PHA Wireless Communications: Addendum

Extension to: Technical Feasibility Study (January 2026)
Subject: Greenfield Application (Ghana Medical City) and Patent Considerations

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Greenfield Application

The primary feasibility study examines retrofitting existing PHA buildings. The same perimeter broadcast model applies to new construction with different cost and performance characteristics.

Ghana Medical City is a 553-acre integrated healthcare and education district in Eastern Region, Ghana.

Component	Scale
Teaching Hospital	300 beds, 300,000 SF
University Campus	68,200 m², 5,000+ students
Covered Stadium	25,000 seats
Entertainment District	35 acres
Housing Districts	Multiple phases

Reference: cityplan.nsgia.com

Retrofit vs. Greenfield

Factor	Retrofit (Alabama PHA)	Greenfield (Ghana)
Building orientation	Fixed	Controllable
Wall materials	Survey each building	Specify during design
Utility node placement	Work around existing infrastructure	Design into site plan
Window placement	Fixed	Orient toward AP locations

In new construction, RF-friendly zones (window bands, covered walkways, courtyards) serve both climate-responsive ventilation and signal penetration. The Ghana project specifies brick construction with courtyards and brise-soleil screens — architectural elements that also function as RF pathways.

Multi-Use Utility Nodes

Rather than separate infrastructure for WiFi, security, IoT, and lighting, a single mast incorporates all functions.

Function	Hardware
WiFi broadcast	Directional outdoor AP
Security camera	PTZ or fixed IP camera
LoRaWAN gateway	LPWAN radio for IoT sensors
Lighting	LED fixture (solar option)
Aesthetic element	Flag, banner, architectural form

LoRaWAN specifications:

Parameter	Value
Range	2-10 km urban, 10+ km rural
Sensor battery life	5-10+ years
Gateway cost	$200-500
Sensor cost	$15-50 each

One gateway covers the entire 553-acre district. Applications include temperature monitoring, leak detection, door/window sensors, occupancy detection, and equipment monitoring across hospital, university, housing, and grounds.

Brick Construction and RF

Ghana Medical City specifies brick and masonry for climate-responsive design and local material sourcing.

From NIST IR 6055:

Material	Attenuation (2.4 GHz)	Attenuation (5 GHz)
Single-wythe brick (4")	4-8 dB	8-15 dB
Double-wythe brick (8")	8-15 dB	15-25 dB
Glass window	0.5-3 dB	2-4 dB

Utility mast placement accounts for window locations and lighter wall sections.

Cost Comparison

Traditional separate-system approach (estimated):

System	Cost
Campus WiFi network	$800,000-1,200,000
Security camera system	$300,000-500,000
Building automation/IoT	$200,000-400,000
Exterior lighting	$150,000-300,000
Total	**$1.45-2.4 million**

Integrated utility node approach (estimated):

Component	Cost
Central backhaul	$50,000-100,000
Utility masts (40-60 units @ $3,000-5,000 each)	$150,000-250,000
LoRaWAN sensors (500 units)	$25,000-50,000
Management platform	$20,000-40,000
Installation	$100,000-150,000
Total	**$345,000-590,000**

Projected savings: 60-75% reduction in infrastructure capital cost.

These are planning estimates. Actual costs require detailed engineering and vendor quotation.

Patent Considerations

Prior Art Summary

Research conducted January 2026:

Smart poles / multipurpose utility poles: Commercial products exist (Bivocom, Comba Telecom, Omniflow) combining WiFi, cameras, sensors, and lighting on streetlight poles for municipal smart city applications.

Combined WiFi/LoRaWAN hardware: Milesight manufactures cameras with built-in LoRaWAN gateways.

Outdoor WiFi for campus coverage: Enterprise campus WiFi with outdoor access points is standard practice.

MDU managed WiFi: Commercial providers (Ruckus, Cambium, Dojo Networks) offer building-wide WiFi for apartments. All identified solutions use interior access points wired to hallways or units.

Potential Novelty

The following combination appears to lack specific prior art:

Inward-directed perimeter broadcast: Smart city poles broadcast outward to streets. The identified prior art does not describe outdoor access points specifically oriented to broadcast inward through building walls to serve residential units without interior wiring.

Residential aesthetic integration: Smart city poles are industrial infrastructure. The flagpole/architectural element approach — designed to match institutional visual vocabulary — appears distinct from municipal smart pole design.

MDU-specific cost structure: The economic model targets affordable housing, comparing perimeter broadcast cost ($40-70/unit) against traditional wiring ($700-1,200/unit).

Integrated property management: Combining WiFi delivery with LoRaWAN property management sensors and security cameras as a unified package for housing operators.

Greenfield architectural integration: Designing building orientation, window placement, and construction materials to optimize RF penetration from pre-planned utility node locations.

Potentially Patentable Claim

A wireless communication and property management system for multi-dwelling residential buildings comprising:

(a) architecturally-integrated mast structures positioned around building perimeters or throughout a development district, each mast incorporating directional WiFi access points oriented inward toward dwelling units;

(b) at least one LPWAN gateway providing property-wide IoT sensor communication;

(c) security cameras integrated with said mast structures;

(d) optional lighting and aesthetic elements;

wherein the system provides building-wide or district-wide WiFi coverage without interior wiring or in-unit equipment installation.

Patent Filing Costs

USPTO provisional patent application (small entity, electronic filing): **$130**

Option	Cost	Timeline
Provisional patent (small entity)	$130	12 months patent pending
Utility patent (small entity)	$3,000-6,000 total	2-4 years to issuance

The provisional application establishes priority date. Conversion to utility patent follows if field results confirm viability.

Implementation Pathway

Alabama PHA (Retrofit): Single building pilot validates core technology. Field data supports patent application.

Ghana Medical City (Greenfield): Infrastructure designed into site plan during architectural phase. Demonstrates optimized implementation.

Both applications proceed in parallel. Alabama provides fast validation. Ghana demonstrates greenfield integration.

Summary

The perimeter broadcast model applies to both retrofit (Alabama PHA) and greenfield (Ghana Medical City) applications.

The greenfield application offers:

- Building orientation optimized for RF penetration
- Multi-use utility nodes replacing separate infrastructure systems
- 60-75% projected cost reduction vs. traditional approach

The combined system — inward-directed perimeter broadcast, residential aesthetic integration, unified property management, greenfield architectural integration — appears to lack specific prior art.

Provisional patent filing cost for small entity: $130.

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