



Best Practices for Healthcare Lighting

Operating Room & Hybrid OR



SCOTT

Regional Manager - Central



RICHARD

Regional Manager - West



CHAD

National Sales Manager

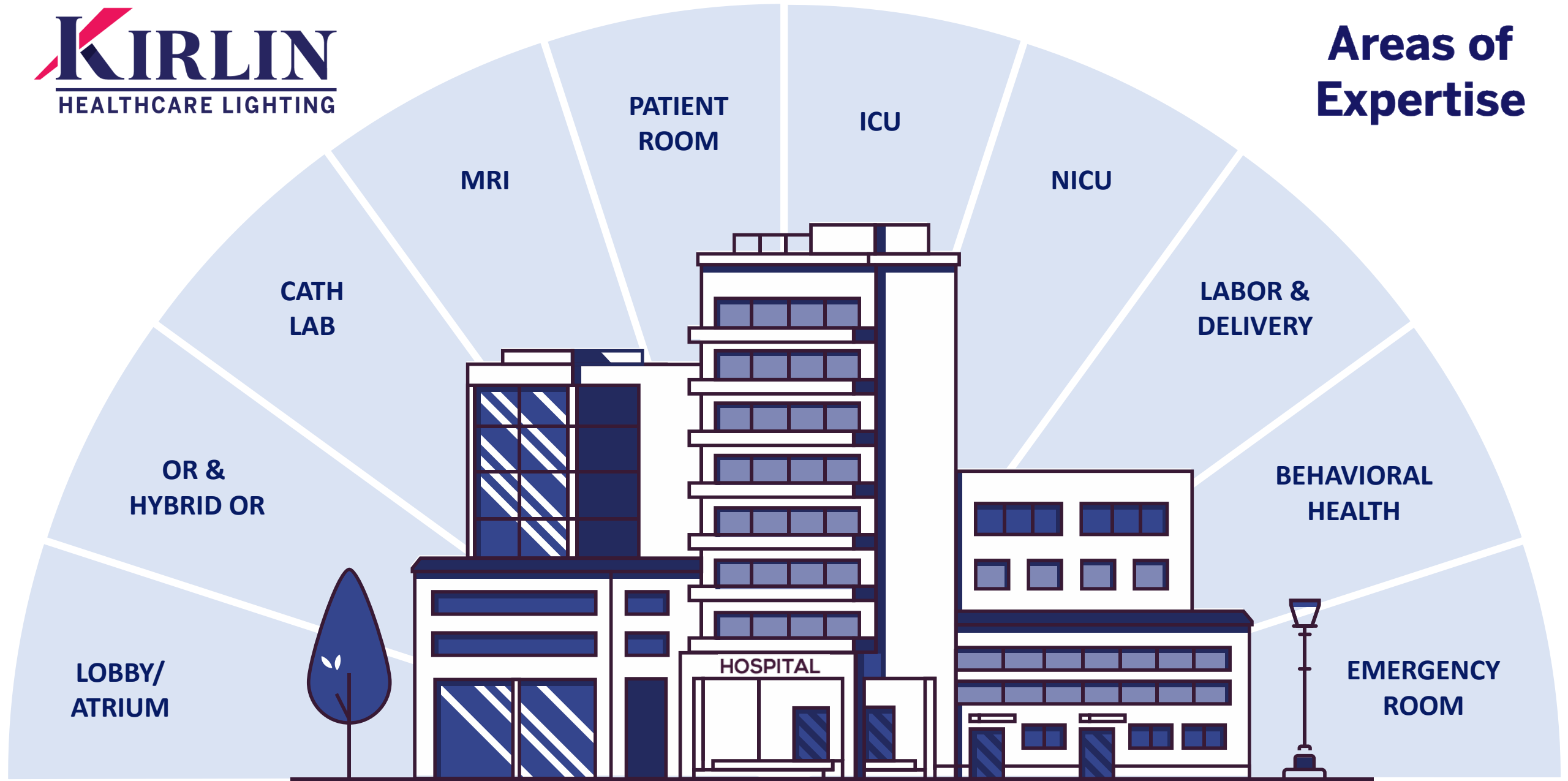


CHRIS

VP Sales & Marketing

Key Focus Areas





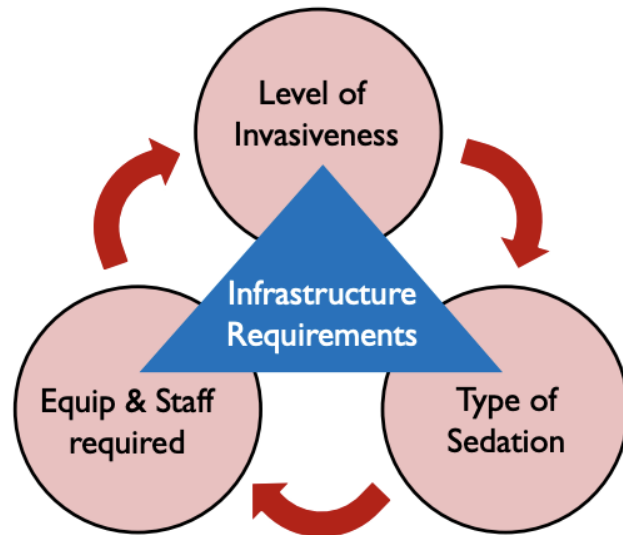
Areas of Expertise



Planning for Surgical & Diagnostic Spaces



An understanding of the following is required to inform the planning of diagnostic, surgical, and interventional spaces.



- *Level of invasiveness, likelihood of infection*
- *Type of sedation used to conduct procedure*
- *Number of staff expected in the room during procedure*
- *Equipment needed to support procedure*

Which, in turn, determine the design requirements:

- *Room classification*
 - Procedure room (formerly Class A)*
 - Operating room (formerly Class B & C)*
 - Type of Imaging room (new Class 1, 2, and 3)*
- *Room size*
- *Room finishes*
- *Room Infrastructure (MEP systems)*

Three Classes of Rooms



1

Procedure Room Type	Imaging Room Type	Use
Exam/ Treatment Room	Class 1 Imaging Room	A room designated for the performance of patient care that may require high-level disinfected or sterile instruments but is not required to be performed with the environmental controls of a procedure room.
Procedure Room	Class 2 Imaging Room	A room designated for the performance of patient care that requires high-level disinfection or sterile instruments and some environmental controls but is not required to be performed with the environmental controls of an operating room.
Operating Room	Class 3 Imaging room (Hybrid OR)	A room that meets the requirements of a restricted area, is designated and equipped for performing surgical or other invasive procedures, and has the environmental controls for an OR as indicated in ASHRAE 170. An aseptic field is required for all procedures performed in an OR.

2

3

Operating Rooms & Hybrid Operating Rooms are **Class 3 spaces**, designated for surgical and invasive procedures.

An aseptic field is required for all procedures performed in these spaces.

OR & Hybrid OR Guidelines



Room Type	Use	Environmental Controls		
		Location	Ventilation	Surfaces
Class 3 Imaging room (Hybrid Operating Room)	Invasive procedures* Any Class 2 procedure during which the patient will require physiological monitoring and is anticipated to require active life support	Accessed from a semi-restricted area	20 total ACH, Positive pressure Primary supply diffuser array extend a minimum of 12' beyond the footprint of the surgical table on each side	Ceiling: Monolithic, scrubbable, capable of withstanding cleaning and/or disinfecting chemicals, gasketed access openings Flooring: Cleanable and wear-resistant for the location; stable, firm, and slip-resistant Floor and wall base assemblies: Monolithic floor with integral coved wall base carried up the wall a minimum of 6 inches Wall finishes: Washable; free of fissures, open joints, or crevices
Operating Room	Invasive procedures* Any procedure during which the patient will require physiological monitoring and is anticipated to require active life support		At least two low sidewall return or exhaust grilles spaced at opposite corners or as far apart as possible	Ceilings: Monolithic, scrubbable, capable of withstanding cleaning and/or disinfecting chemicals, gasketed access openings Floor and wall base assemblies: Monolithic with an integral coved wall base that is carried up the wall a minimum of 6' Wall finishes: Free of fissures, open joints, or crevices that may retain or permit passage of dirt particles

In both areas, **ceilings** must be:

- (1) **monolithic,**
- (2) **scrubbable,**
- (3) **capable of withstanding disinfecting chemicals**
- (4) **gasketed at access openings**

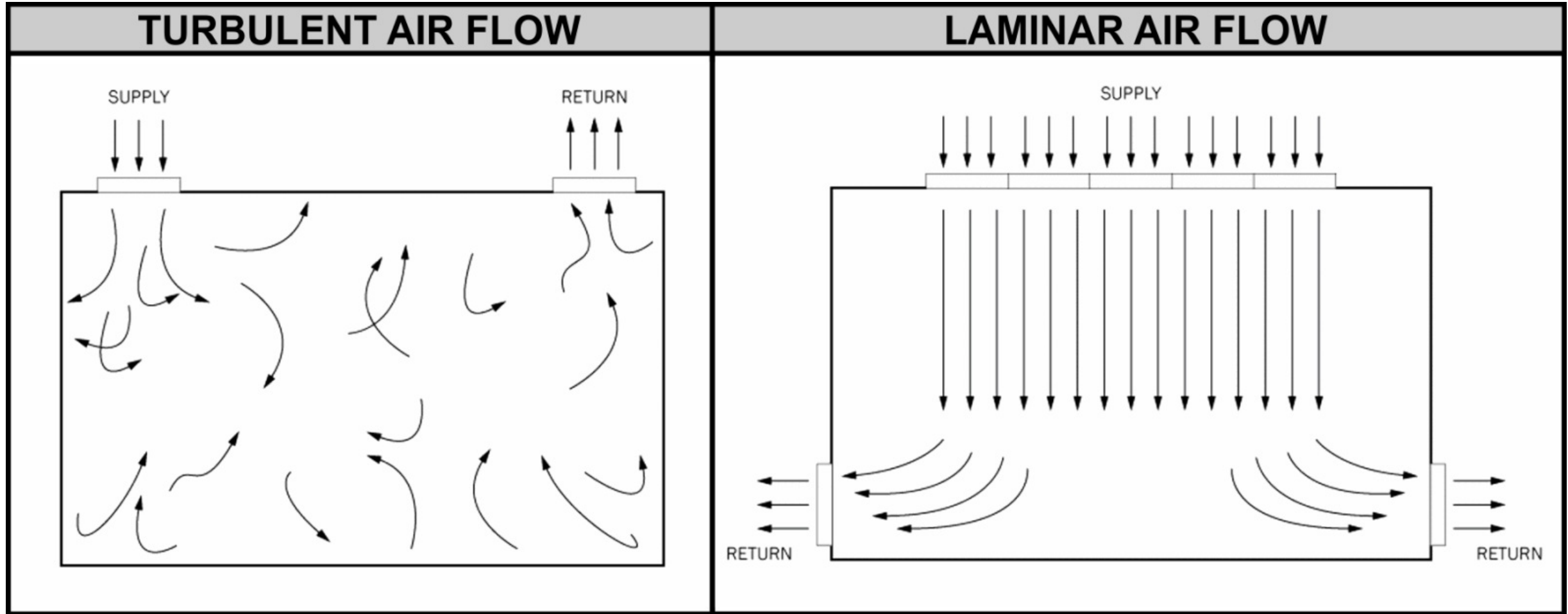
OR Design: Conventional Wisdom



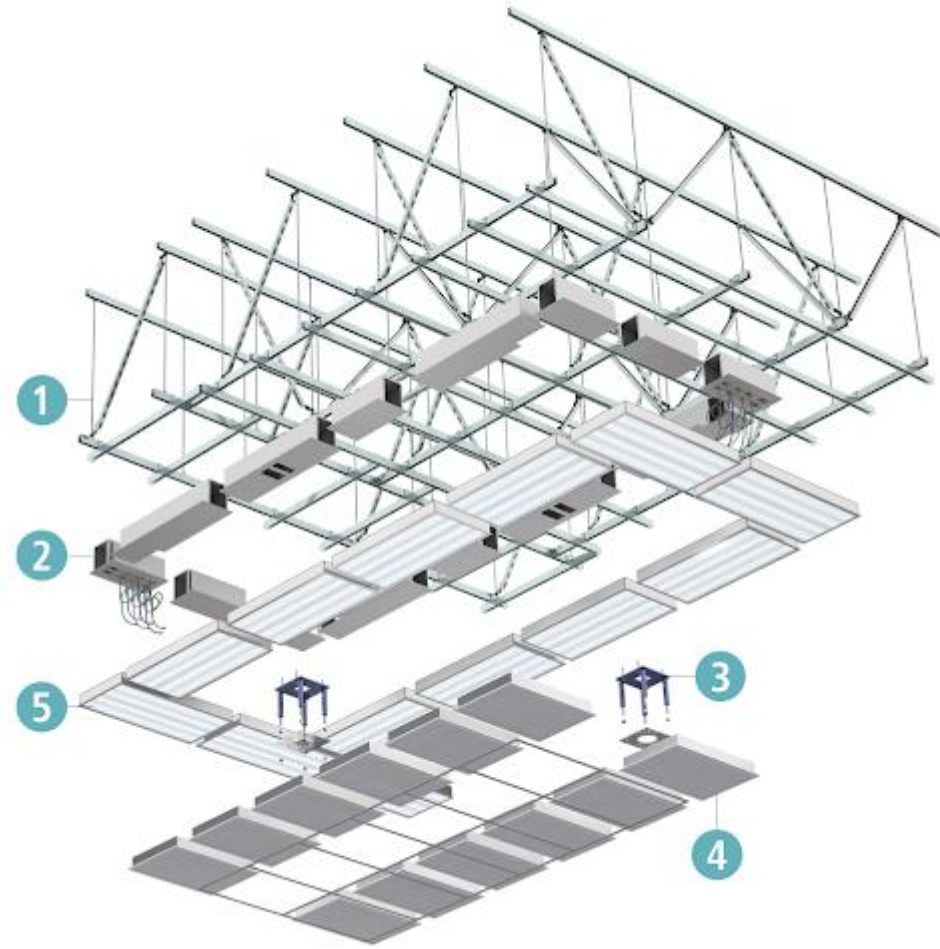
Laminar Flow Ventilation

Boom-Mounted Surgical Lights

Laminar Flow vs. Turbulent Flow



What's Above the Ceiling?



1. Ceiling Super-Structure
2. Raceway
3. Intermediate Structure
4. Air Diffuser Modules
5. Perimeter LED Troffers

Challenging The Conventional Wisdom

Laminar Air Flow

January 01, 2009 | 5 min read

SAVE 

Laminar flow in total knee and hip arthroplasty: A time for re-evaluation?

Building ORs with advanced air handling systems may provide only marginal benefits.

December, 2018

Cost Effectiveness of Laminar Flow Systems for Total Shoulder Arthroplasty: Filtering Money from the OR?

Daniel E. Davis, MD, MS¹; Benjamin Zmistowski, MD¹; Joseph A. Abboud, MD¹; Surena Namdari, MD, MSc¹

“Laminar flow would need to reduce the incidence of [periprosthetic joint infection] by 35.1% to be a cost-effective strategy.”

October 16, 2020

One More Study Showing No Benefit Associated With Laminar Flow in the Operating Room

E. Patchen Dellinger, MD¹

Boom-Mounted Surgical Lights

May, 2009

Influence of the shape of surgical lights on the disturbance of the airflow

Zoon, W.A.C.^{1,2}, Heijden, M.G.M. van der^{1,2}, Hensen, J.L.M.¹ and Loomans, M.G.L.C.¹

“Operating room ventilation systems are used to keep the wound area of a patient free from airborne bacteria. Surgical lighting is one of the major disturbances in operating room ventilation systems.”

September, 2010

On the applicability of the laminar flow index when selecting surgical lighting

W.A.C. Zoon, M.G.M. van der Heijden, M.G.L.C. Loomans, J.L.M. Hensen

“The infection risk was found to be proportional to the projected surface area of the lamp. Although different lamp shapes resulted in a distinctly different flow pattern in the room, this did not affect the infection risk in a significant way.”

March, 2019

Influence of the Arrangement of Surgical Light Axes on the Air Environment in Operating Rooms

Tetsuya Kai,¹ Nobuyasu Ayagaki,² and Hidekazu Setoguchi³

“Persistent stagnation of [air] was observed below single-axis lighting.”

Challenging The Conventional Wisdom

Laminar Air Flow

Boom-Mounted Surgical Lights

December, 2018

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“The increased rate of [infection] is potentially explained by obstruction of laminar flow from overhead theater lights leading to eddies of contaminated air above the surgical field.”

NBBJ's "OR 21" Concept

- Designed in 2015, this proposed "operating room of the future" combines laminar flow with hands-free *recessed motorized* surgical lights
- Could this be the best of both worlds – laminar flow without pathogen "eddies"?
- Now possible, with **INFRALED PRO** from Kirlin!



Lighting an OR with Recessed Sealed Fixtures



Enhanced Visual Acuity

ORs require powerful, accurate **surgical lighting** in combination with proper **perimeter lighting** to prevent eye strain

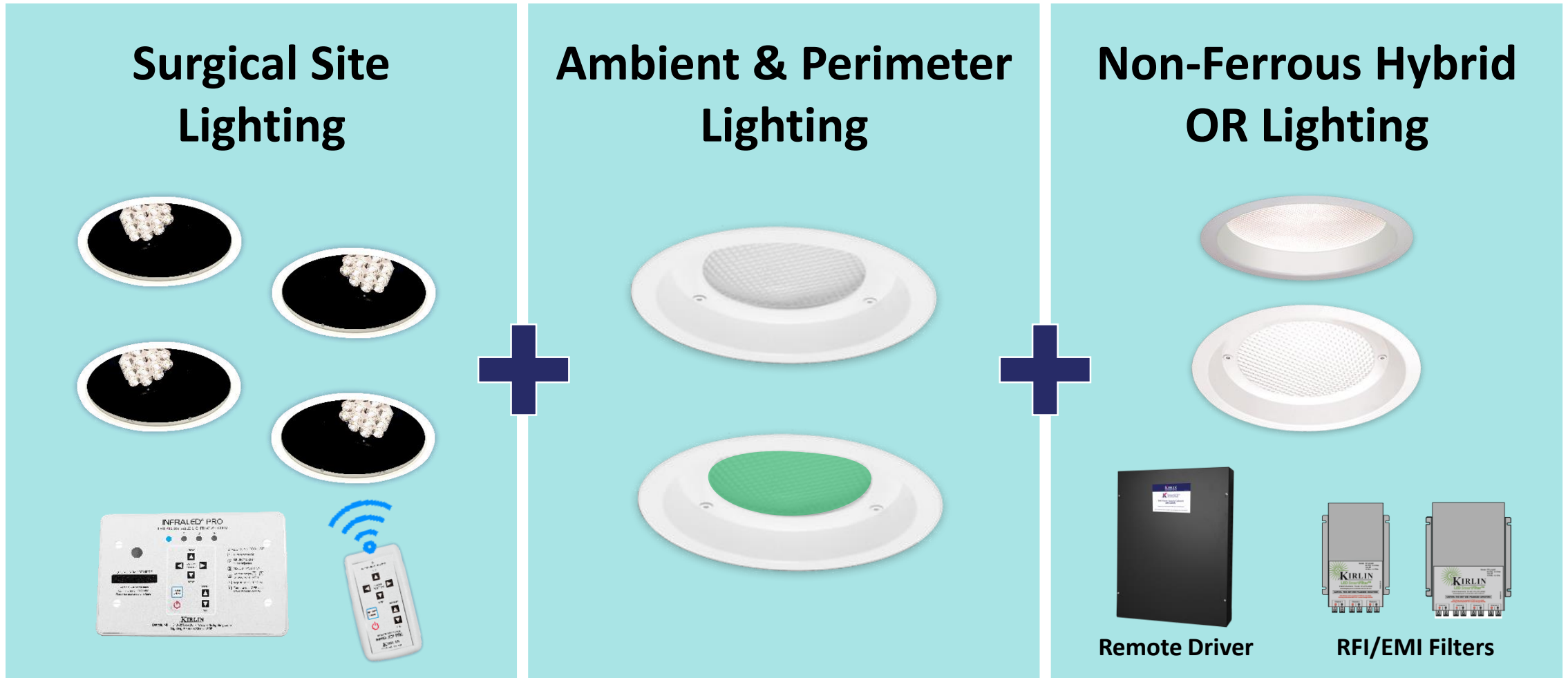


A Safer Environment

Over 20% of all HAIs originate in the Operating Room. **Cleanroom-Rated IP65 and IP66** luminaires (fixed or motorized) help prevent infection.



Best Practices: Lighting the Modern OR



A photograph of an operating room, viewed through the circular opening of a large piece of medical equipment. The room is brightly lit with recessed ceiling lights. In the center, a surgical table is visible, surrounded by various medical instruments and equipment. The overall atmosphere is clean and professional.

Surgical Site Lighting in the Operating Room

PRO 45: Surgical Site Lighting

Kirlin Lighting's INFRALED® PRO 45 provides ideal lighting for the Operating Room

Enhanced Visual Acuity

- 360° rotation and up to 45° tilt for illumination of surgical site
- Fully dimmable & remote-adjustable



A Safer Environment

- Fully recessed with IP66 trim and sealed housing
- Sterile and easy to clean



Improved Patient Comfort

- Replaces imposing boom lights



INFRALED® PRO: Better than the Boom!

Boom-Mounted



- Difficult to clean or disinfect
- Disrupts laminar air flow, causing pockets of non-sterile air
- Collects dust from the air and pathogens from the patient
- Physical hazard with drift issues

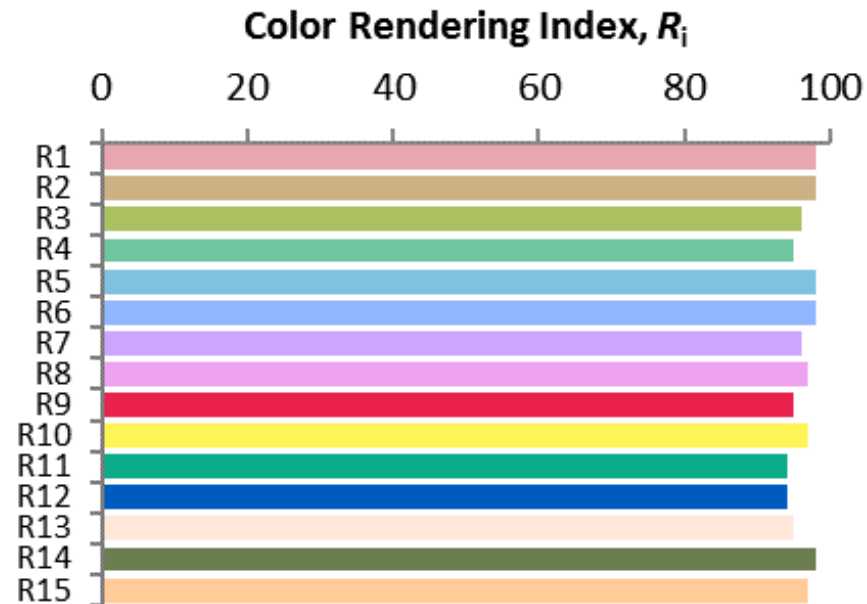
INFRALED® PRO



- Fully recessed with IP66 trim & anti-microbial finish
- Easy to disinfect (luminaires & controls)
- One touch direction and intensity control

High CRI in Multiple Chromaticities

The difference is **95 CRI** with ultra-high **R6, R9, R13** and **R15**



3 Chromaticities (Color Temperatures)

3500K

Mid-White

Labor/Delivery
NICU

4100K

Cool White

ICU
Cath Lab

5000K

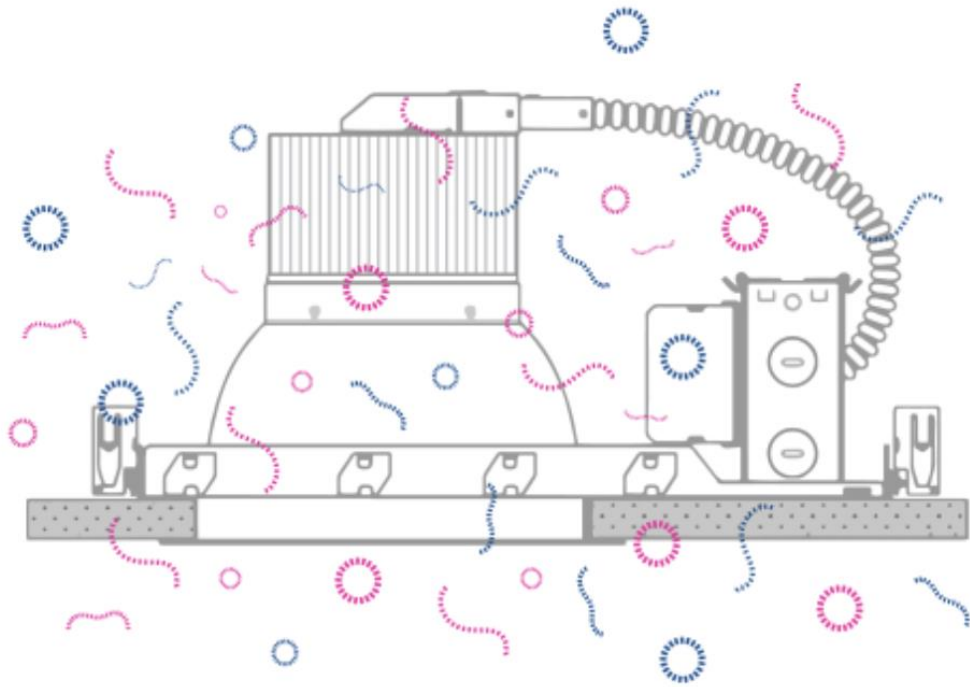
Ultra-Cool White

EP Lab
Hybrid OR

A photograph of an operating room with a strong blue ambient lighting. The room features a central operating table, overhead surgical lights, and various medical equipment. The lighting is focused on the perimeter and ambient areas, creating a clinical and professional atmosphere.

Ambient & Perimeter Lighting in the Operating Room

Infection in the Hospital

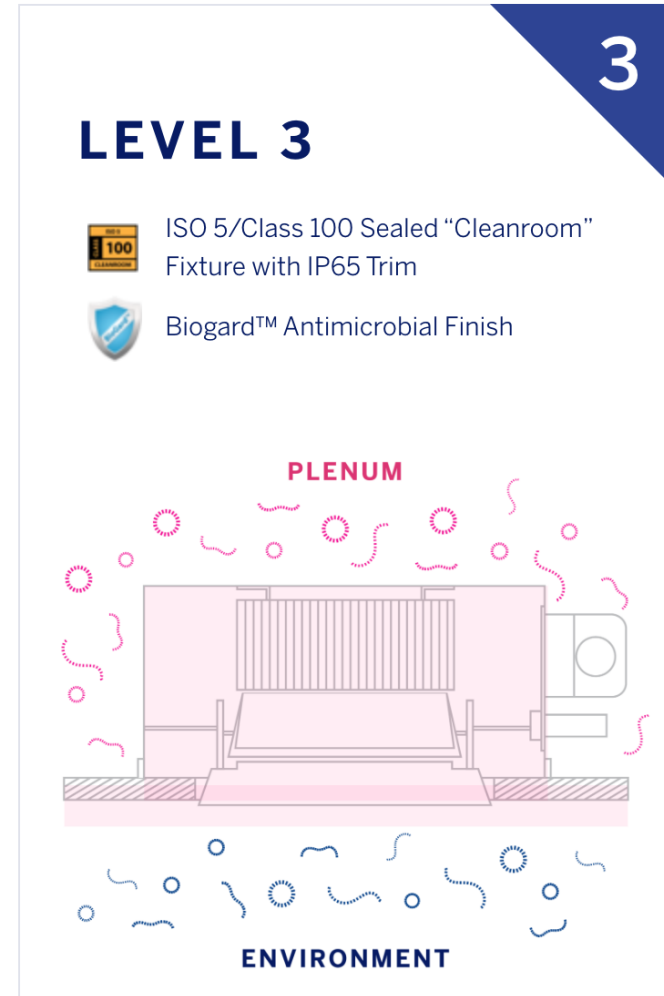
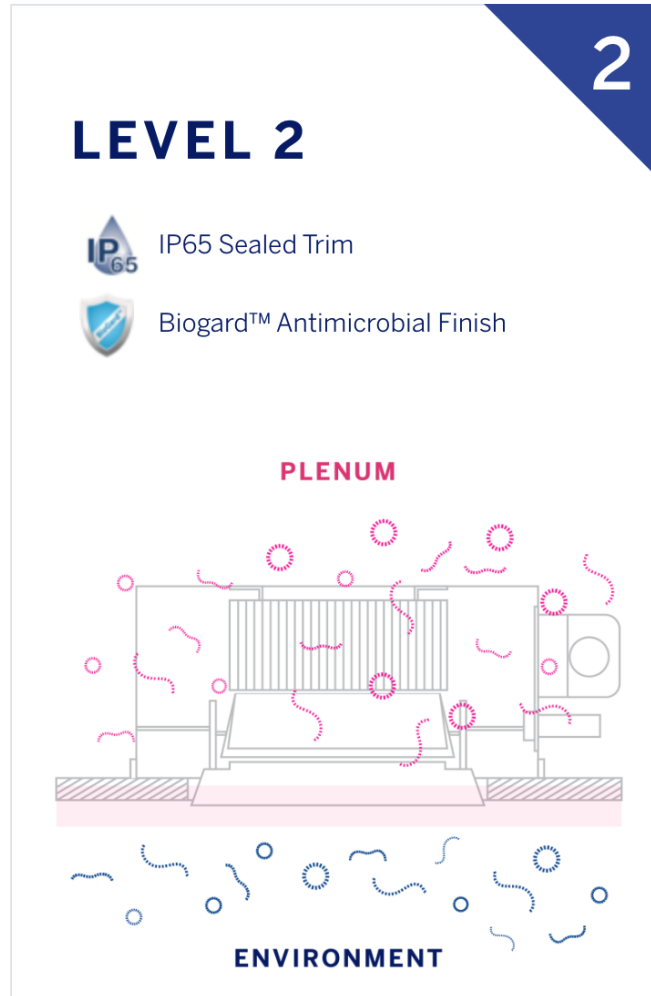
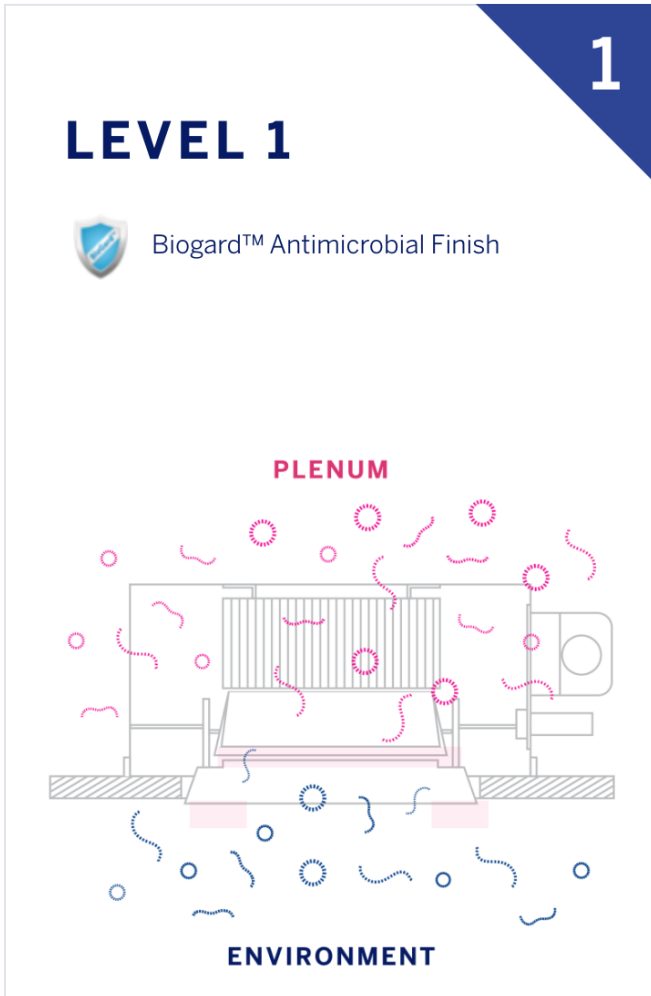


NON-KIRLIN DESIGN

THE PROBLEM

Without lensing, gasketing, or a sealed housing, pathogens and bacteria from the environment mix freely with pathogens and bacteria from the plenum, increasing the risk of widespread infection throughout the hospital.

Three Levels of Infection Control



Kirlin Cleanroom Lighting in the OR: Level 3



MRR-08835



BioGard Antimicrobial Finish



IP65 Ingress Protection



ISO 5 / Class 100 Cleanroom



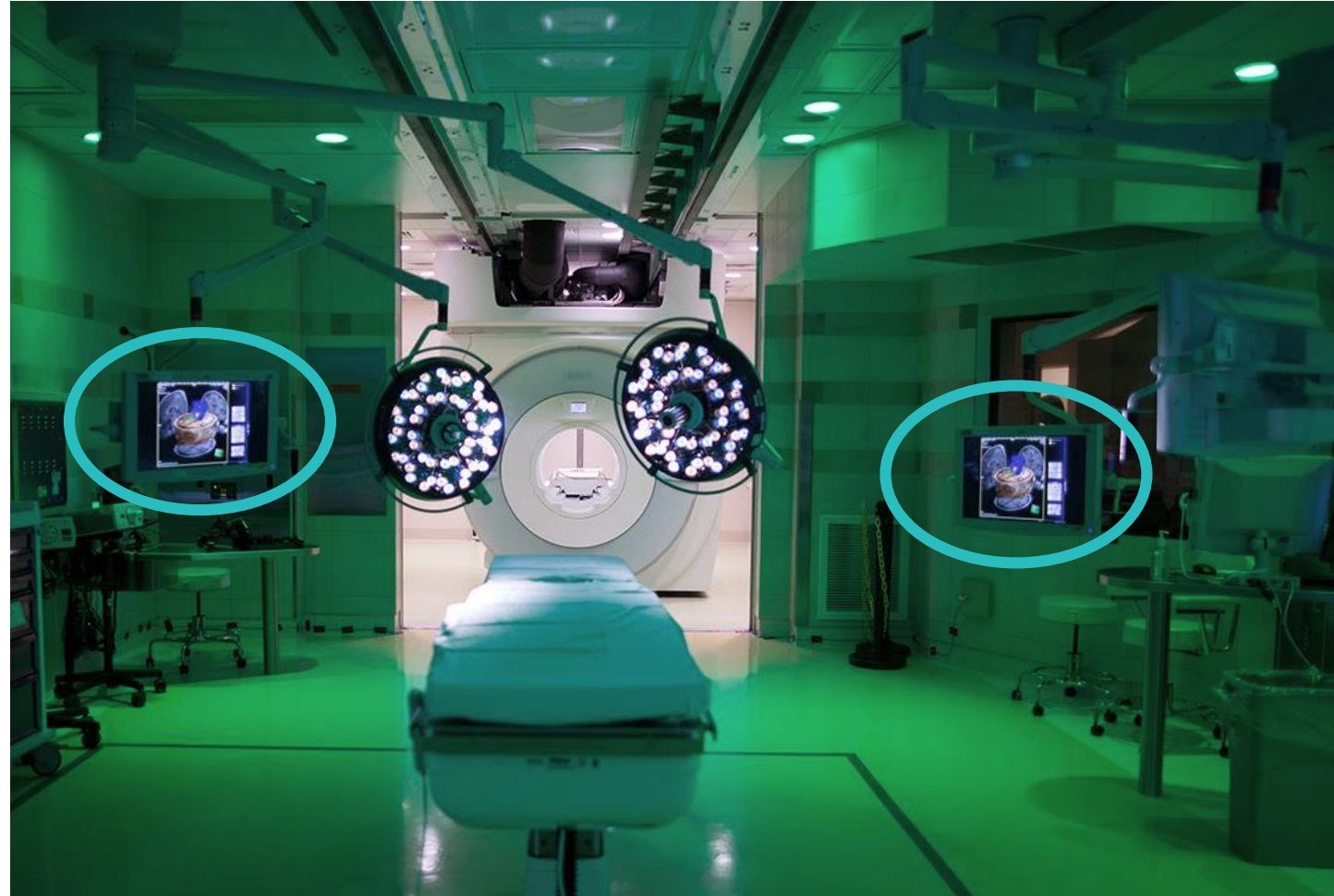
Color-Specific Wavelengths

Why Green (521nm)?

Surgeons tend to prefer “**lights out**” along the perimeter of the OR during video-assisted procedures, for optimal monitor viewing.

Others in the room, such as anesthesiologists and nurses, require illumination to perform their tasks.

Green light is the best compromise – it leads to **enhanced monitor-viewing** with low glare, while providing **sufficient ambient light** for other necessary tasks around the room.





MRI-Safe Lighting in the Hybrid OR

SmartLED™ MRI Lighting System



The #1 Turn-Key MRI lighting system engineered to ensure **accurate scans** throughout the life of the magnet:

- **27 Fixtures:** Downlights, Adjustables, Wall Washers, Sconces, Surface Mounts, Scenic Panels, 2x2 White Panels
- SmartLED™ **Remote Driver Cabinet**
- SmartLED™ **RFI/EMI Filter** (Two Models)
- Emergency Power

Trusted by:



MASSACHUSETTS
GENERAL HOSPITAL





Spotlight: Operating Rooms & Hybrid ORs at David Koch Center

First-of-its-Kind MRI/PET/Angiography Suite



Downlights: MRR-06420 (with remote drivers & filters)

Quantity: 12 units

CCT: 3500K

Output: 2500L

In the Specifier's Words:

“We are proud to have collaborated with NYP to create this unique space. This co-location and arrangement of equipment allows clinicians to diagnose, plan, and precisely guide procedures all in one place, at one time.”

- Shawn Billiard, Project Architect, Ballinger

Fun Fact: Look Down!



5 Gauss

In MRI suites & Hybrid Operating Rooms, there is often a **5 Gauss Line** on the floor.

5 Gauss = 0.0005 T, and that is the point where the magnetic field is weak enough that **ferrous materials pose no harm**.

In a hybrid OR, this is the “do not cross” line for all standard operating room tools and fixtures.

Hybrid Operating Room with X-Ray Imaging



Surgical-Grade Perimeter Downlights: MRR-07830

Quantity: 16 units

CCT: 3500K

Output: 2000L



BioGard Antimicrobial Finish



IP65 Ingress Protection

Operating Room – Center for Women & Newborns



Surgical-Grade Perimeter Downlights: MRR-07550
Quantity: 66 units (across 6 operating rooms)
CCT: 3500K
Output: 1500L



BioGard Antimicrobial Finish



IP65 Ingress Protection



ISO 5 / Class 100 Cleanroom

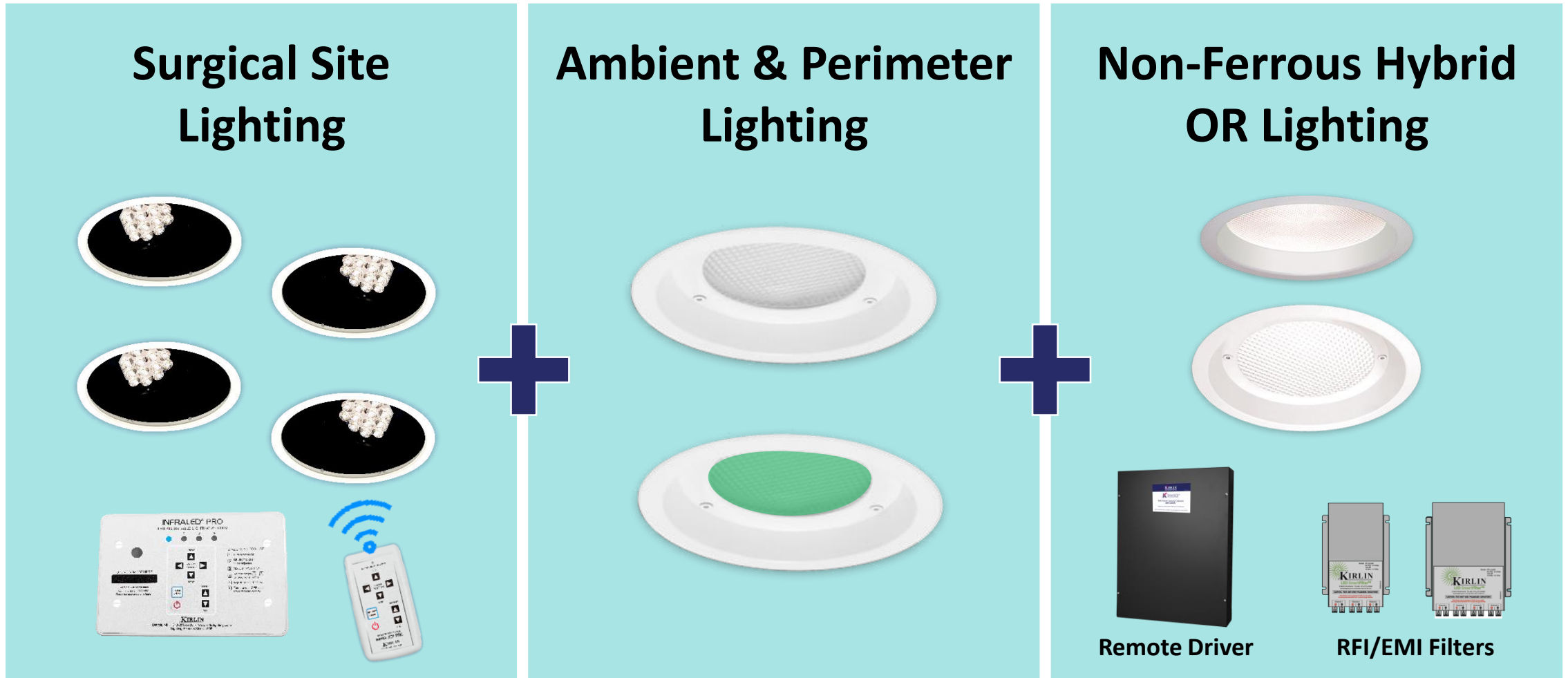
For more on C-Sections, join us next month!



KIRLIN
Best Practices for Healthcare Lighting

Labor & Delivery
December 18th, 2020 @ 9am, 10am, 12pm ET

Best Practices: Lighting the Modern OR





QUESTIONS?