IMEG

HOW WELL DO YOU KNOW WELL?

AN MEP ENGINEER'S GUIDE TO WELL V2 CERTIFICATION

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More than 4 billion square feet of space in 125 countries now use strategies from International WELL Building Institute's WELL frameworks, a fourfold increase since the COVID-19 pandemic began.

Backed by scientific research, WELL is a system for improving human health and well-being by building healthier buildings, organizations, and communities. Its strategies include WELL Certification, the WELL Health-Safety Rating for Facility Operations and Management, the WELL Performance Rating, and certification under the WELL Community Standard.

This whitepaper focuses on what mechanical, electrical, and plumbing engineers need to know about the latest WELL Certification standard, WELL v2, and how it relates to their commercial building projects.

About WELL

The International WELL Building Institute believes human health can be transformed by better, more holistic building standards. The WELL Building Standards, the first set of standards, were released in 2014 and updated in 2018.

Getting a building certified involves reviewing it with 10 concepts in mind: air, water, nourishment, light, movement, thermal comfort, sound, materials, mind, and community.

Think of certification as a sort of nutritional label. The building receives points (called features) in each of the 10 concept categories — some are mandatory prerequisites; others are considered optimizations. Achieved features are totaled for a final rating of Bronze, Silver, Gold, or Platinum. Getting a building certified requires several steps, but design teams can find documentation online to help develop the right building scorecard for their project.

The certification process

The project team will include certified professionals, a dedicated WELL reviewer, coaching support, and a performance testing agent.

Project registration and enrollment comes first and requires basic building information. The team will decide if they will pursue WELL v1, WELL v2, or WELL Certification versus WELL Core. The project team can help the client target the best compliance level.

WELL Certification documentation is updated quarterly, and designers should check the IWBI website regularly for "Wellographies" — updated white papers about the process.

The 10 concepts each have point limitations to create a diverse scorecard. Beyond the mandatory ones, the design team can decide which points to pursue. (There is a separate approach for shell and core buildings with multiple tenants, and the scorecards can be adapted to account for the spaces the building owner cannot control during design and construction.) Gaining points requires either letters of assurance or performance verification via on-site testing. For air quality, water quality, lighting, temperature, and acoustics there are unique testing requirements — the testing and sampling methods are defined in the WELL Performance Verification Guidebook. Verification may be a detailed performance test, a visual inspection, or a spot check, as defined in the guidebook. To gain some points, testing requires active monitoring and data logging during occupancy. One of the aspects that sets WELL Certification apart from other types of building design guidelines is the use of active monitoring and annual data submission.

The MEP engineer's role

The MEP engineer's expertise will be needed for half of the 10 concepts. Here's an overview:

Air

Air quality may affect our productivity and ability to focus. Concerns of indoor air quality include adequate ventilation air (air from outside the building), interior contaminants, exterior contaminants, interior material off gassing, and microbial sources.

There are four prerequisite categories. HVAC engineers and designers will need to address Feature A03, Ventilation Effectiveness. The other prerequisites are related to tobacco use on the property, the management of construction pollution, and measurements of particulate matter, organic gases, and inorganic gases.

Ventilation Effectiveness compliance method depends on the system being either mechanically ventilated or naturally ventilated. The mechanical ventilation system will be expected to meet one of four standards. Buildings pursuing natural ventilation methods have performative requirements based on the desired certification level. A Gold certification has more stringent requirements than a Silver certification as it relates to parts per million. In the U.S., the applicable standard for either mechanical ventilation or natural ventilation is ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality for commercial buildings. Within this standard, engineers will reference tables for minimum ventilation rates, minimum exhaust air rates, acceptable indoor air quality, and requirements for several types of ventilation systems.

The Well Platinum Perkins Eastman office in Chicago. (@Andrew Rugge/Perkins Eastman)

78	Awair Score Fair	
●	Temperature (°C)	27
●	Humidity (%)	17
●	CO_2(ppm)	418
●	TVOCs (ppb)	110
●	PM 2.5 (µg/m^3)	0
●	Light (lx)	2
●	Noise (db)	48
Model	AWAIR Omni	

An example of an air monitoring platform.

Optimizations that include HVAC are:

- Feature A06, Enhanced Ventilation Design, can be pursued by providing enhancements to the ventilation requirements.
- Feature A07 requires operable windows, a practice the design industry had moved away from. Points can be earned for managing the use of operable windows by using hourly monitoring of exterior air quality and temperature.

- Feature A08, the Air Concept category, requires a system that logs data for reporting for annual submissions to maintain certification.

- Feature A10, Combustion Management, either bans or limits the number of emissions from combustion sources including water heaters and hot water boilers.

- Feature A12 defines requirements of particle filtration for ventilation systems, which correlates outdoor air particulate thresholds with MERV ratings for filters. It requires monitoring pressure drop across the filter, so the staff is alerted when replacement is needed. This requires ongoing reporting.

- Feature A13 covers enhanced supply air, which can include activated carbon filtration to mitigate indoor levels of VOCs. Feature A13 also involves ongoing reporting.

- Feature A14 is microbe and mold control. Ultraviolet emission can be used to control microbial growth on cooling coils in forced-air cooling systems. Additionally, interior humidity levels are managed to control interior condensation. On-going reporting is also needed for this feature.

Water

Much of the Water concept focuses on drinking water quality. The need for adequate, daily water intake is well documented, but several factors can affect its quality. System designers will need to quantify the water quality that enters the project site and ensure the water meets prescribed standards.

Within this concept there are three prerequisite features and six optional features. Six focus on controlling and mitigating harmful contaminants. Feature W01, Fundamental Water Quality, W02, Water Contaminants, W04 , Enhanced Water Quality, and W05, Water Quality Consistency, will need performance testing or on-going data reporting.

Plumbing system designers will need to coordinate with the local water utility to gather historical water quality information and design filtration systems that ensure drinking water properties are maintained.

Feature W08, Hygiene Support, addresses sink and faucet selection to ensure the water column is of sufficient size and positioned to keep hands away from surfaces.

Top lighting and interior glass partitions integrate daylighting into the interior of the WELL Gold Aspen Police Department. (@Dallas & Harris Photography)

Light

It has only been 100 years since half of U.S. homes had electric light. Since the widespread adoption of electric lighting, our indoor afternoons do not have enough light, compared to being outside, and our evenings have too much light. Science tells us the spectral density of lighting affects the circadian clock and its production of melatonin, a hormone that plays a role in our sleep/wake cycle. When our body interprets our surroundings as daytime because of electric lights, our body suppresses melatonin, which can disrupt sleep.

The goal of the WELL v2 Light Concept is to create a lighting scheme that promotes better health. There are two prerequisite features and six optional features. Feature L01 requires daylighting design that a lighting designer will need to coordinate with the architect. Two options are provided: daylighting in common spaces or daylighting in all spaces.

Spatial daylight autonomy analysis shows the amount of daylight in a space.

There are two metrics used in this feature: spatial daylight autonomy (sDA) and visible light transmittance (VLT). sDA quantifies the amount of daylighting in a space compared to its total size, answering the question "Am I getting enough usable daylight in my space to promote well-being?" VLT is associated with the optical property of exterior glazing, showing the amount of light that passes through the window. A higher value shows increased light transmission. It is important to note that VLT is affected by the window frame.

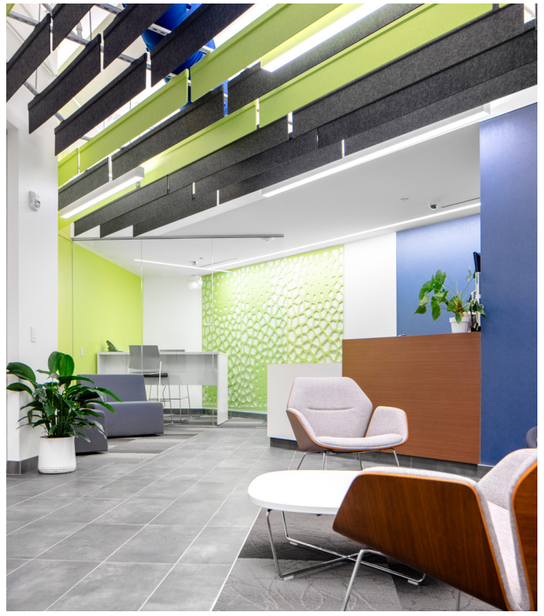
Feature L02 relies on the Illumination Engineering Society (IES) 10th Edition Handbook for indoor and outdoor lighting recommendations. To verify compliance, verification includes annotated design documents and on-site performance testing. Lighting

design used to be a process of calculating the foot-candles (or lux) at the task height and then choosing fixture locations that minimized shadows at the task location. As color temperature options increased, designers started to consider how colors would be rendered. Color rendering may be architectural, based on surface finishes, or it could be for medical applications where the hue skin tone is important. The spectrum of color, not just the overall color temperature, more recently became of interest.

Optimizations include:

- Feature L03, Circadian Lighting Design requires the lighting designer to use the spectral data file for the lighting fixtures chosen to perform calculations at the vertical plane of the occupant's eye location(s). Both melanotic and photopic levels need to be quantified as this feature sets a minimum Equivalent Melanotic Lux (EML) for regularly occupied spaces. Another circadian metric is Circadian Stimulus (CS), which looks at spectrum but also melatonin suppression levels. A CS of 0.7 means that 70% of melatonin is being suppressed (the maximum measured). When CS is less than 0.1, amber lighting, there isn't a measurable effect on melatonin suppression. With CS greater than 0.3, blue light, suppression is effective.

- Feature L04, Glare Control incorporates interior and exterior lighting source glare control. The lighting and electrical designers will coordinate shade control that allows for automatic or occupant controls. There are more requirements for manual controls to ensure daylighting is provided. Glare for



Bringing nature indoors improves indoor air quality at the WELL Gold IMEG Corp. office in Denver. (@The Unfound Door)

interior luminaires requires luminance data and photometric information and the designer needs to coordinate both the fixture choice, mounting height, and the fixture orientation.

- Feature L05 dives deeper into daylight design strategies used in Feature L01.

- Feature L06 requires photometric study of uniformity between spaces and within the space. Glare from reflections is included in this feature, requiring surface finish coordination with the architectural design team.

- Feature L07 continues the visual comfort approach of this concept. Luminaire selections will include specifications for color rending index (CRI) or may comply with IES TM-30 fidelity, gamut, and color rending index ranges listed in the feature.

- Feature L08 defines requirements for lighting controls and relates to circadian tuning and occupant adjustment of lighting color and levels.

- Feature L09 implements strategies that can be adapted to the individual user's lighting needs.

Thermal Comfort

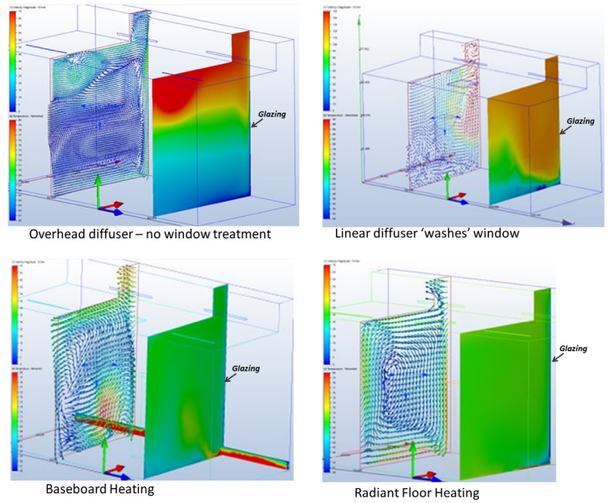
A 2006 study found 41 percent of office workers have been dissatisfied with the thermal environment in their workplace. Other studies have found being too hot or too cold in the office can lead to reduced productivity. The Thermal Comfort Concept goal is for the HVAC system to offer maximum human comfort for all building users, which will promote improved productivity.

There is one prerequisite for this concept, and eight optimizations. The concept uses the same systems as the air quality concepts but different metrics, and like the air concept, requirements are split between mechanically ventilated and naturally ventilated spaces.

Here are the features of note for HVAC engineers:

For Features T01 and T02, the mechanical system metric is the Predicted Mean Vote (PMV) which uses heat balance concepts to describe thermal conditions and relate comfort factors an average person would agree with. ASHRAE Standard 55 — Thermal Environmental Conditions for Human Occupancy is a standard for thermal comfort for projects in the U.S. Feature T03 and T04 relate to zoning and individual thermal comfort control, respectively. Building HVAC designs commonly combine multiple offices on a single zone to mitigate cost, and Feature 03 allows for multiple occupants. While private offices are a straight-forward application of shared thermostats, an open office concept may be more complicated to implement.

T05, Radiant Heating Systems, are limited to hydronic or electric systems for at least 50% of the occupied areas. Radiant heating systems supply a substantial improvement to thermal comfort. Comfort is best achieved with consistent temperatures from head to ankles. This feature also includes a dedicated outdoor air system (DOAS) to achieve ventilation requirements. These systems offer energy savings by allowing for a



Overhead diffuser – no window treatment
Linear diffuser 'washes' window
Baseboard Heating
Radiant Floor Heating

Computer modeling shows the effect of different heating methods on thermal comfort.

variety of thermal control systems such as hydronic fan coil systems, chilled beams, variable refrigerant flow (VRF) or even forced air systems that can be solely recirculation.

Feature T07, Humidity Control, is achieved by controlling relative humidity for at least 98% of operating hours during the year. The systems needed to achieve this goal vary by physical location and will be affected by the arrangement of building entrances and locations used for taking humidity measurements. Humidity control can be achieved in several ways and will likely be accompanied by Feature A14 for UV treatment of cooling coils that will remove moisture from the air during the summer months.

Feature T08, Enhanced Operable Windows, is a beta feature within the concept that enhances the physical comfort of the site. Feature A07 is a prerequisite here since both apply to operable windows. This enhanced point further refines operable window requirements and associates opening characteristics with seasonal temperatures. It requires an interlock between window position and mechanical cooling operation, which likely means sensors at each window for monitoring. It also requires low openings during summer months and high openings during winter months; sensor positions and function will need to be coordinated with the architectural team.

Feature T09, Outdoor Thermal Comfort, awards points for adequate shading by area or via temperature modeling of shading elements. This feature also requires computational fluid dynamic (CFD) study of wind speeds near outdoor seating areas, to make sure wind speeds don't discourage the use of these areas.

The WELL-certified SSM Health Dean Medical Group & Fond du Lac Regional Clinic was the first WELL certified medical clinic in Wisconsin. (© Peter McCullough Photo + Drone)

Sound

The aspects of a typical acoustical study will seem familiar to designers performing the calculations and preparing the necessary documents for the Sound Concept features.

Feature S01, Sound Mapping, is the only prerequisite. Suitable metrics are background noise levels, in either dBA (A-weighted overall sound pressure level) or NC (noise criterion). Acoustical designers will need to take interior and exterior noise sources into consideration as they develop the necessary metrics. Interior noise commonly includes HVAC systems, which require modeling. Exterior noise includes traffic, which can be modeled using Federal Highway Administration software. These calculations will provide overall dBA at the building façade, which the designer can use to correlate glazing transmission loss with interior noise contribution.

The second part of Feature S01 requires listing the transmission loss metrics for demising walls and doors to document acoustical privacy. The third part includes rating spaces as being either loud, quiet, or mixed. This classification impacts decisions made to achieve optional features S02-S09.

Feature S02 identifies the maximum permissible noise levels for pre-defined interior spaces. Higher points are available for quieter results during performance testing on-site.

Feature S03 is related — it quantifies transmission loss of demising partitions and doors, which contributes to a reduction in overall noise levels.

Feature S04 sets maximum permissible levels of reverberation time, labeled as RT60. This is the amount of time, in seconds, it takes a sound impulse to decay by 60 decibels. This metric characterizes a space as being "lively" or "dry;" most occupants will say a "lively" room has noticeable echoes. To control reverberation time, sound absorption elements are typically added to the ceiling and walls. The second and third parts set quantities for surface treatments with a minimum noise reduction coefficient (NRC) of 0.70.

The Aspen Police Department used water-efficient landscaping to meet the Water concept requirements for WELL certification. (©Dallas & Harris Photography)

Feature S05 defines a maximum sound masking level. Areas known for congregating, such as dining, corridors, and open offices, have a higher sound masking level requirement than quiet areas.

Feature S06 measures minimum background sound to ensure speech privacy.

Feature S07 specifies minimum IIC ratings — the measurement of noise transfer through floor-ceiling elements because of physical impact, i.e., foot fall — all of which will require a resilient flooring solution to achieve.

Feature S08 focuses on speech intelligibility and accessibility though the use of audio equipment. Requirements are based on location and can be audio/video systems, public address systems, or speech reinforcement systems, with separate requirements for each. The second aspect of this feature allows for individuals to have access to, or away from, the systems listed in this feature. Hearing conservation is an important aspect for all employers and building owners to consider.

Feature S09 focuses on hearing health and conservation. Compliance with this feature requires access to hearing protection, compliance with applicable regulations, and no-cost audiogram testing. This feature also requires the designation of a qualified supervisor who handles the execution and maintenance of the conservation program.

Team coordination vital for certification

This whitepaper focused on the concepts that heavily rely on MEP support, but designers can expect to coordinate with the entire design team on other aspects of WELL V2 certification. Achieving compliance with Nourishment, Movement, Materials, Mind, and Community concepts will require participation by all project designers.

Having educational resources available is a common theme for WELL concepts and features. That could be a kiosk or monitor that displays information about healthy living, or displays of active metering of utility usage or air quality, for example. There are extra points available for innovation, so designers have the freedom to experiment with a focus on the goals and mission of WELL.

As designers become more familiar with the WELL Certification system, a similar holistic approach to building design is likely to become prevalent in non-certified building designs.

ABOUT THE AUTHOR

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