

# Installing Wi-Fi & Small Cell Access Points in K-12 and Higher Education Facilities

Wi-Fi and Small Cell wireless networks are ubiquitous on college campuses and residence halls. Full-campus installations challenge the network designer and installer because wireless service is required in such diverse settings as classrooms, libraries, laboratories, administration buildings, residence halls, auditoriums, stadiums and outdoor areas. Adding complexity to the network design process, these facilities are comprised of many types of construction, including historically and architecturally sensitive buildings, older construction residence halls, high-density classrooms and auditoriums, and outdoor campus areas. The wireless network is an essential part of educational programming and administration and is used for campus-wide notification, IoT and research.

The mission-critical nature of the wireless network in education necessitates consideration of a wide variety of requirements:

- Provide superior, reliable wireless coverage throughout every type of facility and construction
- Blend aesthetically with the indoor and outdoor environment, particularly important on college campuses
- Physically protect access points and associated cabling from theft, vandalism, tampering, accidental damage, and unauthorized moves and disconnects
- Protect access points from weather, spilling liquids and environmental damage where appropriate
- Achieving convenience of installation while preventing of authorized access to the wireless access point

Simultaneously satisfying all the above criteria will challenge the network designer and installer to use every tool in the toolbox. Oberon provides products to help the wireless designer and installer achieve these objectives.

## Full-Campus Solutions

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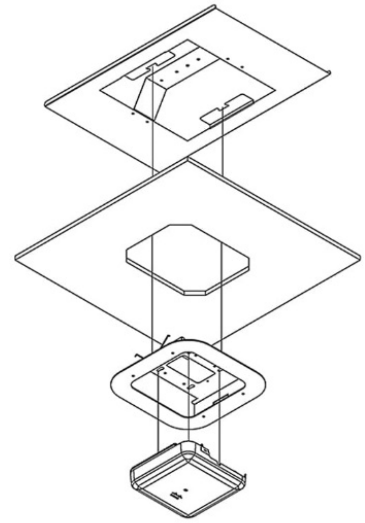


# Wireless Coverage in Typical Classrooms

College classrooms and administration areas are typically conventional commercial construction with suspended or panel ceilings.

Oberon offers a wide variety of ceiling recess mounts for access points from all leading vendors. These recess mounts help to:

- Blend the access point into the environment
- Protect the AP and cabling
- Preserve the ideal wireless coverage from the ceiling



Oberon *Wi-Tile™* 1047 suspended ceiling locking enclosure with Aruba AP

[oberoninc.com/collection/wi-tile](http://oberoninc.com/collection/wi-tile)



Oberon *Envelop™* Model 1042 hard ceiling recess mount for Aruba AP

[oberoninc.com/collection/envelop](http://oberoninc.com/collection/envelop)



Oberon *Envelop™* Model 1040 recess mount for suspended and cloud ceilings conceals the AP behind a low-loss, low-profile plastic cover

[oberoninc.com/collection/envelop](http://oberoninc.com/collection/envelop)



# Wireless Coverage in High-Density Venues

## Auditoriums – Concert Halls – Indoor Sports Venues



The TIA TSB-162 Telecommunications Guidelines for Wireless Access Points recommends providing for placement of at least one Access Point (AP) within each 60' X 60' building cell. This aligns with recommendations from leading access point manufacturers to use one AP per 2,500 to 3,000 sq. ft. However, schools have many facilities with much higher density requirements such as large classrooms, auditoriums and stadiums. In these facilities, the TIA 4966 Telecommunications Infrastructure for Educational Buildings and Spaces standard recommends a density of one AP for every 25 occupants, as shown in the chart.

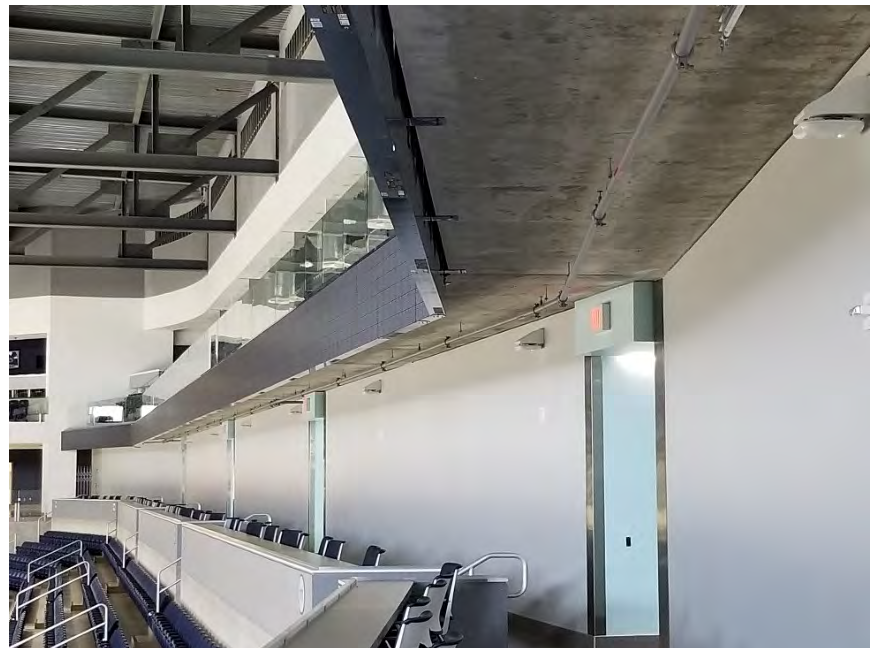
Facility Occupancy	Number of APs
1 - 25	1
26 - 50	2
51 - 75	3
76 - 100	4
101 - 125	5
126 - 200	9
201 - 300	14
301 - 400	18
401 - 500	21

*TIA 4966 Telecommunications Infrastructure for Educational Buildings and Spaces Recommended Wireless Access Point Density*

## Simplifying Installation in Challenging Environments

The large number of APs required and the absence of a convenient ceiling can make outfitting such facilities a challenge. These facilities often lack both the suspended ceilings into which the AP can be mounted and the above-ceiling space through which the horizontal cabling can be conducted. The installer is challenged to find a place for AP and associated cabling.

Furthermore, leading access point manufacturers recommend mounting the AP in a horizontal orientation to achieve the best antenna coverage, making it undesirable to simply mount the AP like a clock on the wall. Oberon offers a wide variety of products which can help to integrate APs into the environment, including right-angle wall brackets, open-ceiling fixtures and under-seat mounts.

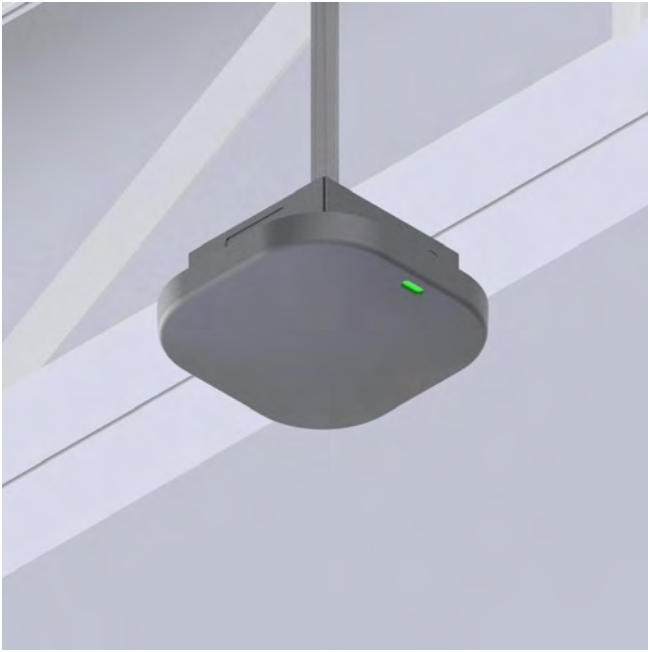


Oberon *H-Plane*<sup>™</sup> right-angle AP wall mounts provide a convenient place to mount APs in places where the ceiling is not convenient, accessible, or too high.

They can be used in high-density areas such as auditoriums, lectures halls and indoor sports venues to provide optimized wireless coverage.

Oberon *H-Plane*<sup>™</sup> Model 1011 places the access point in the preferred horizontal orientation for ideal wireless coverage.





Oberon *H-Plane™* Model 900-HC hanging conduit mount simplifies access point installation in areas with open ceilings.

- Convenient to install
- Conceal APs in open ceilings
- Built-in mounting features for Cisco and HP Aruba APs
- Universal T-bar mount for all other AP vendors
- Mounts the AP in the preferred horizontal orientation
- Easily terminate local patch cord inside box
- Conceal the AP in dark ceilings with the available black ABS plastic vanity cover



Oberon *Skybar™* Model 1020-USM30 is a NEMA-4-rated, compact under-seat enclosure for most vendors' APs. Protect APs in under-seat installations in high-density venues.

# Establishing Outdoor Wi-Fi Networks for Schools

Extending the Wi-Fi network outdoors creates a new set of challenges. APs need to go where the people are, but installers are often precluded from mounting APs on buildings or on light poles. Access points still need to provide the optimum wireless coverage, but must be physically secured, protected from the elements, and perhaps above all, aesthetically blended into the environment. Oberon offers a wide range of NEMA-rated, water-tight, UV-resistant enclosures designed with aesthetics in mind.

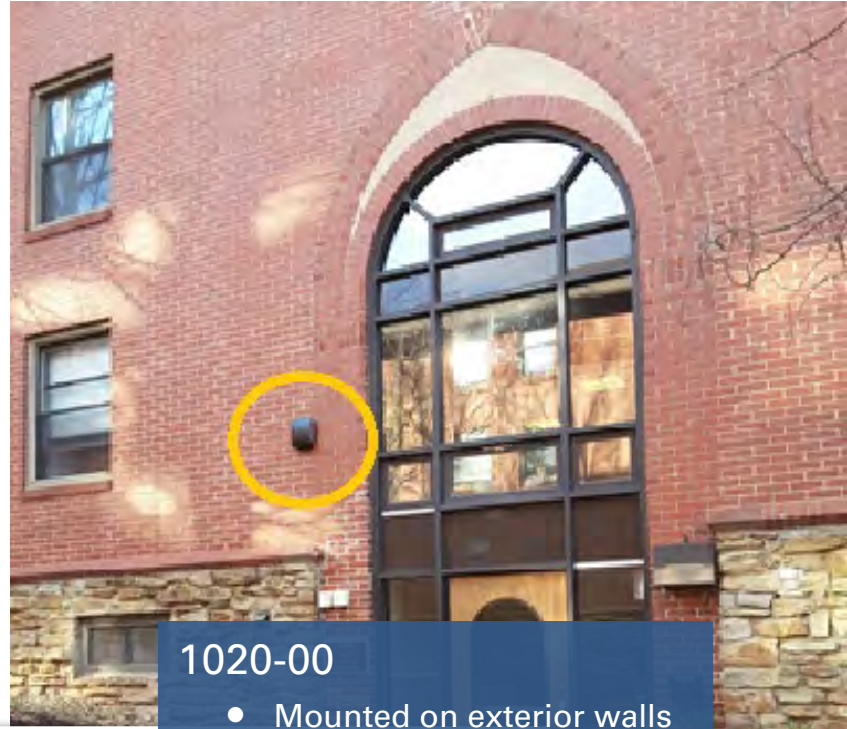
## Solutions for Challenging Environments

Educational facilities include a wide variety of environments, indoors and out. Oberon supports education networks with secure access point enclosures and mounts for use in diverse installation settings. Our solutions are designed to simplify installation, secure and protect the AP, and optimize the wireless performance of access points and antennas.





Oberon's most compact *Skybar* NEMA 4 enclosure conceals and protects APs with embedded antennas in locations where it is desirable to minimize the visibility of the AP. The Model 1020 is a rugged, low-loss ABS plastic enclosure. It can be painted to blend in with the environment and is ideal for courtyards and entryways. Available with a right-angle mounting bracket (to position the AP in the preferred horizontal orientation), and a pole mounting bracket.



1020-00

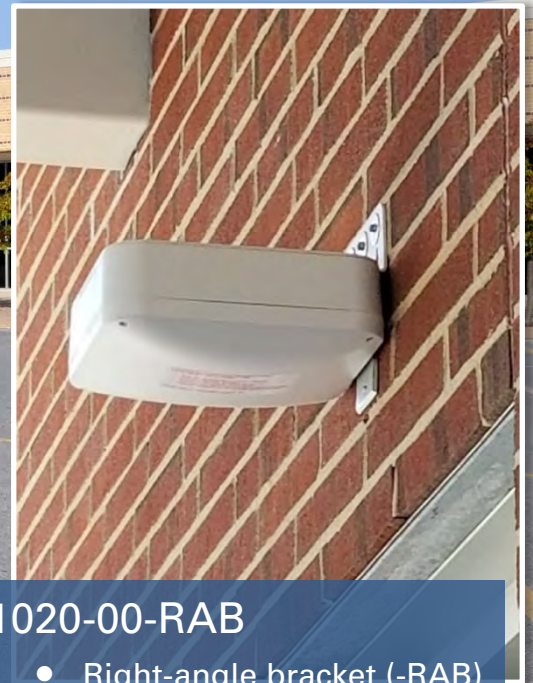
- Mounted on exterior walls

# 1020 Series



1020-00-RAB-PMK

- Right-angle bracket (-RAB)
- Pole mount kit (-PMK)



1020-00-RAB

- Right-angle bracket (-RAB)



# 1021 Series



## 1021-00-PMB

- Pole mount bracket (-PMB)



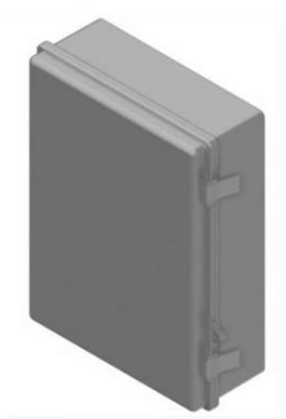
## 1021-00-ANTPLATE PMB

- Internal articulating mounting accessory (ANTPLATE)
- Pole mount bracket (-PMB)

Sized for flexibility, the Model 1021 *Skybar* NEMA 4 enclosure is large enough to conceal and protect APs and directional (panel) antennas. The Model 1021 is a rugged, low-loss polycarbonate plastic enclosure available with an internal articulating antenna mount and a pole mounting bracket.

The 1021 is ideal for Wi-Fi coverage in parking areas and garages as it can be mounted on the wall or on light poles. It can be painted to blend in with the environment.





The easy-to-install model 1024 NEMA 4 enclosure features a hinged, lockable lid. A universal interior mount panel will accommodate all leading vendors' APs. This rugged, polycarbonate, low-loss enclosure is available with either a clear or opaque door and is large enough for AP with attached antennas. Ideal for Wi-Fi coverage in parking areas and garages.

# 1024 Series





Oberon's Model 3001-00 is an outdoor shroud for concealing larger outdoor Wi-Fi and small cell APs, antennas, remote radio heads, cabling and connectors. The Model 3001-00 includes a paintable, rugged ABS plastic hinged cover which is virtually transparent to wireless signals. The 3001-00 also includes a heavy-duty panel for mounting APs, antennas, and brackets from most leading wireless vendors. Where outdoor network aesthetics is paramount, conceal and protect outdoor rated wireless equipment.

# Model 3001

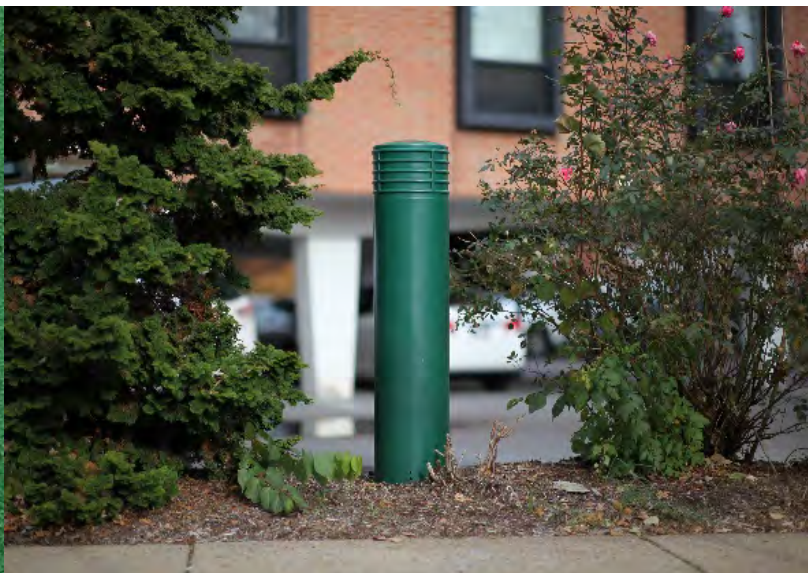




# 3032 Series



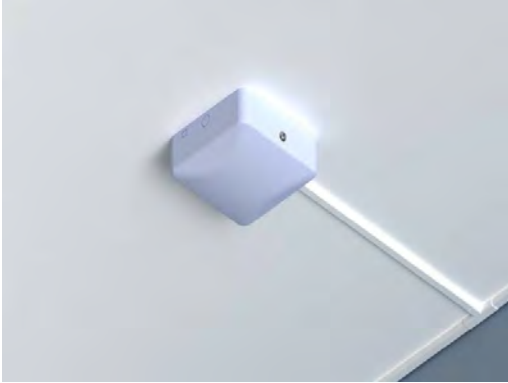
Oberon's *NetPoint™* 3032 Wi-Fi Bollard extends wireless coverage into outdoor areas. These bollards are 60" tall and are large enough to conceal and protect most vendors' outdoor APs, antennas, cables, power injectors and media converters. Wi-Fi bollards allow the wireless designer to install the wireless infrastructure where it is needed, without hanging APs on walls or light poles. *Netpoint™* Wi-Fi bollards are available in a wide variety of colors suitable for most campus and park environments.



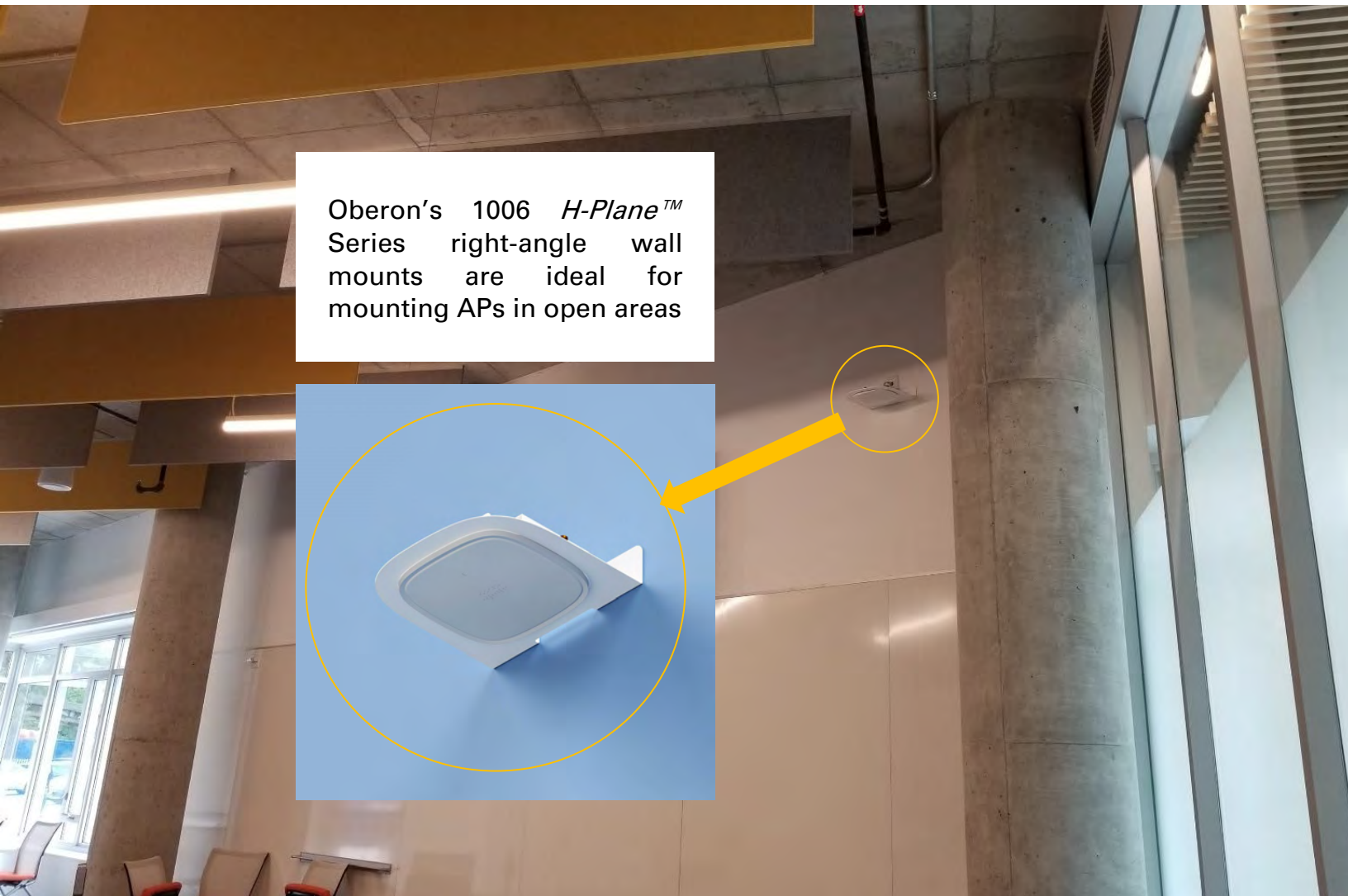


# Installation in Residence Halls and Common Areas

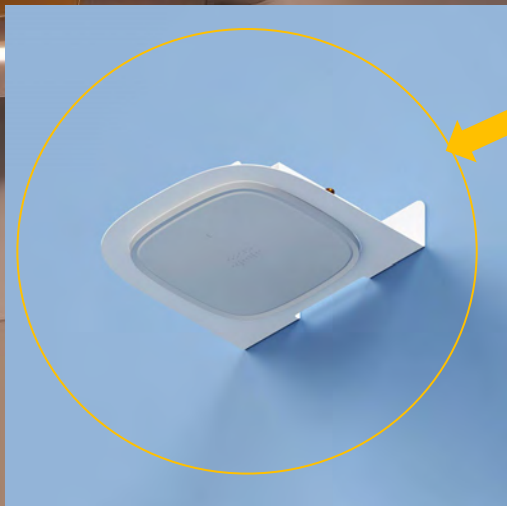
In residence halls, hotel-style APs are commonly installed in individual rooms. In food service halls, gymnasiums, libraries, laboratories and other open common areas throughout campus, the AP should be secured from theft, vandalism, tampering, and unsolicited moves, adds, and changes. Securing the AP will reduce service and maintenance calls.



Install APs in difficult locations with Oberon's Model 1015-00 *HiBar™* all-plastic lock-box, which aesthetically secures the AP and cabling. The 1015-00 is large enough for most vendors' APs, and is constructed of low-loss, impact-resistant ABS plastic.



Oberon's 1006 *H-Plane™* Series right-angle wall mounts are ideal for mounting APs in open areas





## Sidebar: Loss in Construction Material

Residence halls and other campus buildings create a challenge for the wireless designer due to the wide variety of construction styles and ages. Based on results below, from a large sample of site surveys, it is evident that the loss through common building materials can be quite variable. Block walls, plaster and metal lathe walls, and E-Glass create a high loss barrier. Regular glass and drywall are much lower loss.

The wireless loss through building material is dependent on material thickness and composition, wireless signal frequency, and the angle at which the signal passes through the material. The table below provides an idea of the variability in building material loss and shows how difficult it can be to estimate the coverage of wireless access point. Note that the loss is given in a logarithmic scale (dB). A 3 dB loss is a loss of 50% the power, a 10 dB loss is a loss of 90% of the power, a 20 dB loss is a loss of 99% of the power.

Wireless Loss through Typical Building Materials

MATERIAL	900 MHz (Cellular)	2.4 GHz (Wi-Fi)	5-6 GHz (Wi-Fi)
Regular glass	< 1 dB	0.5 - 3 dB	2 - 6 dB
Ceiling tile (5/8")	< 1 dB	0.1 - 2 dB	0.2 - 3 dB
Drywall sheet (1/2")	1 - 3 dB	0.5 - 4 dB	1 - 5 dB
Particle board/door	1 - 3 dB	1.6 - 4 dB	2 - 7 dB
Brick wall	> 5 dB	5 - 18 dB	15 - 30 dB
Block wall	> 7 dB	7 - 18 dB	10 - 30 dB
Reinforced concrete	> 15 dB	> 15 dB	> 20 dB
Low E-glass	> 13 dB	> 13 dB	> 20 dB

Most schools are engaging the 5 GHz band to the maximum extent possible due to the much greater bandwidth available in the 5 GHz band versus the 2.4 GHz band. In theory, attenuation at 5 GHz should be similar to attenuation at 2.4 GHz, but in practice, some materials attenuate the 5 GHz signal much more than 2.4 GHz, so the wireless coverage is not as large at 5 GHz as it is at 2.4 GHz. However, a knowledgeable designer will use the greater attenuation at 5 GHz as an advantage to design high-density, high-bandwidth Wi-Fi networks.

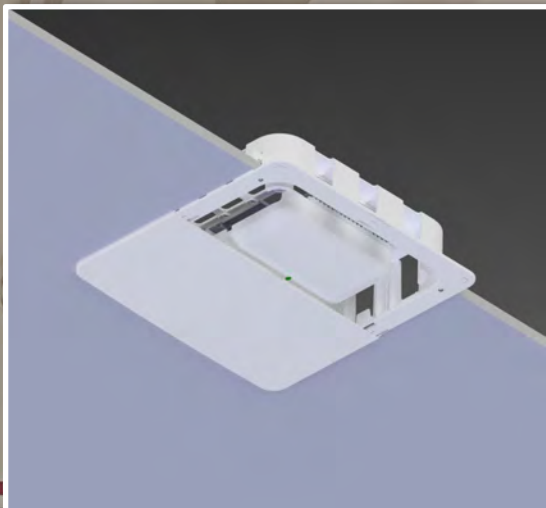


Oberon offers a wide variety of solutions for mounting and securing the Wi-Fi access points in the preferred horizontal orientation in a variety of challenging construction environments.

# Installation in Historical Buildings

Many campuses have historical buildings of great importance to the community, and the desire to preserve the character and appearance of the building is paramount. These structures require special attention to the wireless installation due to the complexity of the construction and the sensitivity of the setting.

Typically, these buildings lack suspended ceilings and do not have convenient pathways for cabling. Oberon has engaged an industrial designer to develop solutions suitable for architecturally sensitive venues. These include a line of surface mounts and recessed hard-lid ceiling- and wall-mountable access point enclosures and mounts.



*Oberon's Model 1019-RM Envelop™ recess ceiling/wall mount AP enclosure is large enough for most vendors' APs and features a paintable, low-loss, low-profile, snap-on cover.*



*Oberon's Model 1007 right-angle AP wall mount mimics a lighting wall sconce. Interchangeable trims allow the installer to recess APs from most vendors into the wall sconce.*



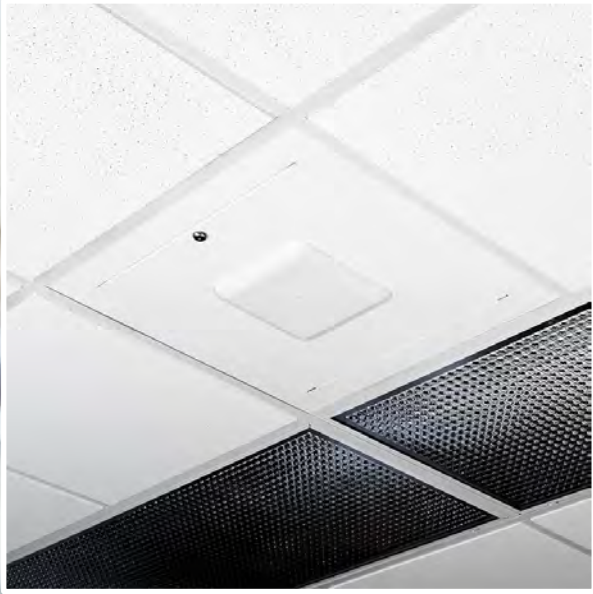
# Installation in University Health Centers and Hospitals

Installing the wireless network in University health centers and hospitals will pose a new set of requirements. Hospitals are extremely careful to avoid the spread of Airborne Infectious Diseases, which are a contributor to hospital acquired infections. Airborne Infectious Diseases are comprised of mold and fungal spores, airborne dust particles which may bear bacteria and virus, and other airborne nuclei. The space above a ceiling (whether used as a plenum for air handling or not) or in a wall is recognized as a reservoir for these diseases. Hospitals now - especially leading University research hospitals - are extraordinarily careful NOT to breach the ceiling barrier. Mounting APs above a suspended ceiling, or on the ceiling gridwork and poking holes in the ceiling tile for the data cable, is prohibited in some facilities.

Additionally, The Joint Commission (the body that accredits healthcare facilities) has specified that facilities should establish Infection Control Risk Assessment (ICRA) procedures for mitigating the spread of infectious disease and agents. Again, recognizing that the space above a suspended ceiling may accumulate dust and generate mold spores, the ICRA procedures may restrict access to the space above suspended ceilings. If work is to be performed above the suspended ceiling, requiring that ceiling tiles are lifted or moved, it may be necessary to get a permit and "tent-off" the work area using plastic sheets, or use a moveable Negative Air-Pressure Enclosure (NAPE). The tented area needs to be ventilated and the air filtered by a HEPA filter. This process is time-consuming and may be disruptive to workflow in the vicinity. Unfortunately, this space above, or in, the suspended ceiling is precisely where wireless access points are located, due to preferred wireless coverage from the ceiling location. Likewise, the supporting cabling for the wireless is in this space above the ceiling tiles.

Oberon's line of UL listed suspended ceiling AP enclosures are designed to preserve the integrity of the ceiling barrier and simplify ICRA procedure compliance. With the AP mounted in the ceiling enclosure, the AP can be accessed without requiring a permit, or deploying a NAPE enclosure.





Oberon Model 1047 Wi-Tile™ suspended ceiling enclosures feature lockable, easily interchangeable doors. Enclosures accommodate APs from most vendors for easy ICRA-compliant equipment changes. The APs are recessed revealing only the antennas of the AP, providing for optimum wireless coverage.



Oberon Model 1074-SC Wi-Tile™ suspended ceiling enclosures preserve the integrity of the ceiling system, helping to mitigate the spread of airborne infectious disease, simplifying compliance with ICRA procedures and maintaining the smoke and fire barrier.

## Cabling to Wireless Access Points

The BICSI TSB-162A recommends using Category 6A cable to each AP, and many schools are electing to run two Category 6A cables to each location to anticipate future needs for additional bandwidth, power, or devices at each location. When cabling for the AP, remember to consider the rapid development in device bandwidth and powering needs.



## About Oberon

Oberon offers the widest selection of indoor and outdoor wireless enclosures and aesthetic mounting solutions for securing wireless infrastructure in virtually every venue. Oberon's products are used where RF coverage, infrastructure security, environmental robustness, and aesthetics are paramount in the network implementation. Oberon is a division of Chatsworth Products.

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