



**VERITAS CONCEPT
ENGINEERING**

FOUNDATION FOR OPTIMIZED FACILITIES

FACILITY PLANNING • INDUSTRIAL ENGINEERING CONSULTING

Engineer the operation before you design the building.

Robin Owens, Founder & Principal Engineer

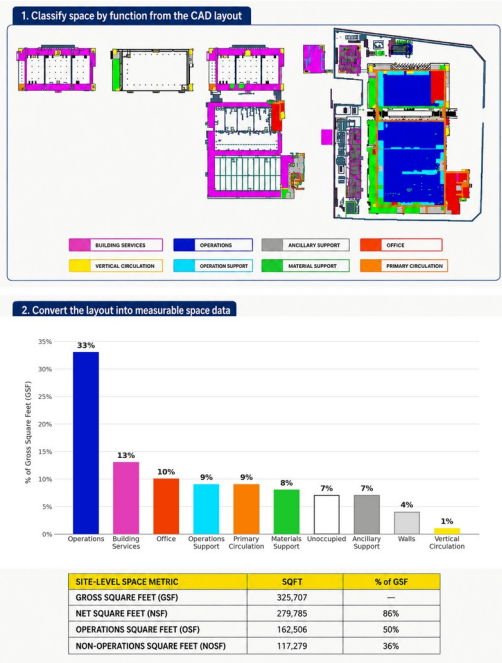
www.veritasconcept.com



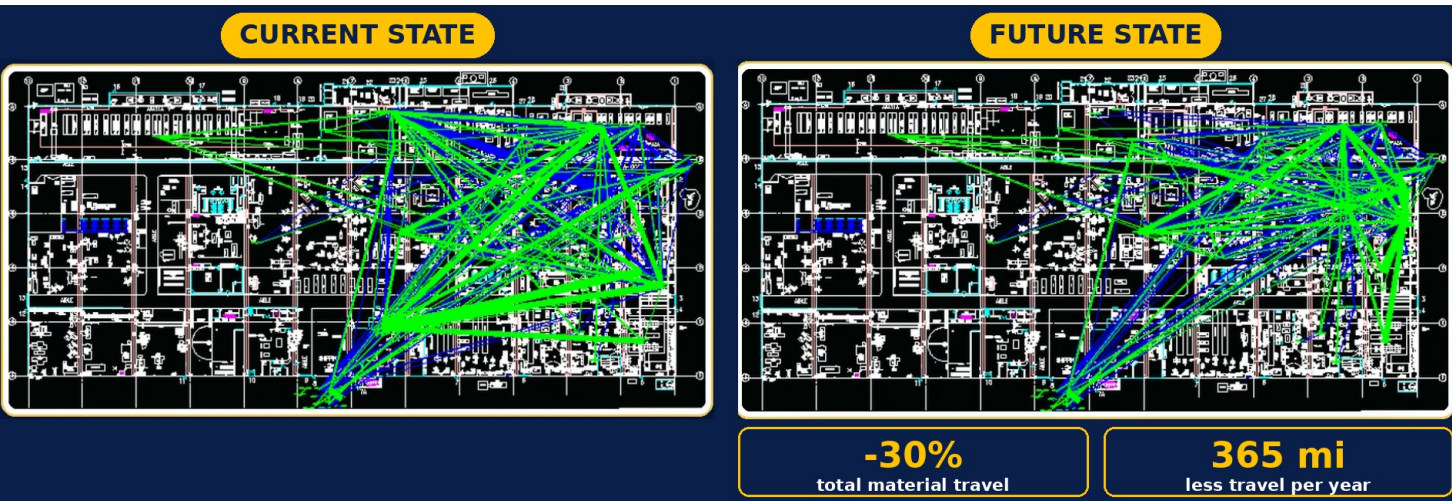
Real client work — not a mockup.

Two pieces of an actual engagement, before we explain how VCE gets there.

Look beyond total square footage. Understand how facility space is actually used.



Space Planning & Analysis — real facility space classified and scored down to the square foot.



Flow Analysis — a week-long kaizen event, current state vs. future state, cutting total material travel by 30%.

Full breakdowns of these two, plus block layout, space, and flow analysis, start a few pages in.

Engineer the operation before you design the building.

Locking in a building design before the operation is fully planned is how facilities end up with costly rework, relationships and adjacencies baked into the wrong places, utilities sized for the wrong loads, and space allocated to the wrong things.

Not under-planned. Operationally unengineered. The mechanical and electrical systems get engineered — sized, calculated, stamped. The layout itself almost never does.

VCE brings that same rigor to the layout: operational requirements, space, circulation, utilities, and relationships, defined before design moves too far forward — while changes are still cheap to make.

WITHOUT THIS STEP, HERE'S WHAT FOLLOWS:

- Conflicts surface mid-construction, triggering change orders and cost overruns.
- Fixes cascade through the remaining phases, breaking the schedule.
- Utilities and layouts get retrofitted after the fact instead of designed right the first time.

ONE PLAN.
EVERY STAKEHOLDER BUILDS FROM IT.



Owners



Architects



Engineers



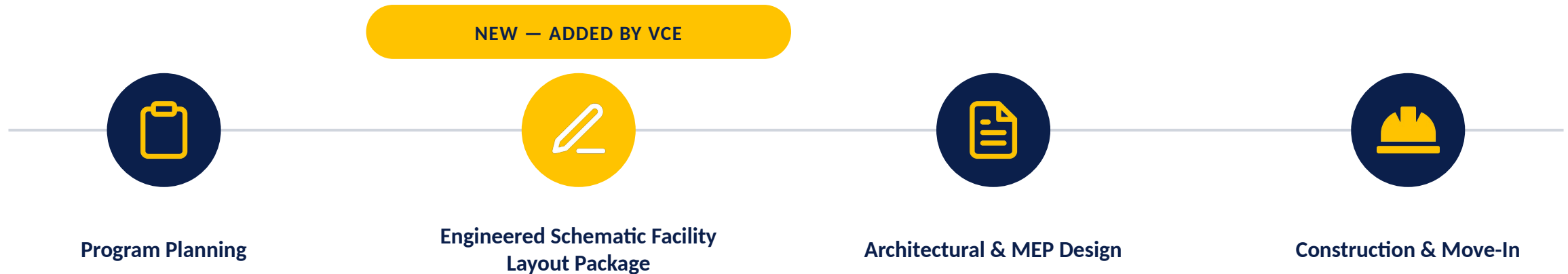
Contractors

HOW VCE FITS IN

One step added. Everything else about your process stays the same.



The same CONCEPT → DESIGN → CONSTRUCTION path you already run — VCE just adds one step up front.



VCE plugs into the process you already run — no new gates, no new vendors, no disruption to your existing team.

WHY THIS MATTERS, BY THE NUMBERS



Front-end planning isn't just our opinion — it's measurable.

Two independent industry research bodies have tracked this across hundreds of real capital projects. Here's what they found:

~10%

CII

Lower capital cost

On average, projects that planned well upfront cost about 10% less to build than projects that skipped that step — the single biggest cost lever CII found.

~7%

CII

Shorter schedules

Well-planned projects also finish construction about 7% faster on average, with roughly 5% fewer change orders along the way.

Up to 20%

IPA

Best- vs. worst-planned projects

Compare the best-planned projects to the worst-planned ones and the total capital cost can swing by up to 20% — same scope, very different bill.

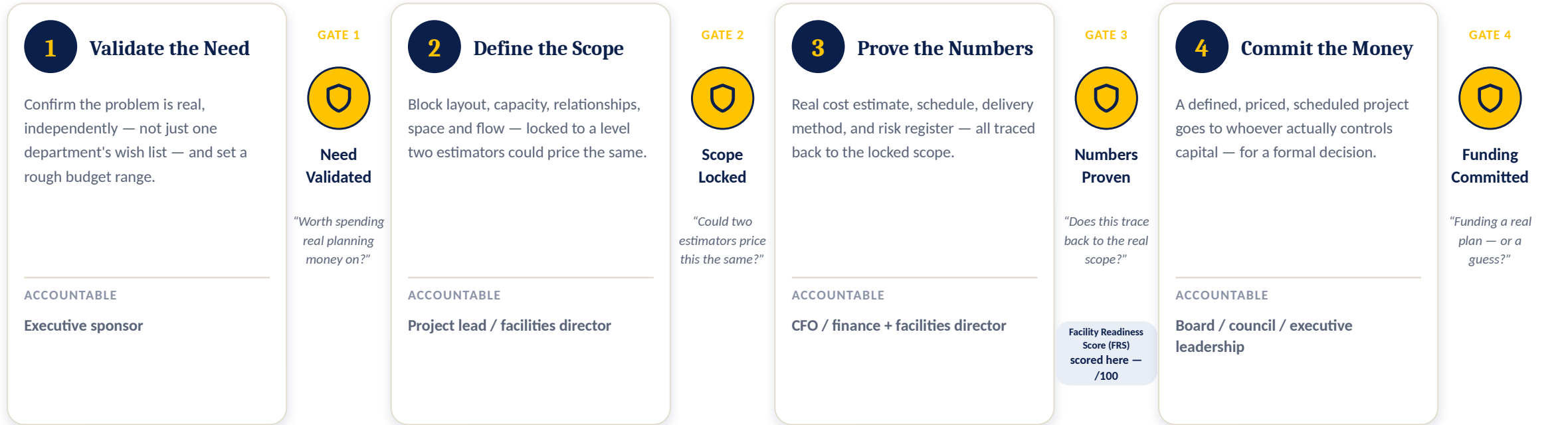
CII = Construction Industry Institute, Adding Value through Front End Planning (Research Team RT-268, publication SP268-3, 2012). Findings reflect a focused set of 17 case-study projects (~\$1.5B combined value), part of CII's broader front-end planning dataset spanning \$35B+ in aggregated project data.

IPA = Independent Project Analysis, Front-End Loading (FEL) Index research, benchmarked across IPA's database of 25,000+ capital projects.

This same research base is what VCE's FRF process is built on.

The FRF Gate Process

An optional Front-End Planning (FEP) process for facility and building owners who need it.



FRF — a gated process for defining the scope of any facility or building project before you commit capital

FRS — a scored readiness index, run once at Gate 3, confirming the numbers are real before capital is committed

After Gate 4, the funded package moves to the architect and MEP team for detailed design and construction — both outside FRF's scope.

WHAT VCE DOES

Six ways VCE plans the operation first



2D/3D AutoCAD Modeling

Make proposed layouts easy to understand so every stakeholder sees the same plan before changes get costly.



Block Layout Planning

Define operational needs, activity requirements, space needs, relationships, and flow before design moves too far forward.



Relationship Planning

Some areas need to be close. Others need to be separated. Make those needs visible before layout decisions are finalized.



Flow Analysis

Examine the movement of materials, people, vehicles, and equipment to find bottlenecks and reduce wasted motion.



Space Planning & Analysis

Understand how facility space is actually used and allocated, and how much supports revenue-generating work.

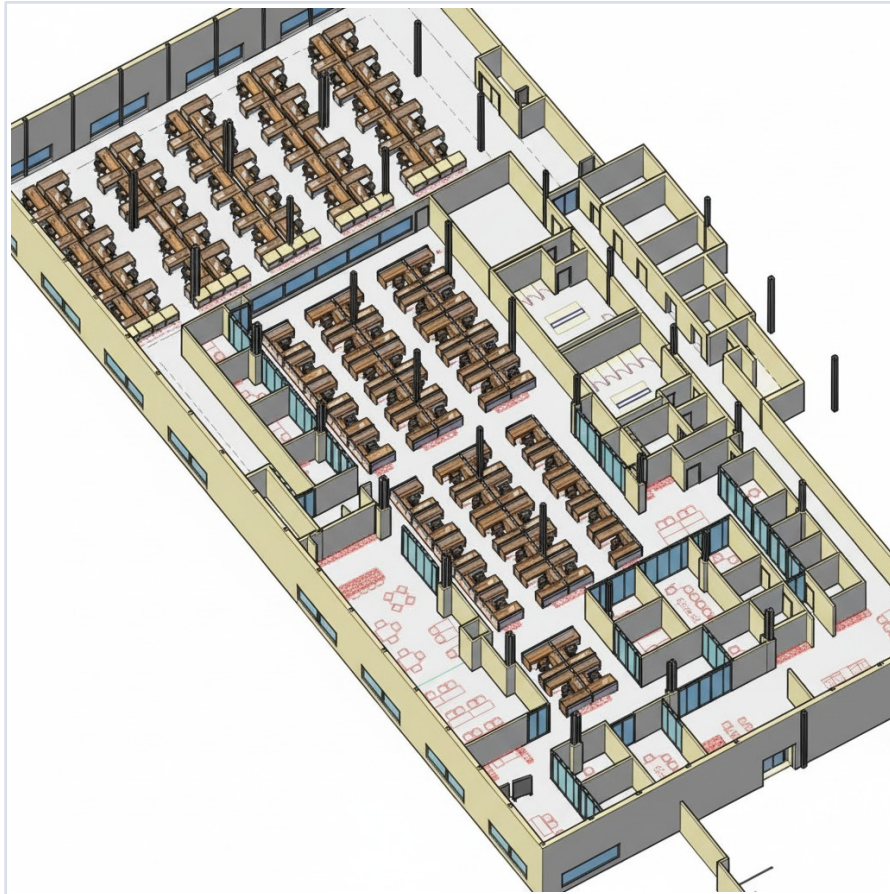


Utilities Documentation

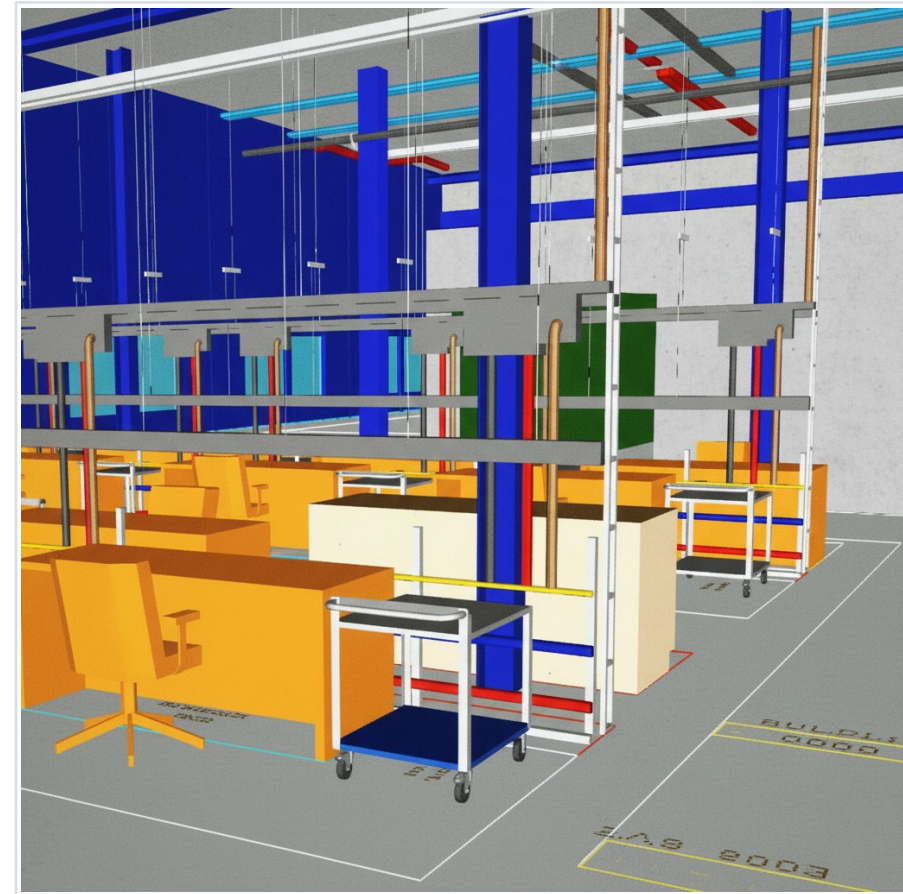
Catalog power, compressed air, water, drains, gases, and HVAC needs in an organized matrix for design handoff.



2D/3D modeling: everyone sees the same plan



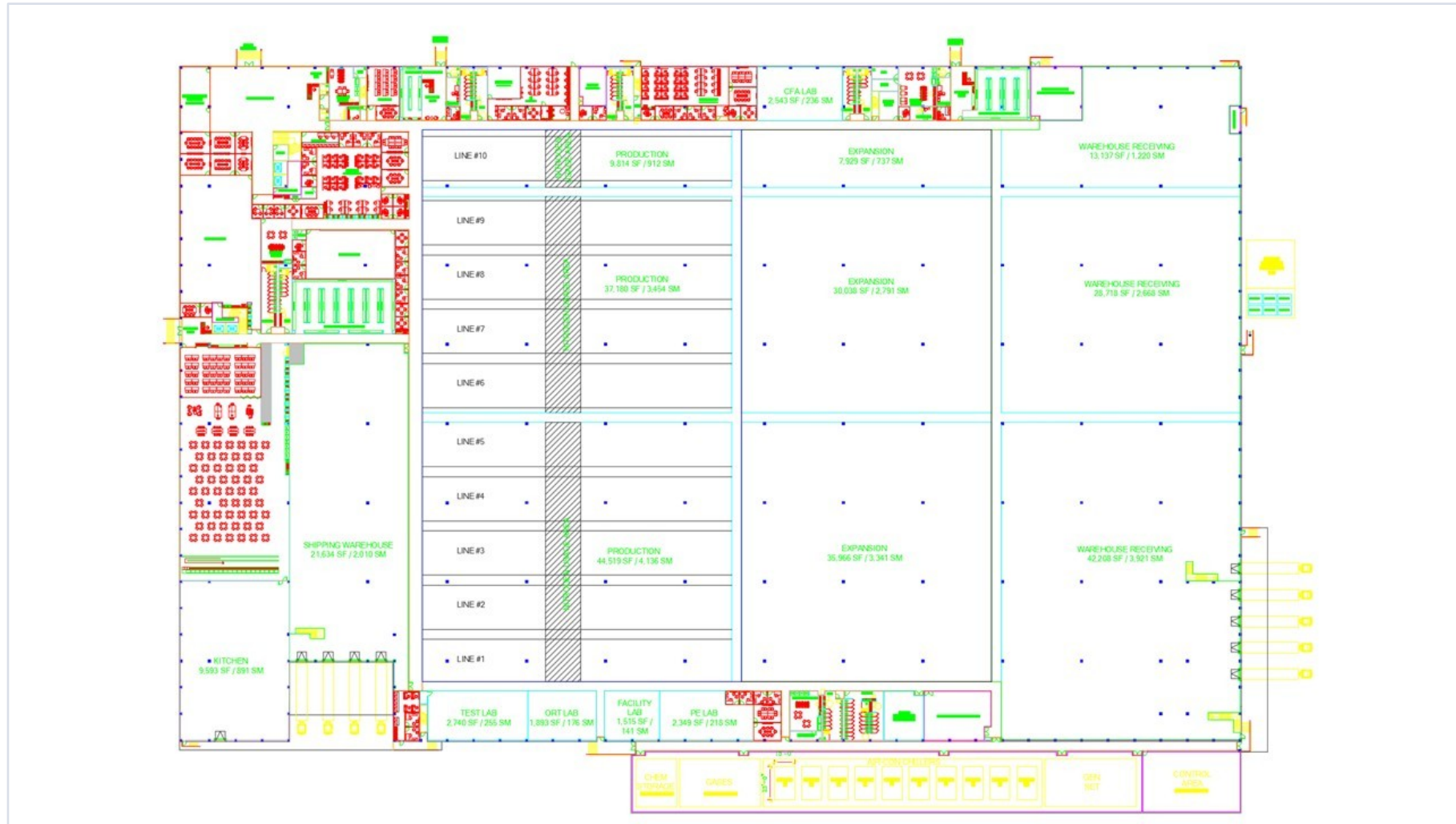
Concept space plan, modeled in 2D/3D — the model every stakeholder reviewed before drawings began.



Utility & equipment coordination — 3D shows what a 2D drawing can't, so the plan is actually understood before it's built.



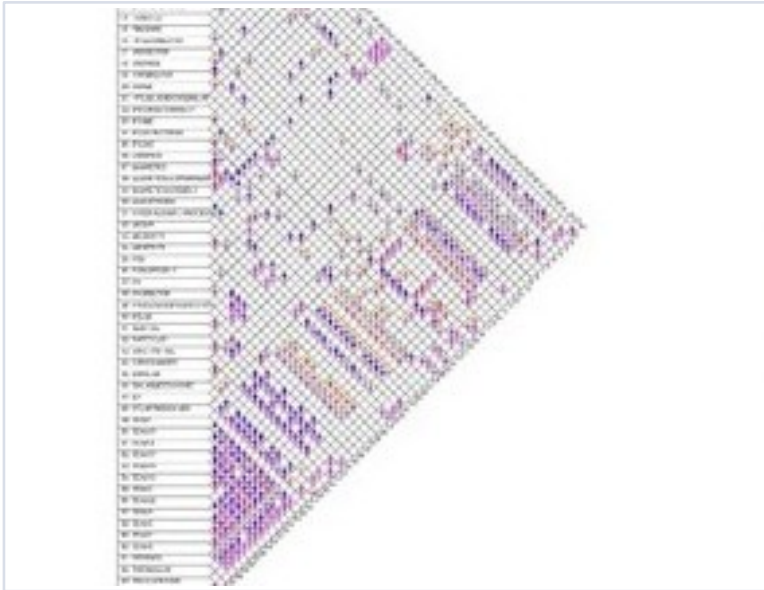
Block layout planning, before design starts



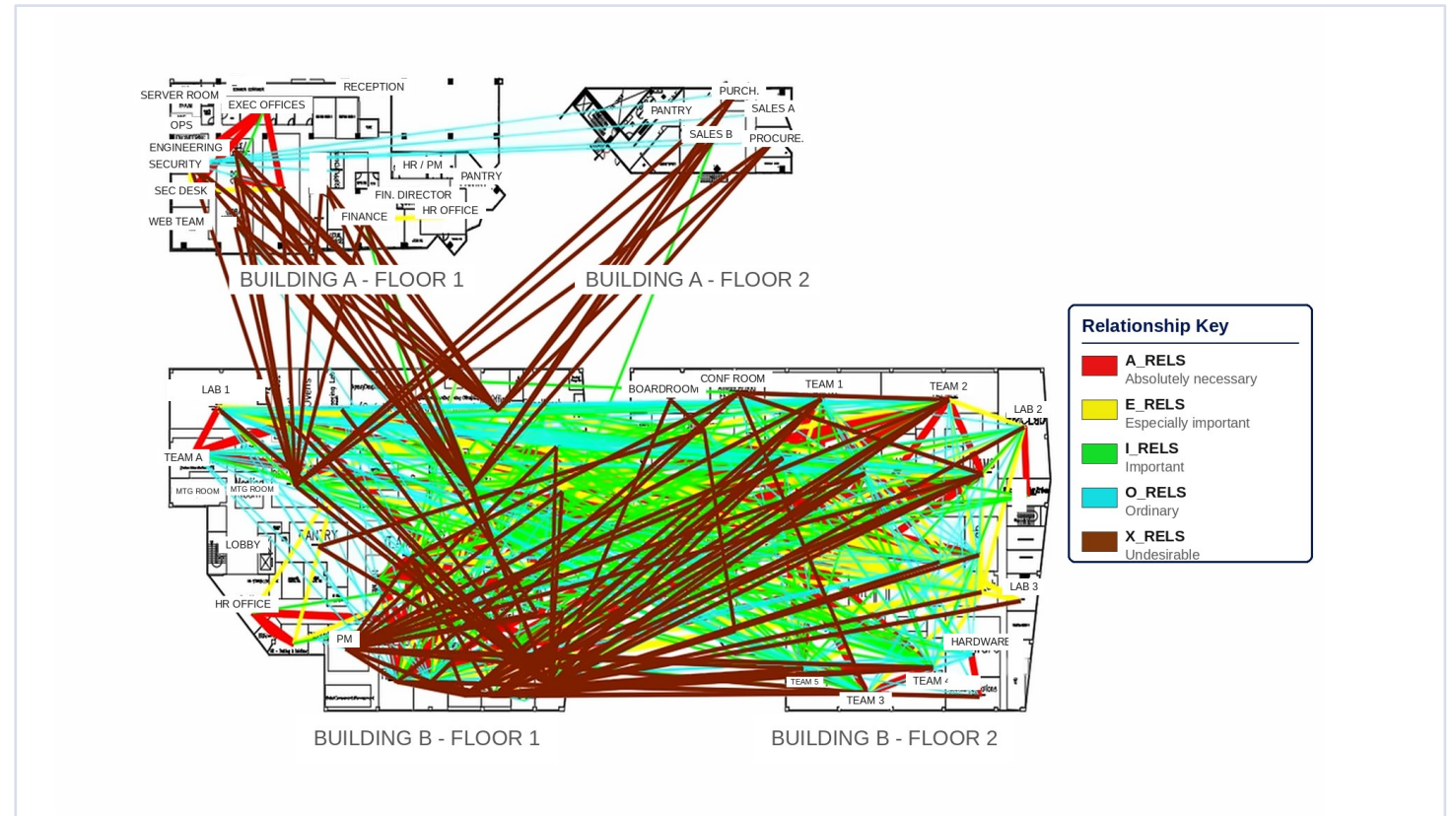
Production lines, expansion space, labs, and warehouse receiving blocked out and sized in CAD before detailed architectural design begins. Used to compare footprint options before the building shell was locked in.

Relationship planning, made visible

RELATIONSHIP CHART

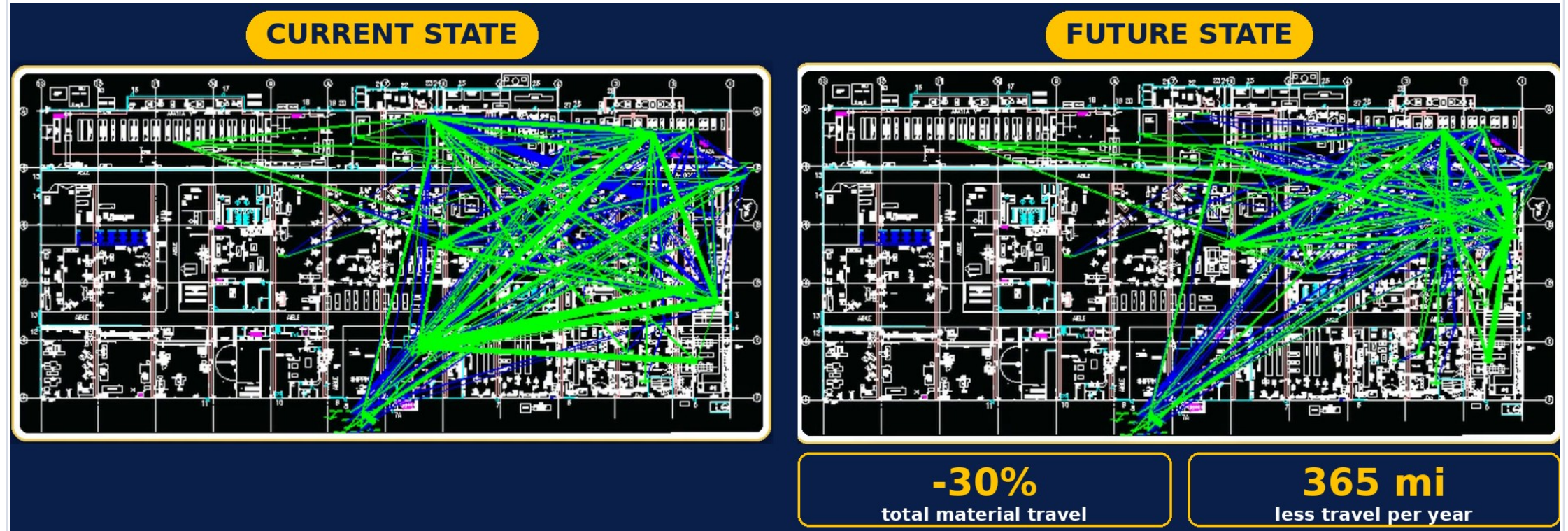


Each pair of areas is scored for how important it is that they sit close together or stay apart, giving a single reference every layout option gets checked against. That resolved conflicting department priorities with data instead of opinion.



Labels and identifying details have been replaced to protect client confidentiality. Colored lines show where departments and equipment need to be close, and where they need to be kept apart, across floors and buildings.

Flow analysis: where distance adds up

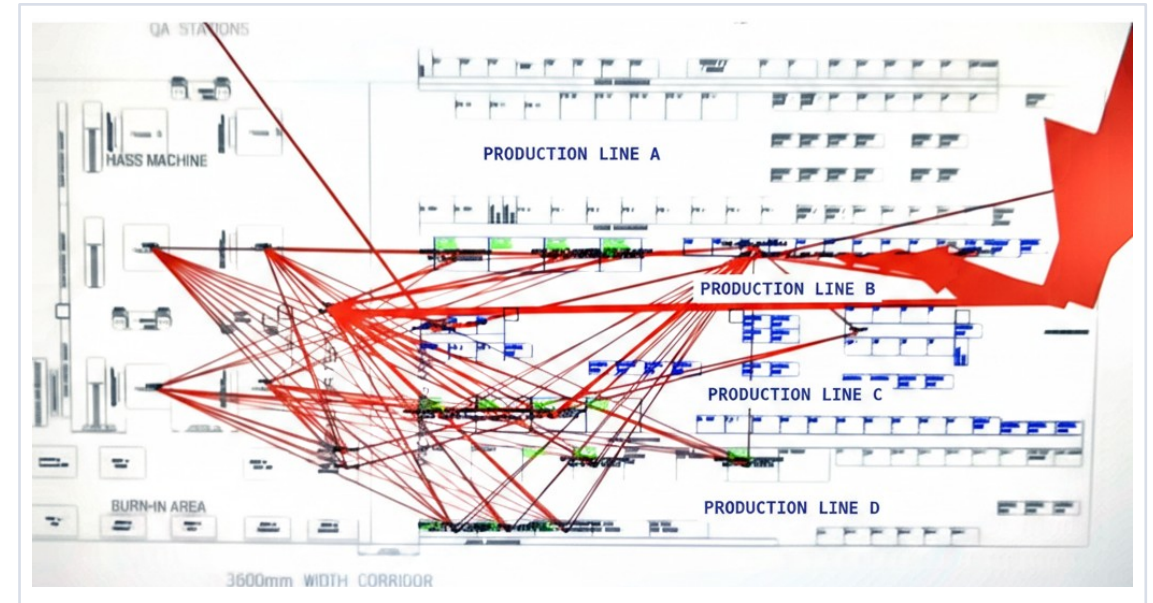


A week-long kaizen event, current state vs. future state: every material flow re-mapped and re-run, cutting total travel distance by 30%.

Flow Analysis: you can't improve flow you can't see



*Every move of one product and its parts through the warehouse.
Mapped in full — not assumed.*



*The same product as it flows through the production line.
This line was assumed to run in a simple straight line.*

Product and Production line names shown are illustrative placeholders; the underlying flow analysis is real.

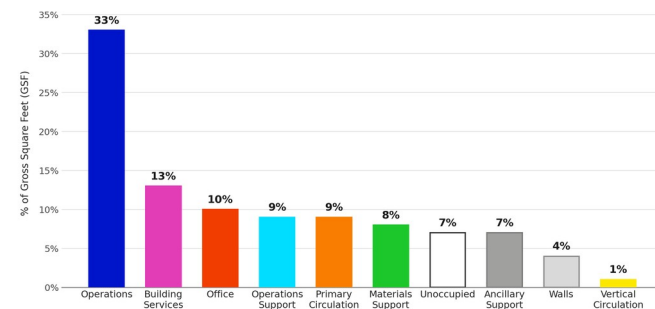
Space planning: a high-level site space analysis

Look beyond total square footage. Understand how facility space is actually used.

1. Classify space by function from the CAD layout



2. Convert the layout into measurable space data



SITE-LEVEL SPACE METRIC	SQFT	% of GSF
GROSS SQUARE FEET (GSF)	325,707	—
NET SQUARE FEET (NSF)	279,785	86%
OPERATIONS SQUARE FEET (OSF)	162,506	50%
NON-OPERATIONS SQUARE FEET (NOSF)	117,279	36%



Look beyond total square footage. Before drilling into equipment density, VCE classifies space at the site level by function — production, warehouse, support, office — so leadership can see how the whole site is actually being used.



Site-level metrics show what share of the footprint is production versus everything built around it, which is the first checkpoint before any detailed space planning begins.

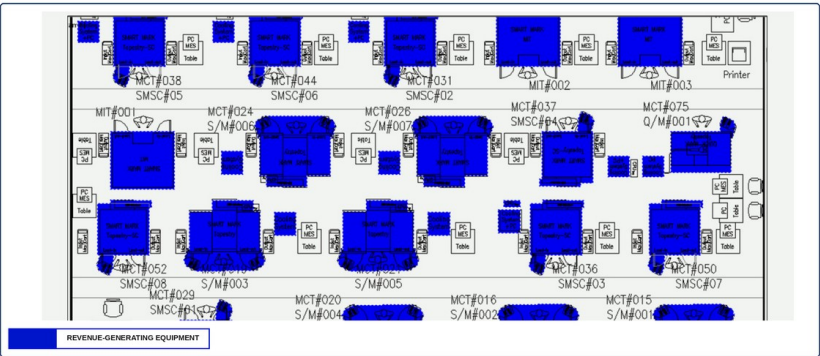


This high-level view sets the frame; the next step narrows in to how densely equipment fills the production space itself.

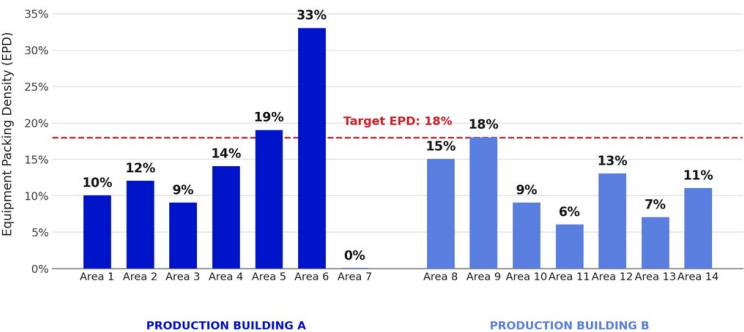
Space planning: Value-Creating Space, by the numbers

How efficiently are you using your operations space?

1. Map equipment footprint within operations space



2. Calculate equipment packing density (EPD)



EQUIPMENT PACKING DENSITY	VALUE-ADD SQFT	OPERATIONS SQFT	EPD
PRODUCTION BUILDING A	7,330	52,373	14%
PRODUCTION BUILDING B	5,930	53,900	11%
COMBINED TOTAL	13,260	106,273	12%



Equipment Packing Density measures how much of your operations space is occupied by value-creating and revenue-generating equipment & processes, versus everything else.



Mapping it area by area shows where a facility is running efficiently and where capacity is being left on the table.



Comparing areas against a target density turns square footage into a number leadership can act on.



Utilities documented in one clear matrix

SEMICONDUCTOR FABRICATION LAB — UTILITY REQUIREMENTS MATRIX																					
Zone	Equipment	Electrical				Mechanical			Process Gases					Chemical / DI				Facility Systems			
		208V 3Ø (A)	480V 3Ø (A)	UPS Power (A)	Emergency Power (A)	Chilled Water (GPM)	Process Cooling Water (GPM)	Vac / CDA Exhaust (CFM)	N₂ Nitrogen (SCFM)	O₂ Oxygen (SCFM)	H₂ Hydrogen (SCFM)	Ar Argon (SCFM)	CDA (Clean Dry Air) (SCFM)	DI Water (GPM)	Chemical Drain (GPM)	Acid Waste (GPM)	Solvent Waste (GPM)	Fire Suppression (GPM/ft²)	EMS Monitoring (Points)	Vibration Control (VC Class)	Grounding / Bonding (Ω)
PHOTOLITHOGRAPHY																					
	Photoresist Coater	20	—	6	—	16	—	259	3	—	—	—	3	3	4	—	—	—	3	—	—
	Stepper / Scanner	—	60	10	—	12	—	—	9	—	—	—	4	5	—	—	—	0.31	4	VC-C	—
	Developer	20	—	—	—	4	—	—	6	—	—	—	—	8	3	—	—	—	—	—	—
	Mask Aligner	30	—	19	—	5	—	261	8	—	—	—	—	—	—	—	—	—	4	—	—
ETCH																					
	Dry Etch (RIE/ICP)	—	30	13	—	8	—	99	5	1	—	4	10	—	3	1.5	—	—	4	—	—
	Wet Etch Station	20	—	—	—	—	—	137	8	4	—	7	—	3	2	1.6	—	—	—	—	—
	Plasma Asher	20	—	—	—	—	—	111	2	5	—	5	—	—	—	—	—	—	3	—	—
DEPOSITION																					
	CVD Furnace	—	60	14	—	4	9	—	9	—	3	6	—	—	3	—	—	—	2	—	—
	PVD Sputter	—	40	14	—	11	—	172	—	—	—	2	—	—	—	—	—	—	3	VC-E	—
	ALD System	30	—	—	—	—	—	—	3	4	—	—	7	—	—	—	—	—	4	—	—
	PECVD	—	40	19	—	14	—	266	9	—	2	7	—	—	—	—	—	—	2	—	—
CMP																					
	CMP Tool	30	—	—	—	13	—	—	—	—	—	—	—	1	2	—	1.4	—	—	VC-D	—
	Post-CMP Cleaner	20	—	—	—	—	—	—	—	—	—	—	—	5	2	—	—	—	—	—	—
IMPLANT / DIFFUSION																					
	Ion Implanter	—	100	16	9	10	6	188	9	—	—	4	—	—	—	—	—	—	4	VC-D	<5
	Diffusion Furnace	—	60	—	10	9	—	—	7	4	3	—	—	—	—	—	—	—	4	—	—
	RTP System	—	40	—	—	7	—	—	8	—	—	7	—	—	—	—	—	—	3	—	—
METROLOGY / INSPECTION																					
	SEM / TEM	30	—	12	—	—	—	275	—	—	—	—	—	—	—	—	—	—	3	VC-D	<2
	Profilometer	15	—	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	VC-C	—
	Defect Inspection	20	—	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	VC-C	—
	Ellipsometer	15	—	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	VC-E	—
CLEAN / WET BENCH																					
	Wet Bench Station	20	—	—	—	—	—	—	—	—	—	—	—	7	4	1.5	1.4	—	—	—	—
	Spin Rinse Dryer	20	—	—	—	17	—	—	—	—	—	—	—	2	4	—	—	—	—	—	—
	Megasonic Cleaner	20	—	—	—	—	—	—	—	—	—	—	—	1	3	—	—	—	—	—	—
SUPPORT																					
	Chemical Storage	15	—	—	—	—	—	—	—	—	—	—	—	—	4	1.7	1.1	0.23	3	—	—
	Gas Cabinet	15	—	—	—	—	—	—	8	—	—	6	10	—	—	—	—	0.28	3	—	—
	Scrubber System	—	30	—	—	18	—	—	—	—	—	—	—	—	2	1.6	1.1	—	—	—	—
	HEPA Fan Filter Unit	20	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LEGEND																					
Value	Mocked sample data — illustrative only; confirm actual loads with vendor data sheet																				
—	Utility not required for this equipment																				
Units	Shown at the top of each column (A, GPM, CFM, SCFM, Points, Ω, etc.)																				
EMS	Environmental Monitoring System — temperature, humidity, particle count																				
CDA	Clean Dry Air — dewpoint ≤ -40°F, particle class per ISO 14644																				

Format used to catalog power, compressed air, water, drains, gases, and HVAC needs by area for handoff to design teams.
Values shown are for demonstration only. This is what keeps mechanical and electrical sized to real loads, not guesswork.

A concept package your architect and MEP team can start from

When VCE's front-end planning wraps up, your architect and MEP engineers start from a concept package that has already been checked against real operational requirements — relationships, space, flow, and utilities.

That means design moves faster, with fewer surprises once drawings are underway.



Design starts from a validated operational foundation.

WHAT'S IN THE PACKAGE



2D/3D concept model



Block layout plan



Relationship study



Flow analysis



Space & density analysis



Utility requirements matrix

ROBIN OWENS

Founder & Principal Engineer
Veritas Concept Engineering



30+ years in industrial engineering & operations



BS Industrial Engineering, MMM, and MBA,
Penn State



8 years living and working in Asia; former IE
instructor, Mapúa University, Manila



Navy veteran — 5 decorations, 2 years of
service in the Persian Gulf

BACKGROUND

Robin brings over 30 years of industrial engineering and operations experience from Boeing, Amkor Technology, Advanced Energy, Intel, and Becton Dickinson, including multiple site leadership roles at Jabil. Robin also spent 7 years with Dr. Dave Sly of Iowa State University, helping bring FactoryFLOW and FlowPlanner, the industry's leading facility layout and flow analysis software for decades, to companies across the USA and Asia.



Robin works directly with facility owners, architects, MEP engineers, and general contractors, translating operational requirements into plans the design and construction teams can build from.

SPECIALIZATION

Front-end facility planning for new and modified facilities, staying engaged through design and construction to preserve the original operational vision in the finished facility.



VERITAS CONCEPT
ENGINEERING
FOUNDATION FOR OPTIMIZED FACILITIES

PUBLISHED EXPERTISE

25 years of published work on facility planning



ISE MAGAZINE • JUNE 2026

Measuring What Matters: Rethinking How Facility Space Is Defined and Managed

Co-authored with Michael Ellis, retired VP at Amkor Technology

INDUSTRIAL ENGINEER MAGAZINE • OCTOBER 2013

Automatic Engineering: Asian Manufacturers Can Duplicate Western Improvements with MPM Systems

INDUSTRIAL ENGINEER MAGAZINE • NOVEMBER 2011

Advancing Facility Planning: Education and Practice in Asia Fall Short of Europe and the United States

IIE SOLUTIONS MAGAZINE • AUGUST 2001 (COVER STORY)

Modeling Future Factories: Whether You Look to the East or the West, 3D Modeling is the Future

Planning a new facility, expansion, renovation, or layout change?

VCE helps define operational requirements before architectural design moves too far forward — whichever of these is on your plate right now.



New Facility

Define operations and space needs before ground breaks on design.



Expansion

Plan added capacity without disrupting what already works.



Renovation

Reset relationships, flow, and utilities inside existing walls.



Layout Change

Re-plan operations before equipment and teams get moved.

HOW TO ENGAGE

You don't have to do it all at once.

Every piece of VCE's front-end planning stands on its own. Start with the one question costing you the most right now, or run the full plan front to back.



Full Front-End Plan

All six pieces — block layout, relationships, space, flow, utilities, and 2D/3D modeling — run together into one concept package for your architect and MEP team.



One Service at a Time

Just need to know if your space is used well, or where flow is wasting time? Pick a single piece — block layout, relationships, space, flow, or utilities. Each one stands on its own.

Either way, the goal is the same: real answers before decisions get expensive to change.



LET'S TALK

Let's plan the operation first.

Robin Owens, Founder & Principal Engineer — Veritas Concept Engineering



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