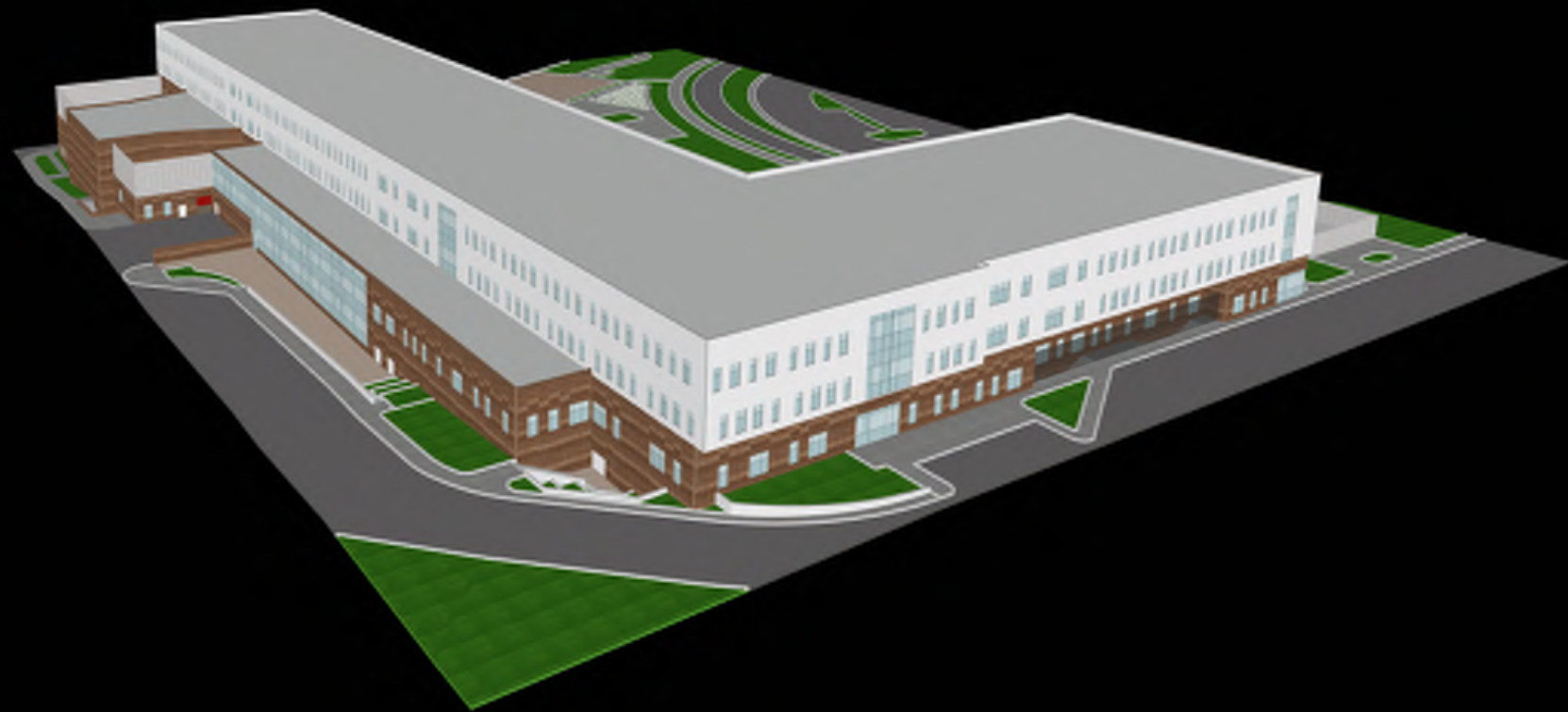


Figure 11: PRELIMINARY BUILDING MODEL (3)

2.1 PRELIMINARY BUILDING MODEL CONTINUED



Figure 12: PRELIMINARY BUILDING MODEL (4)

2.1 PRELIMINARY BUILDING MODEL CONTINUED

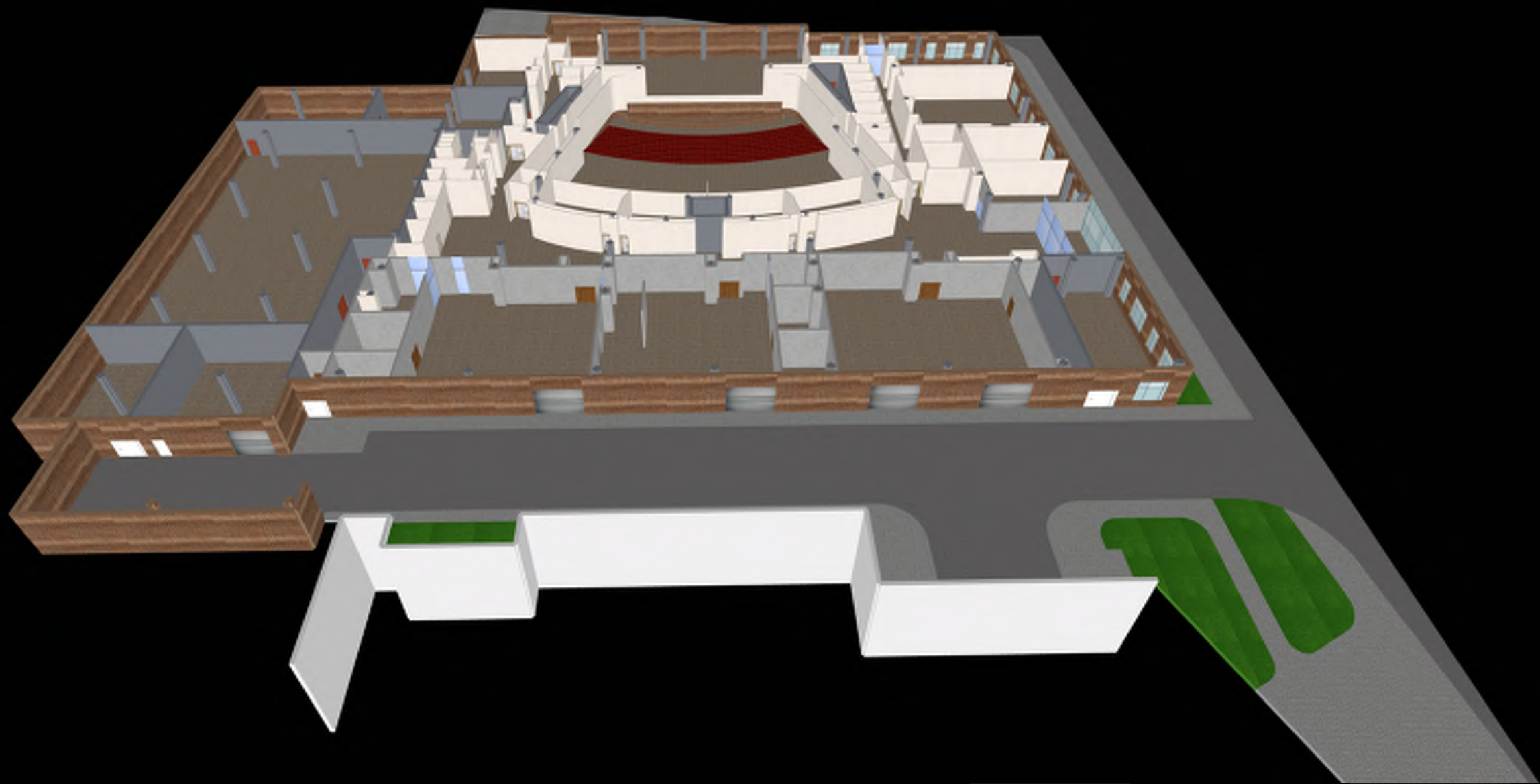


Figure 13: PRELIMINARY BUILDING MODEL - LOWER LEVEL

2.1 PRELIMINARY BUILDING MODEL CONTINUED



Figure 14: PRELIMINARY BUILDING MODEL - FIRST FLOOR

2.1 PRELIMINARY BUILDING MODEL CONTINUED



Figure 15: PRELIMINARY BUILDING MODEL - SECOND FLOOR

2.1 PRELIMINARY BUILDING MODEL CONTINUED



Figure 16: PRELIMINARY BUILDING MODEL - THIRD FLOOR

2.1 PRELIMINARY BUILDING MODEL CONTINUED



Figure 17: PRELIMINARY BUILDING MODEL - FOURTH FLOOR

2.1 PRELIMINARY BUILDING MODEL CONTINUED

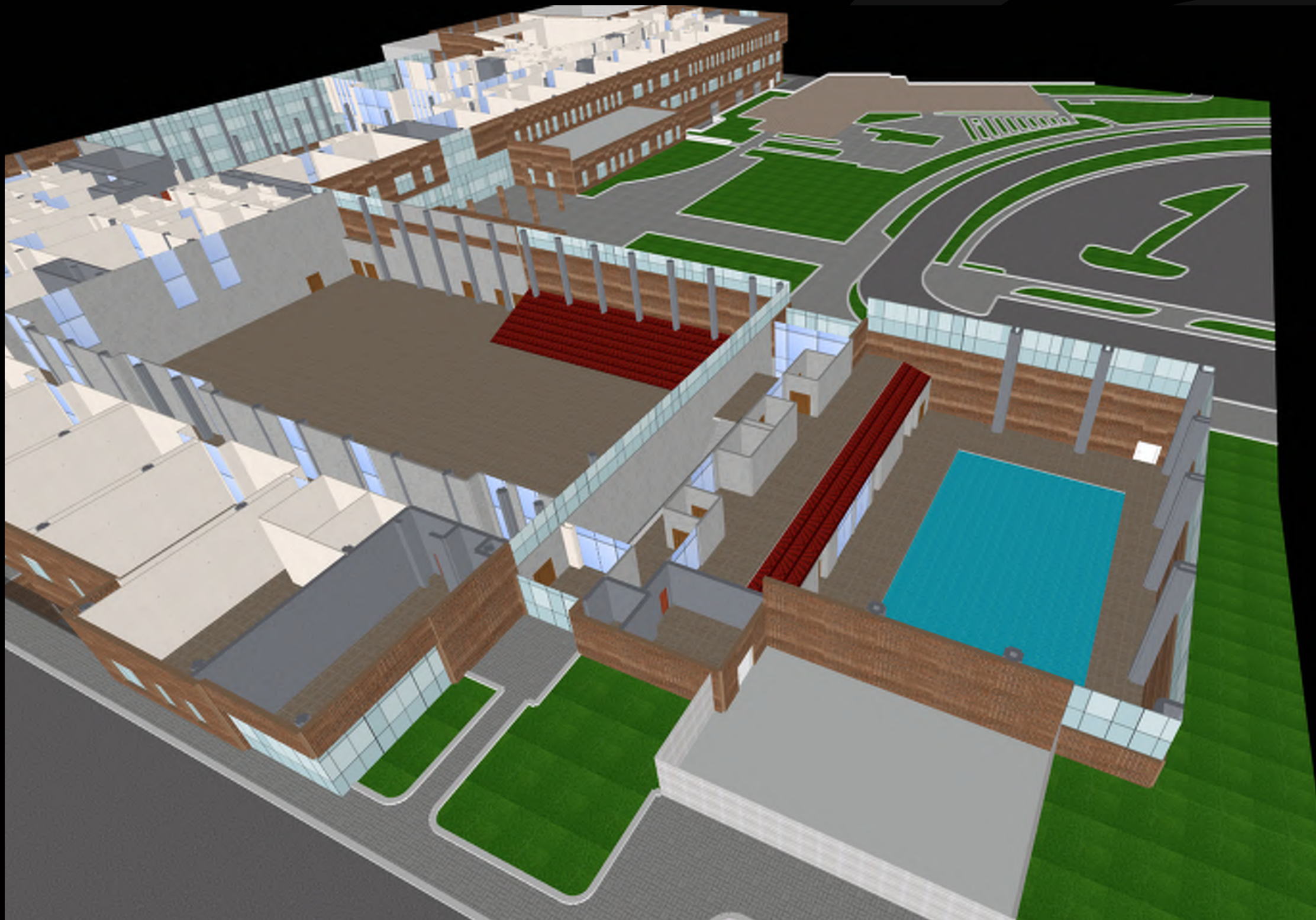


Figure 18: PRELIMINARY BUILDING MODEL - GYM-POOL

2.1 PRELIMINARY BUILDING MODEL CONTINUED

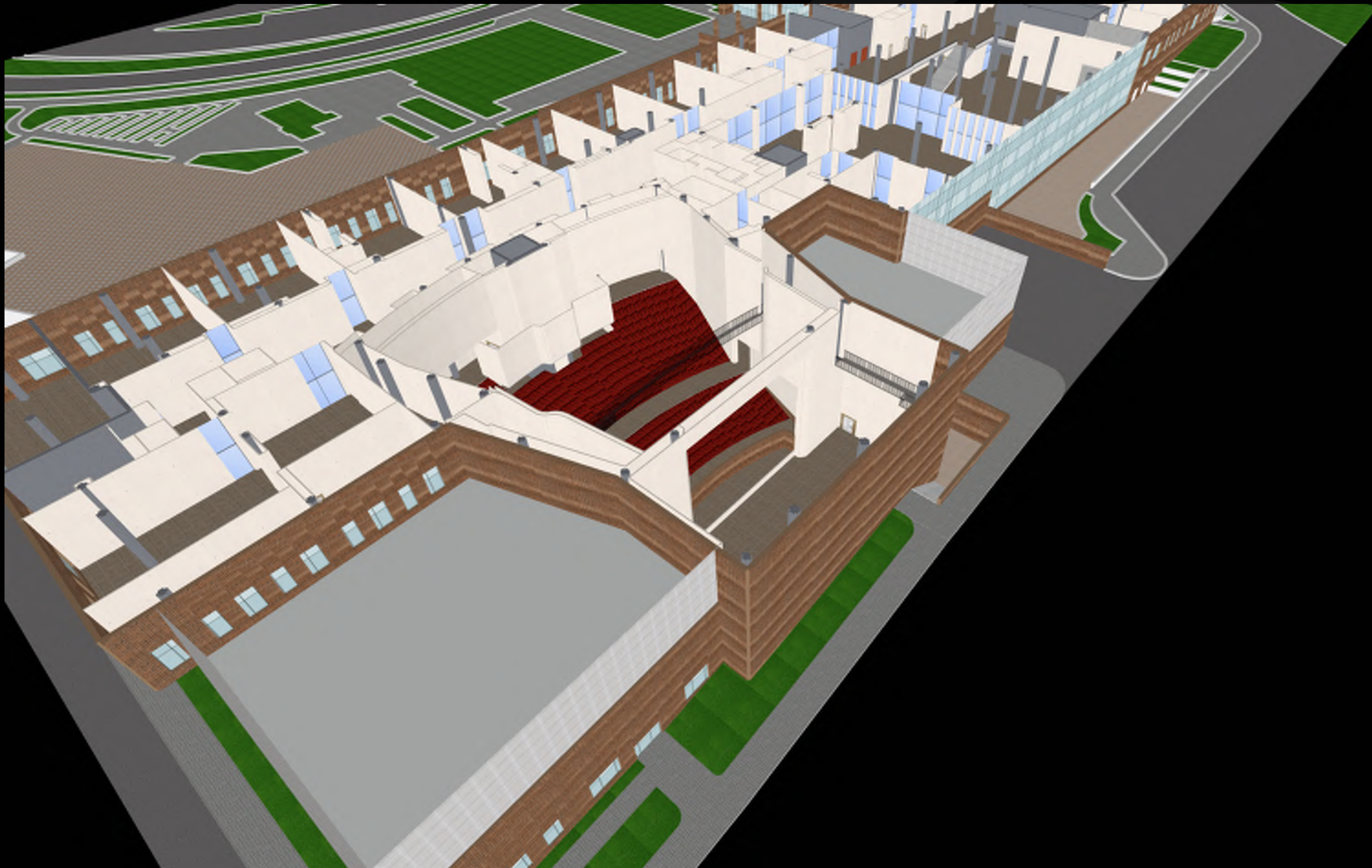


Figure 19: PRELIMINARY BUILDING MODEL - AUDITORIUM

2.1 PRELIMINARY BUILDING MODEL CONTINUED



Figure 20: PRELIMINARY BUILDING MODEL - GOOGLE EARTH (1)

2.1 PRELIMINARY BUILDING MODEL CONTINUED

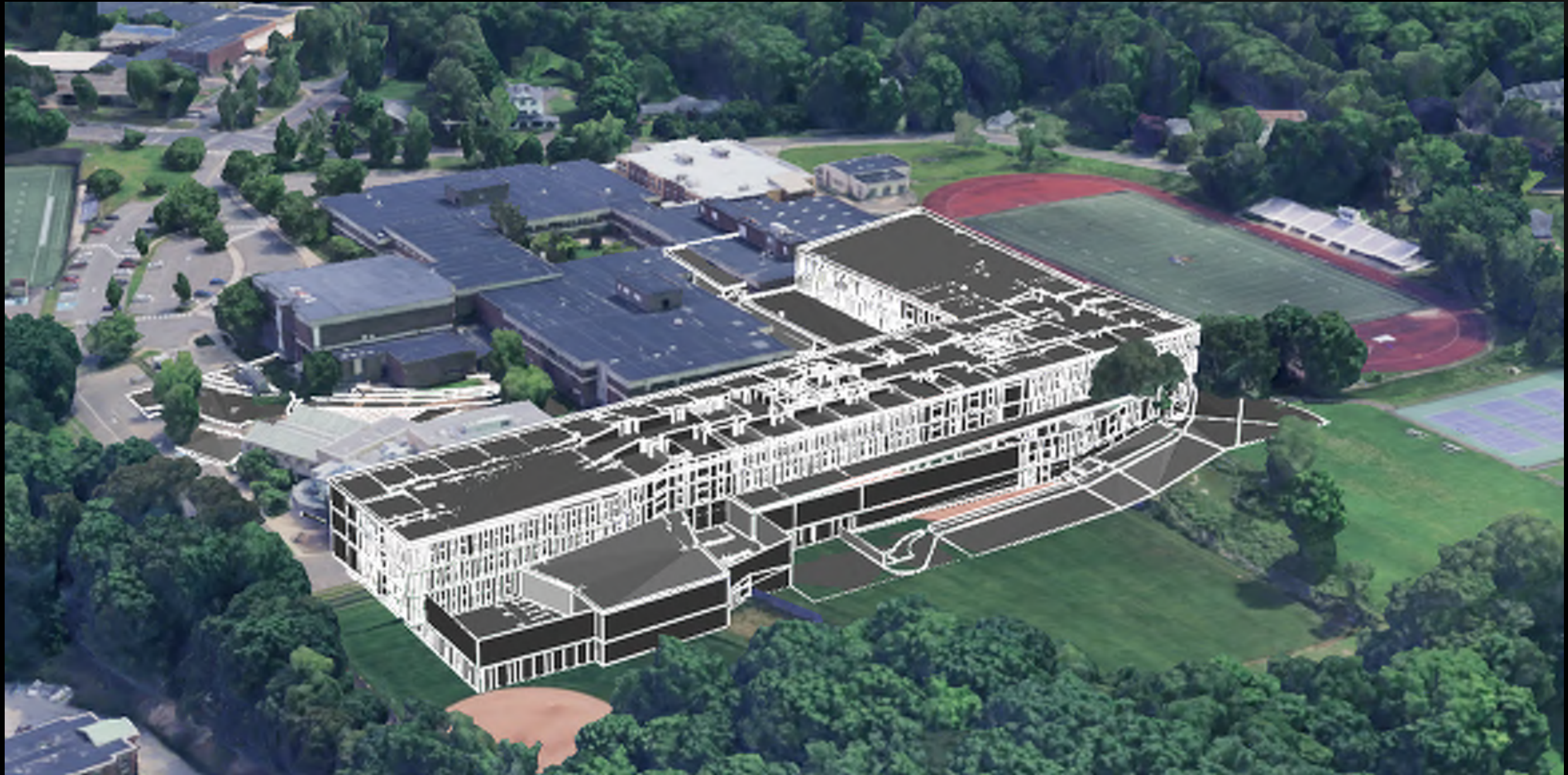


Figure 21: PRELIMINARY BUILDING MODEL - GOOGLE EARTH (2)

2.1 PRELIMINARY BUILDING MODEL CONTINUED



Figure 22: PRELIMINARY BUILDING MODEL - GOOGLE EARTH (3)

2.4 SUPPLEMENTARY SPECIFICATION

SUPPLEMENTARY SPECIFICATION SECTION ATTACHED FOLLOWING REPORT CONTENTS

RECOMMENDED COURSE OF ACTION

1. COORDINATE MEETING WITH FACILITY, STAMFORD FD, CTS UNIT

- Coordinate a joint meeting with key stakeholders, including facility management, representatives from the Stamford Fire District, and the Connecticut Division of Statewide Telecommunications (CTS) Unit.
- Solicit input from the Stamford Fire District regarding any jurisdiction-specific preferences, operational constraints, or anticipated future needs for the emergency communication system. Request CTS Unit clarification on any statewide or simulcast network integration requirements not explicitly documented in the existing technical bulletins. Identify any additional regulatory, performance, or physical infrastructure considerations (e.g., fire alarm integration, alarm supervision, monitoring point locations).

2. PRE-CONSTRUCTION EXTERIOR BENCHMARK SURVEY

- Perform an exterior benchmark signal level survey to evaluate emergency responder radio coverage in accordance with applicable requirements to inform future refinements to the building's RF propagation model.
- Coordinate directly with the Connecticut Division of Statewide Telecommunications (CTS) Unit and the Stamford Fire District to ensure both agencies are present on-site during the survey and aligned with test procedures.
- Capture and document signal measurements at strategic exterior locations using calibrated equipment, with results to be used in system design updates and included in documentation submitted for AHJ review.

3. REFINE BUILDING PROPAGATION MODEL AND SYSTEM DESIGN LAYOUT

- Refine the iBwave building propagation model and system design layout to serve as the basis of record for contract design.
- Incorporate additional inputs from the equipment manufacturer (Westell) and qualified system integration vendors (references available upon request)

4. SEQUENCED IN-BUILDING SIGNAL SURVEYS AT CRITICAL CONSTRUCTION MILESTONES AND SUBSTANTIAL COMPLETION

- Schedule series of in-building benchmark signal surveys at critical construction milestones to assess the evolving RF environment and identify the potential need for an ERRCS as early as feasible.
- Use preliminary survey results to guide system planning and coordinate timely provisioning of system components and installation, reducing risk of schedule impacts later in the project.
- Conduct a final comprehensive signal survey at the point of substantial completion to formally document building signal strength characteristics and submit as justification for system requirement in accordance with AHJ expectations.

APPENDIX

4.1 BENCHMARK PARAMETERS

For the purposes of benchmark testing, potential criteria utilized to interpret sufficient signal strength and predicted quality of emergency responder radio communications is as follows:

EXTERIOR SITE SIGNAL LEVEL

SECTION 510, 2022 CONNECTICUT STATE FIRE CODE - 2021 IFC PORTION

510.1 Emergency responder radio coverage in new buildings.. Approved in-building, two-way emergency responder communication coverage for emergency responders shall be provided in all new buildings. In-building, two-way emergency responder communication coverage within the building shall be based on the existing coverage levels of the public safety communication systems utilized by the jurisdiction, measured at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

DELIVERED-AUDIO-QUALITY (DAQ) TEST

- DELIVERED AUDIO QUALITY METRICS (DAQ):**
- DAQ 1** Unusable. Speech present but not understandable.
 - DAQ 2** Speech understandable with considerable effort. Requires occasional repetition due to noise/distortion.
 - DAQ 3** Speech understandable with slight effort. Requires occasional repetition due to noise/distortion.
 - DAQ 3.4** Speech understandable without repetition. Some noise/distortion present
 - DAQ 4** Speech easily understood. Occasional noise/distortion present.
 - DAQ 5** Speech easily understood.

TABLE 2: DELIVERED AUDIO QUALITY (DAQ) TEST PARAMETERS

GRID TEST

MEASUREMENT		DL AREA POINT	DL CRITICAL POINT
GENERAL POWER (RSSI)		-95.0 dBm	-95.0 dBm
P25 POWER (RSSI)		-95.0 dBm	-95.0 dBm
P25 S/N (SINR)		18.0 dB	18.0 dB
P25 FBER		2.60%	2.60%

MEASUREMENT		SAMPLE COLLECTION METHOD	
P25 TRAFFIC CHANNELS POWER		MAX	
P25 CONTROL CHANNELS POWER		AVERAGE	

TEST DETAILS			
FLOORS TESTED	4	RESULT CALCULATION	BY AREA BY FLOOR
AREAS TESTED	MIN 80	AREA PASS CRITERIA	95%
CRITICAL POINTS TESTED	-	CRITICAL POINT PASS CRITERIA	99%

TABLE 3: GRID TEST PARAMETERS

REFERENCES

1. SECTION 510, 2022 CONNECTICUT STATE FIRE CODE - 2021 IFC PORTION

510.1 Emergency responder radio coverage in new buildings. Approved in-building, two-way emergency responder communication coverage for emergency responders shall be provided in all new buildings. In-building, two-way emergency responder communication coverage within the building shall be based on the existing coverage levels of the public safety communication systems utilized by the jurisdiction, measured at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

510.4.1 Emergency responder communication enhancement system signal strength. The building shall be considered to have acceptable in-building, two-way emergency responder communication system coverage where signal strength measurements in 95 percent of all areas and 99 percent of areas designated as critical areas by the fire code official on each floor of the building meet the signal strength requirements in Sections 510.4.1.1 through 510.4.1.3.

510.4.1.1 Minimum signal strength into the building. The minimum inbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area as specified by the fire code official. The inbound signal level shall be a minimum of -95 dBm throughout the coverage area and sufficient to provide not less than a Delivered Audio Quality (DAQ) of 3.0 or an equivalent Signal-to-Interference-Plus-Noise Ratio (SINR) applicable to the technology for either analog or digital signals.

510.4.1.2 Minimum signal strength out of the building. The minimum outbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area as specified by the fire code official. The outbound signal level shall be sufficient to provide not less than a DAQ of 3.0 or an equivalent SINR applicable to the technology for either analog or digital signals.

510.4.2.6 Additional frequencies and change of frequencies. The in-building, two-way emergency responder communication coverage system shall be capable of modification or expansion in the event frequency changes are required by the FCC or other radio licensing authority, or additional frequencies are made available by the FCC or other radio licensing authority.

2. CTS UNIT, CLMRN - TECHNICAL ADVISORY BULLETIN, INTERIM EMERGENCY RESPONDER RADIO COVERAGE ENHANCEMENT

3. DELIVERED AUDIO QUALITY METRICS (DAQ):

- DAQ 1** Unusable. Speech present but not understandable.
- DAQ 2** Speech understandable with considerable effort. Requires occasional repetition due to noise/distortion.
- DAQ 3** Speech understandable with slight effort. Requires occasional repetition due to noise/distortion.
- DAQ 3.4** Speech understandable without repetition. Some noise/distortion present
- DAQ 4** Speech easily understood. Occasional noise/distortion present.
- DAQ 5** Speech easily understood.

4. DAQ/SINR/BER % - EQUIVALENCE TABLE (SOURCE: TIA TSB-88. 1E Annex A Table A1 11/2018)

RADIO	DAQ 3.0	DAQ 3.0
	BER %	SINR
P25 C4FM	2.6	17.4
P25 CQPSK	2.6	15.7