



BuildingGreen's Top 10 Products for 2024

Brent Ehrlich, Products & Materials Specialist



About BuildingGreen's Top 10 Building Product Awards

- 22nd BuildingGreen Top 10
- Not a “pay-to-play” award
- Winners are hand selected
- BuildingGreen is an independent company
- No advertising in publications
- No money from manufacturers

About this year's Top 10 Building Products

- Increase material circularity
- Improve our communities' resilience
- Mitigate carbon emissions and their impacts
- Reduce chemicals of concern
- Have other benefits and co-benefits

What we are going to cover

- Unveiling of BuildingGreen's Top 10 Products for 2024
- For each product
 - Business as usual—why the Top 10 product is needed
 - The smarter solution

Business as usual: increasing flood risks due to climate change

- Rising sea levels
- More intense storms
- Minimal flooding = significant damage to buildings, infrastructure, and equipment
- \$\$\$ cleanup costs and remediation often not covered by insurance
- Contaminated materials sent to landfills



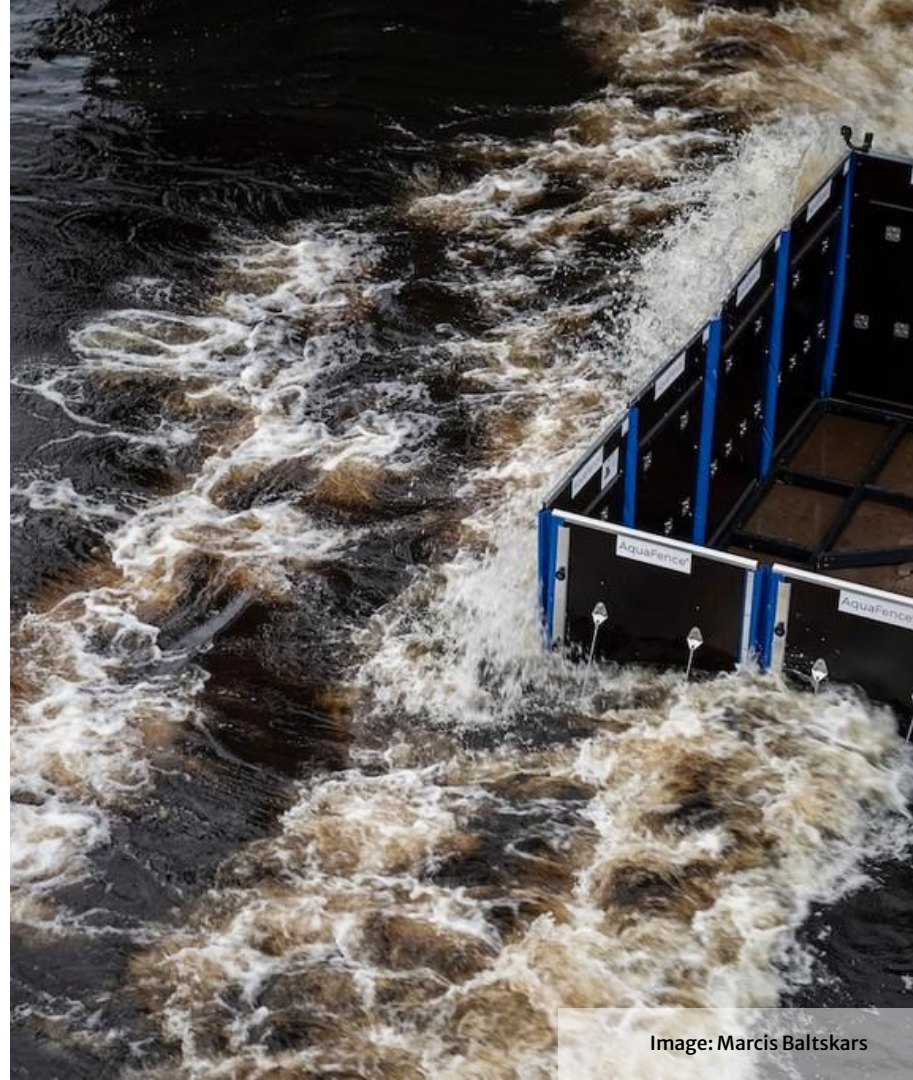
Top 10 Product: AquaFence flood barriers

- Deployable flood barriers
- Faster to deploy than sandbags
- Protection for buildings, resources, and infrastructure
- Most require no pre-installation site work



Top 10 Product: AquaFence flood barriers

- FloodWall—protection 2.5' to 9'
 - Commercial (whole building), municipal, industrial
 - Longer stretches
- FloodBarricade—2.5' to 9'
 - Residential and commercial openings
 - Shorter spans
 - Installs <3 minutes
- FlashWall—up to 19.5"
 - For flash flooding events
 - Quick assembly



Business as usual: few alternatives to vinyl flooring

- Ubiquitous
- Few alternatives in terms of aesthetics and cost
- Exposes fence-line communities to potentially toxic chemical
- Much of it is made in Xinjiang Uyghur Autonomous Region of China
- No recycling or take-back programs



Image: The Vinyl Institute

Top 10 Product: HMTX Industries Mycelium Collection of SRP Rigid Core TPU Flooring

- TPU: thermoplastic polyurethane
- Can be recycled into new flooring with no loss of performance
- A more environmentally and socially responsible vinyl alternative
- Available first quarter of 2024
- EPD, HPD, Declare label coming
- Setting up take back program with QR code tracking



Top 10 Product: HMTX Mycelium Flooring Collection



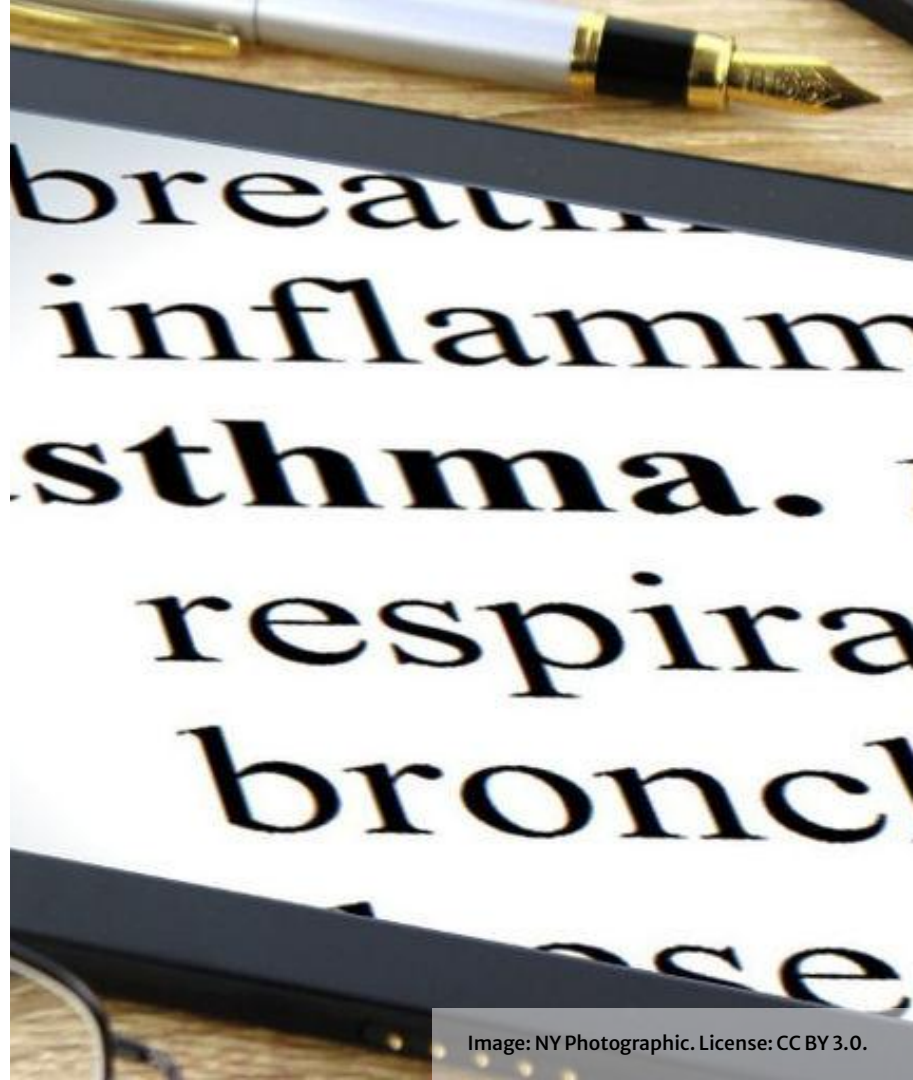
Image: HMTX Industries



Image: HMTX Industries

Business as usual: poor indoor air quality and data

- Indoor air quality worse than outdoor air
- Improving HVAC performance requires feedback
- Lack of data = inefficient HVAC
- Poor data quality if sensors aren't regularly maintained and calibrated
- Data that's hard to translate into action



Top 10 Product: Kaiterra Sensedge and Sensedge Mini

- Modular system for maintaining sensors
- Improved accuracy
- Less downtime
- Less waste



Top 10 Product: Kaiterra Sensedge and Sensedge Mini

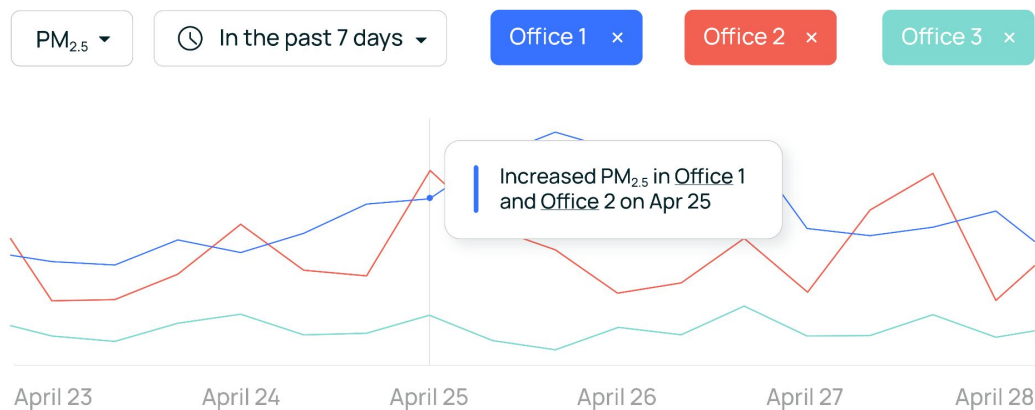
- WELL and RESET require annual calibration
- Replaceable sensors = not sending them back to manufacturers
- Sensor upgrades = future proof



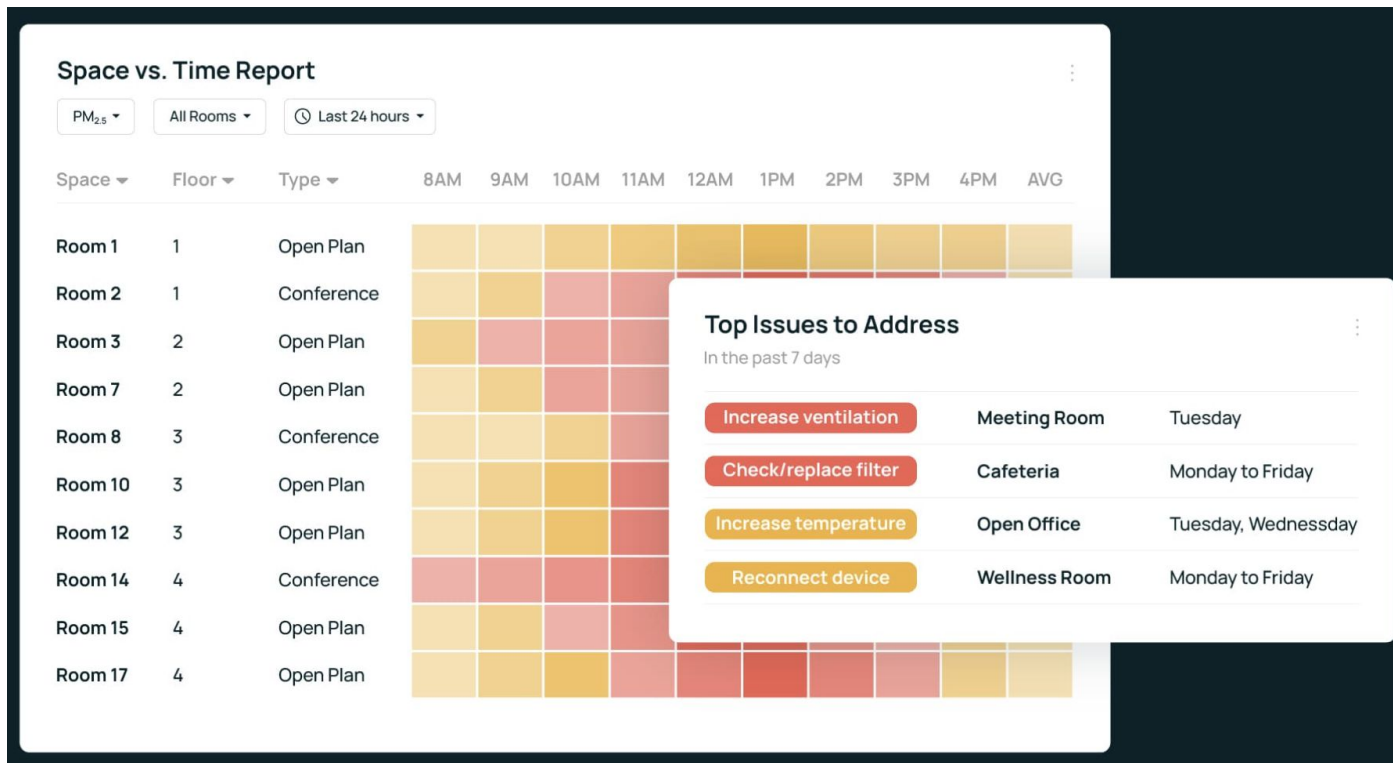
Top 10 Product: Kaiterra Sensedge and Sensedge Mini

- Project overview by performance, location, or building
- Historical trends for each device and timeframe
- Customized, real-time alerts when air quality exceeds benchmark

Air Quality Trend



Top 10 Product: Kaiterra Sensedge and Sensedge Mini



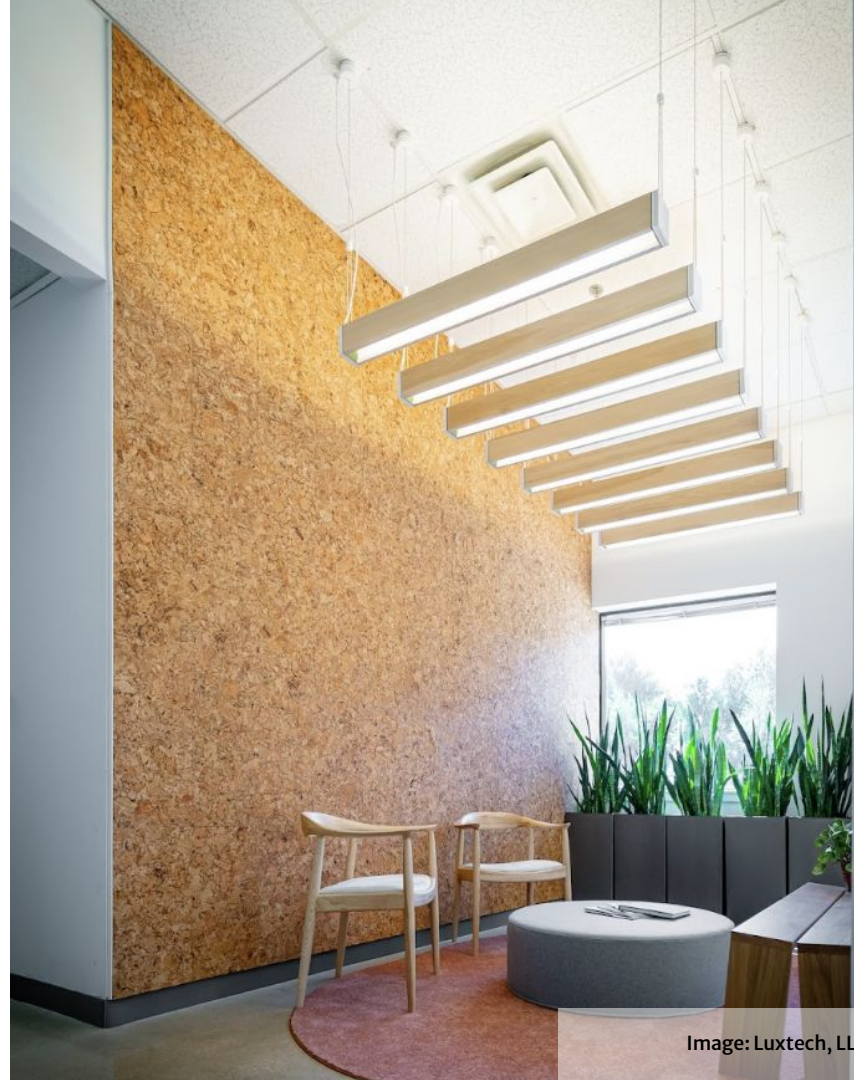
Business as usual: lighting with high embodied carbon and chemicals of concern

- LED lighting is awesome!
- But it is made with:
 - Aluminum
 - Steel
 - PVC and other plastics
- It may also contain heavy metals



Top 10 Product: Lightly Butterfly

- Natural materials in place of metals and plastics:
 - Local poplar
 - Local wool
 - Other biobased materials
- First commercial lighting that is LBC Red List Free:
 - No heavy metals
 - PVC-free wiring
 - Biobased, zero-VOC finishes
- 95% biodegradable



Top 10 Product: Lightly Butterfly

- Five finish options
- Color temps:
 - 3000K, 3500K, 4000K
 - Tunable 2700K–6500K
- High color-rendering index of 90
- Low glare
- Excellent efficacy
 - Linear pendant: 136–141 lumens per watt
 - Wall mount: 115–125 lumens per watt



Top 10 Product: Lightly Butterfly

Environmental Product Declaration



Lightly
Butterfly Linear Pendant

According to
ISO 21930
ISO 14025

Declare.

Lightly - Fixture - Boothwyn PA Lightly

Final Assembly: Boothwyn, Pennsylvania, USA

Life Expectancy: 10+ Year(s)

End of Life Options: Biodegradable/Compostable (95%),
Recyclable (3%), Landfill (2%)

Ingredients:

Frame: Poplar; **Plywood:** Wood, Various; 4,4'-Methylenediphenyl diisocyanate; Polyvinyl alcohol; Soy; **ECOS Atmosphere Purifying Paint:** Water, Titanium dioxide; Calcium Carbonate; 1,2,3-Propanetriol; 2-Propenoic acid, homopolymer, ammonium salt; 2-Propenoic acid, homopolymer, sodium salt; 9-Octadecenoic acid (Z)-; Benzaldehyde, 4-hydroxy-3-methoxy-; Cellulose, 2-hydroxyethyl ether; Ceramic materials and wares, chemicals; Cutting Oils; Fatty acids, C12-18, Me esters, sulfonated, sodium salts; Fatty acids, C32-36-branched; Fatty acids, tallow, potassium salts; Glycine, N-methyl-N-(1-oxododecyl)-, sodium salt; Hectorite; Xanthan gum; Zeolites, NaA; Zinc pyrrhione; **Flex LED Module:** Copper; Tin, Organic; Methyl methacrylate; Glass, oxide, chemicals; Iron; Polyamide 9T; Silver; Vinyl silicone polymer; Polyimide; 2-Propenoic acid, 2-methyl-, polymer with methyl 2-methyl-2-propenoate; Phenol, 4,4'-(1-methylethylidene)bis[2,6-dibromo-, polymer with (chloromethyl)oxirane and 4,4'-(1-methylethylidene)bis(phenol)]; 2-Propenenitrile, polymer with 1,3-butadiene; Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 2,2'-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)]bis[oxirane]; Aluminum hydroxide; Dapsone; Rosin; **Wire:** Copper; Polyphenylene Ether; **Stain:** Water; Propenoic acid; 2-methyl-, monoester with 2,2,4-trimethyl-1,3-pentanediol; **Wood Gelatin Glue:** Gelatins; Water; **Connector:** Carbonic acid, polymer with 4,4'-(1-methylethylidene)bis(phenol)]; Copper; **Wool Felt:** Wool; Pigment; **Hemp Cord:** Hemp; **Glue:** 2-Propenoic acid, 2-cyano-, ethyl ester; **Birch Dowel:** Birch

Living Building Challenge Criteria: Compliant

I-13 Red List:

- LBC Red List Free
 - LBC Red List Approved
 - Declared
- % Disclosed: 100% at 100ppm
VOC Content: Not Applicable

I-10 Interior Performance: Not Applicable

I-14 Responsible Sourcing: Low Risk Wood

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Business as usual: textiles that contain PFAS

Per- and polyfluoroalkyl substances (PFAS)

- “Forever chemicals” persistent in the environment
- More than 10,000 compounds
- Some highly toxic and bioaccumulative
- Ubiquitous
- Very serious worldwide problem
- Heavy past use on carpet
- Still found on textiles



Top 10 Product: Maharam

- Founded 1902
- Corporate social responsibility:
 - ISO 14001 for manufacturing= reduced energy, water, paper, and waste
 - Environmental incentives for staff commuting practices
 - Facilitation of “green cleaning”



Top 10 Product: Maharam

- Upholstery
- Wallcovering
- Panel
- Privacy curtain
- Window covering



Business as usual: PV panel waste and scarce U.S. materials

- Crystalline panels = high embodied energy and carbon
- When made in China
 - Coal power plants
 - Forced labor
 - Environmental justice issues
- Minimal U.S. PV production and raw materials
- Potentially hazardous at end of life
- Nearly zero recycling



Top 10 Product: Solarcycle Advanced Solar Panel Recycling Solutions

- Reduces need for high-impact production of new PV panels
- Recovers valuable materials from aging solar panels
 - Crystalline silica, silver, copper
 - 95% of the dollar value
 - Domestic supply chain
- Cost effective
- Scalable



Top 10 Product: Solarcycle

- The panels are first assessed for power, durability, and reuse potential.
- If recycling is required, a fully automated process recovers and separates:
 - Aluminum frame and junction box
 - Glass and laminates
 - Silica, metals, and plastics



Top 10 Product: Solarcycle

- A U.S. DOE grant funds metal refinement for domestic reuse.
- Economies of scale result in the lowest possible price.
- Can reduce the embodied carbon of PV by 85%.
- Solarcycle assists customers with ESG reporting.



Business as usual: PFAS and microplastic pollution from wastewater treatment

- PFAS and microplastics in wastewater
- Contaminated “biosolids” (=sludge) from treatment
- If spread as fertilizer: pollutes farms, groundwater
- If landfilled: results in methane and carbon emissions



Business as usual: concrete with high embodied carbon

- Cement = 5%–8% of the world's anthropogenic carbon emissions
- Many viable cement replacements:
 - Fly ash
 - Slag
 - Limestone
 - Clay
 - Glass
 - Other supplementary cementitious materials (SCMs)
- Are there other options?



Top 10 Product: Solid Carbon BioLock Admixture

- Biochar made from biosolids
- Reduces the embodied carbon of concrete
- May prevent landfill emissions
- Bonus! Destroys PFAS and microplastics



Top 10 Product: Solid Carbon BioLock Admixture

- Biochar is essentially charcoal
- Made by *pyrolysis* (burning material at high temperatures without oxygen)
- Solid Carbon
 - Low-emitting, low-energy process
 - Almost self sustaining
 - Leaves mostly carbon behind
- 1-to-1 swap for sand
- Performance neutral in concrete mix



Top 10 Product: Solid Carbon BioLock Admixture

- 1,000 kg of the admixture =
–1,000 kg CO₂e
- Can also avoid methane emissions, creating much greater benefit
- Third-party LCA accounting for avoided emissions from specific landfill showed carbon-negative concrete



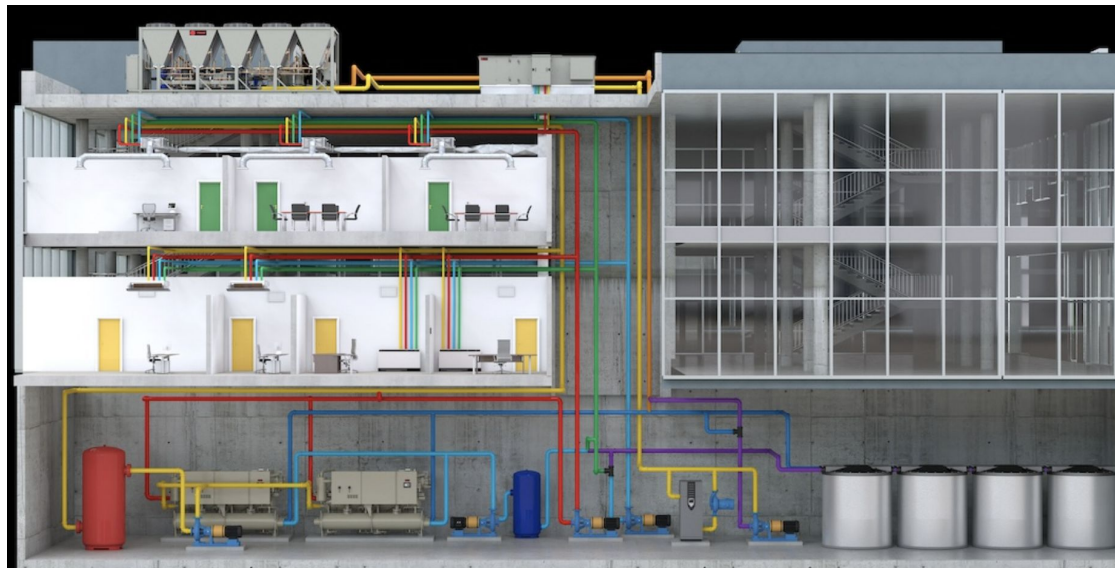
Business as usual: lack of efficient heat pumps and energy storage

- Getting off fossil fuels is necessary.
- But electrification of commercial HVAC is challenging.
- Heat pumps are great but less efficient in cold climates.
- Energy storage is expensive.
- Can we solve all this at once?



Top 10 Product: Trane Thermal Battery Storage-Source Heat Pump System

- Heat pumps + ice-based thermal energy storage (TES)
- TES= a sort of battery
- Ice → water phase change stores and releases energy
- One Ice Bank stores almost 2 million Btu
- Efficient heating in very cold temps



Top 10 Product: Trane Thermal Battery Storage–Source Heat Pump System

- Air-to-water heat pumps
 - Can heat the building
 - Can be used to store energy
- Chiller-heater
 - Recovers heat
 - Heats water to a usable temperature
 - Uses lower GWP refrigerant
- Calmac Ice Bank
 - Stores waste heat as cold water
- Tracer Controls
 - Balance carbon reduction, efficiency, and energy savings

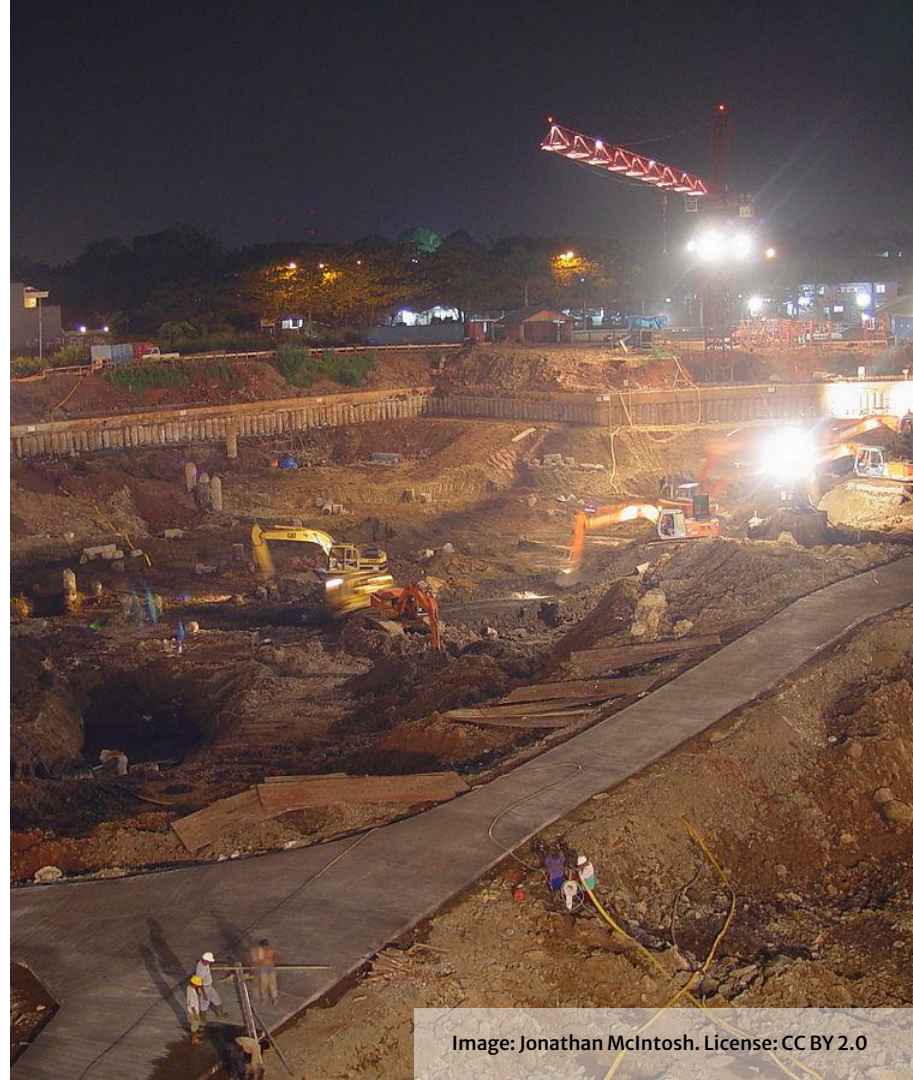
Top 10 Product: Trane Thermal Battery Storage-Source Heat Pump System

- Maximizes heat-pump efficiency in cold climates
- Viable in urban areas (small footprint)
- Cooling loads: standard systems up to 20,000 tons; larger systems possible
- Federal incentives: tax credit through the IRA



Business as usual: noisy fossil fuel-powered construction equipment

- Typically runs on dirty diesel fuel that emits GHGs + toxic pollutants:
 - Particulates
 - Formaldehyde
 - Benzene
 - PAHs
 - Nitrogen oxides
- Can burn up to 2.5 gallons per hour
- Often left idling
- Associated with worker hearing loss and wider noise pollution



Top 10 Product: Volvo Construction Equipment Electric Machines

- Six electric construction machines with lithium-ion batteries:
 - Compact excavators
 - Compact wheel loaders
 - Double-drum asphalt compactor
- Comparable or better performance
- Fewer emissions
- Quieter
- Vibration free
- Less maintenance



Top 10 Product: Volvo Electric Machines

- Charging time:
 - 6 hours with Level 2 AC
 - 1 to 2 hours with DC fast charging
- Better for jobsite employees and communities
- Can work at times and in places diesel equipment can't
- Estimated 35% lifetime cost savings
- 6-year warranty



Top 10 Product: Volvo Electric Machines



Image: Volvo



Image: Volvo

Business as usual: jobsite water consumption and pollution

- Masons, bricklayers, tile setters, painters, and others have to clean their tools using whatever water source is available.
 - Schlepping tools wastes time.
 - Washing them wastes potable water.
 - Waste can clog plumbing.
 - Contaminated water drains into wastewater or stormwater systems



Top 10 Product: Washbox

- Mobile tool-washing station for construction trades
- Operates as a closed loop
- Once filled, no water hookup is needed
- Pump is powered by standard wall outlet
- Reduces waste and pollution:
 - Filters and recycles the water
 - Collects solids so they can be disposed of responsibly



Top 10 Product: Washbox

HOW IT WORKS

BOTTOM TANK
Wash tools using the recycled water from the Washbox bottom tank

TOP TANK
All wastewater and waste inputs are collected in the top tank for processing

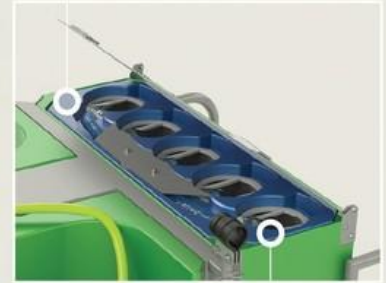
WASTEWATER RECYCLING
The wastewater is automatically stirred then the waste is allowed to settle

RECYCLED CLEAN WATER
The clean water is drained back to the bottom tank where is ready for reuse



GREEN INDICATOR LIGHT
The Washbox is now ready for further washing

FILTER MANIFOLD
The slurry waste is automatically moved to the filter module with our robust transfer pump



REUSABLE FILTERS
By 10am each morning empty the accumulated waste from the filter bag

FOLDING STEPS
Steps fold away for easy maneuvering around your job site. When it's in position just fold out for easy access to a filter module



Championing the Changemakers in Sustainable Design & Building.

Certified



Corporation

Certified B Corporations meet the highest verified standards of social and environmental performance, transparency, and accountability. We've valued their verification system since 2019 and are proud to announce BuildingGreen's B Corp (re)certification.