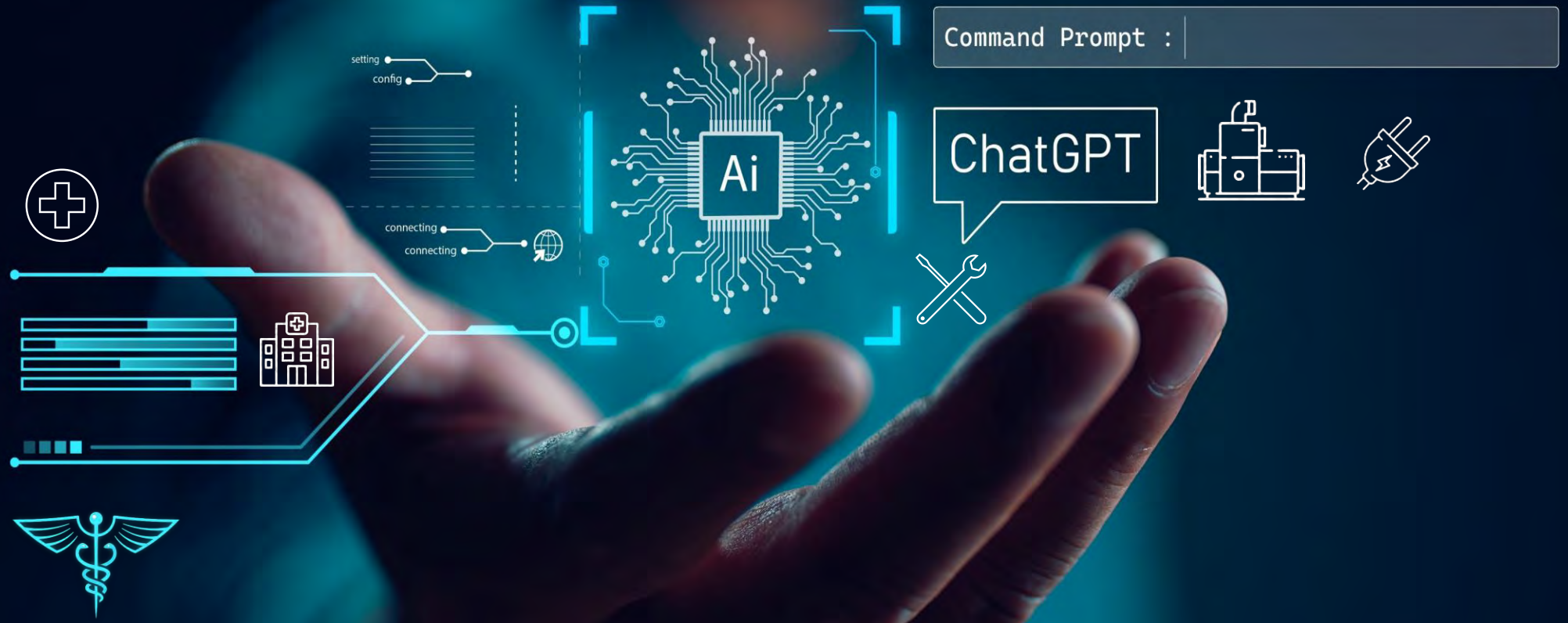
Empowering Healthcare

Digitization as the Foundation for AI-Driven Innovation in HealthCare Facilities



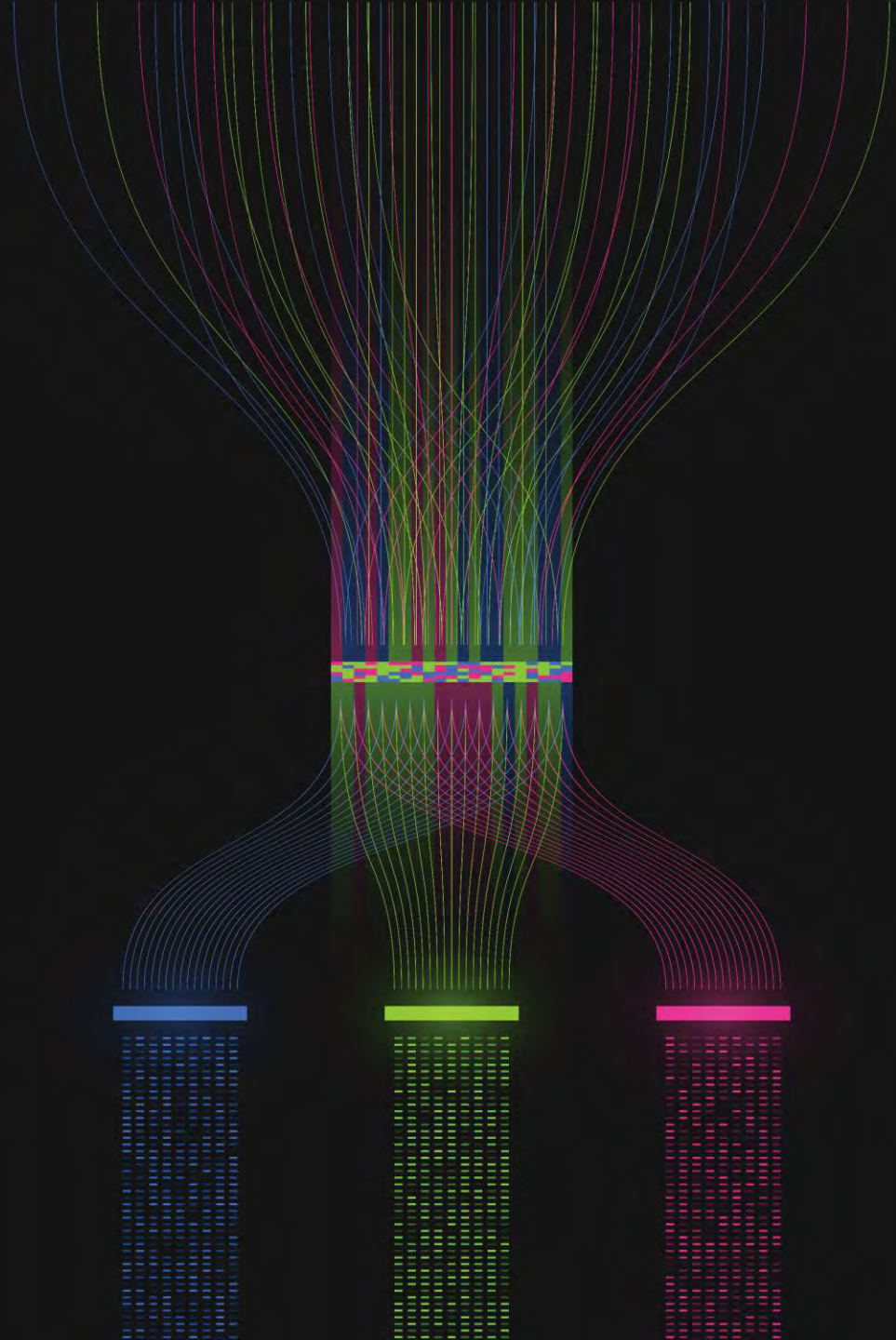
40th Annual FPC Seminar + Expo

Abstract

- Artificial Intelligence (AI) has become an integral part of our daily lives.

- Within the healthcare industry, AI is already making significant strides across various stages, from design and construction to operations.

- However, to fully realize the benefits of AI, it is essential for design consultants, contractors and healthcare institutions to first embrace digitization.



Agenda

01 Introductions

02 Use Cases in our Industry

03 How do we **Technically** prepare for AI?

04 How do we **Culturally** prepare for AI?

05 Summary

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Introduction

Brad Pollitt
Moffitt Cancer Center

Paul Bevis
Brasfield & Gorrie

Daniel Ellis
Affiliated Engineers

Sanjyot Bhusari
Affiliated Engineers

“The world of AI is now moving away from its pioneering phase and moving toward the next one called the "enterprise wave." And then to the physical wave. AI is here!”

NVIDIA CEO Huang

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Introduction

Centralized data capture and storage from multiple sources

Verified formulas ensuring consistency

Ease of internal and external collaboration

IP and privacy control

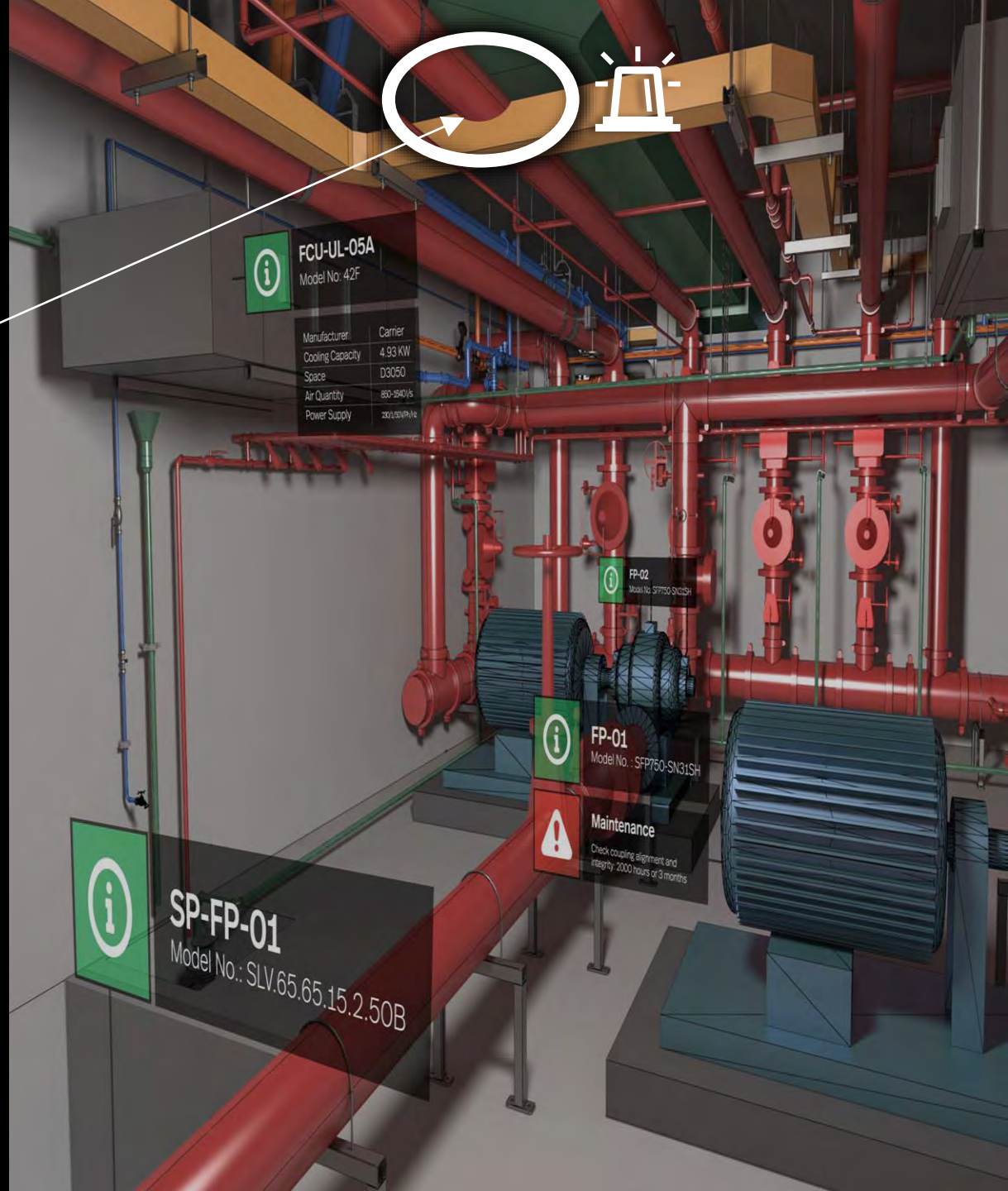
Improved workflows

Enhanced efficiencies

Design – Use Cases

- **Design Clash Detection:** AI-enhanced BIM tools can analyze architectural designs to identify potential conflicts between different systems (e.g., electrical, plumbing, structural) early in the design process.

- **Design-to-Construction Optimization:** AI algorithms can analyze building information models to suggest design changes that simplify construction processes, reduce materials waste, and improve



Construction – Use Cases

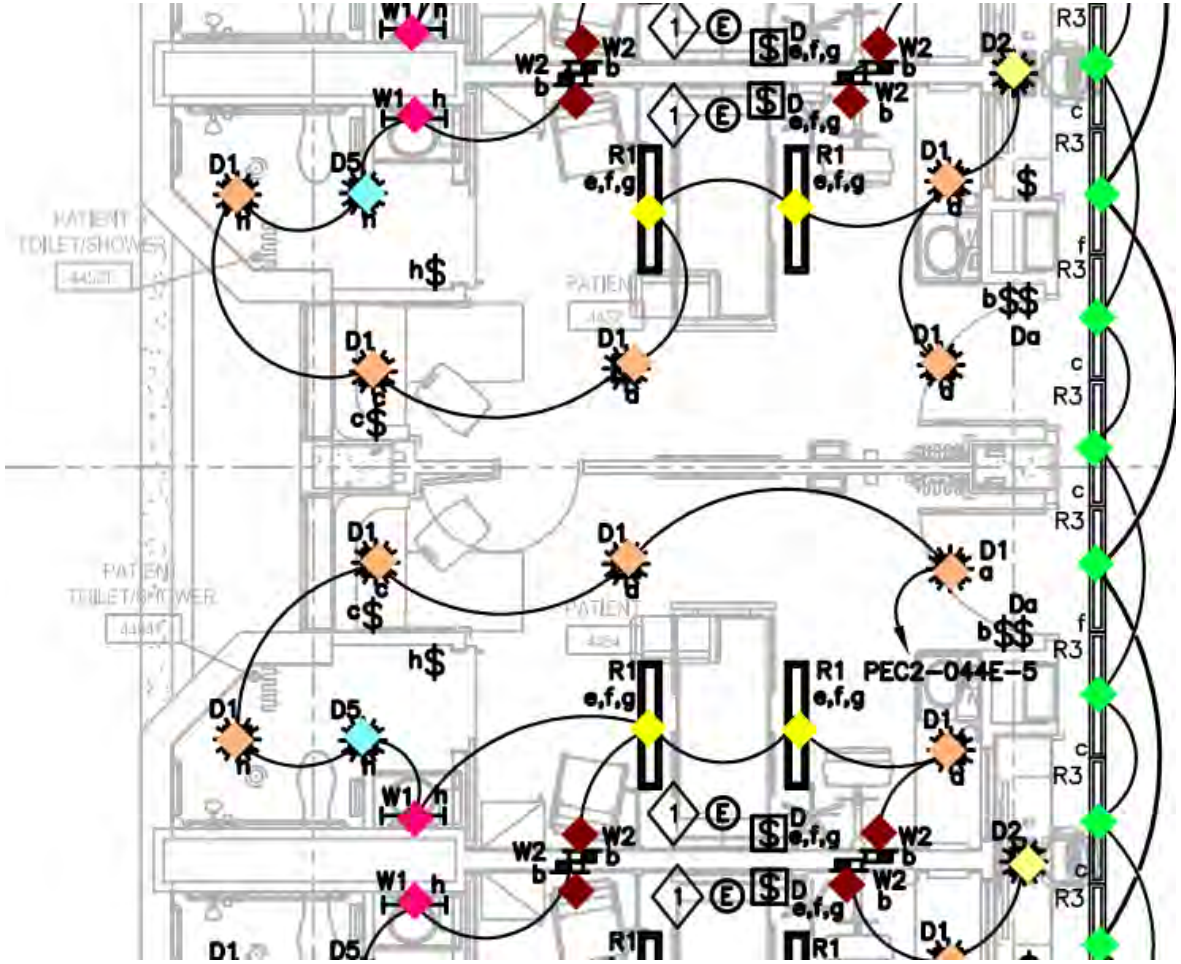
Goals for Digitization and AI advancement in the Construction Industry

- Increase Accuracy
- Increase Efficiency
- Reduce Risk

Construction – Use Cases

Preconstruction – Where have we been?

- Material Quantities are taken-off by hand (one by one)
- Budgets are Established by going out to Market
- Large Team Effort
- Overall process can be slow in an effort to be accurate



Construction – Use Cases

Preconstruction – Where are we heading?

- Investments in Data and Software
  - Instant quantity takeoffs
  - Real time budget updates based off real market data
- Developing Processes that utilize client specific data to allow for specific targeted goals/decision points
- GOAL: Increase Accuracy

TOTAL PROJECT		UF 62 MS Escalated 10% From Dec. 2021 Pricing		UF 52 Med-Surg 10.07.23 Budget Pricing		DELTA UF 62 (ESC) to UF 52 (BUD)		
		GSF 17,360		GSF 19,334		GSF 19,334		
CSI	Item of Work	Total Cost	Cost Per SF	Total Cost	Cost Per SF	Delta	Delta Cost Per SF	Comments
1010	Wall Protection	$151,306	$8.72	$160,707	$8.31	$9,401	($0.40)	
1100	Equipment - Patient Lifts	$216,655	$12.48	$225,256	$11.65	$8,601	($0.83)	
1105	Equipment - Patient Headwalls	$69,943	$4.03	$87,005	$4.50	$17,062	$0.47	
1110	Equipment - Pneumatic Tube System	$73,016	$4.21	$27,965	$1.45	($45,051)	($2.76)	
1210	Window Treatments	$40,797	$2.35	$41,810	$2.16	$1,013	($0.19)	
1500	Fire Protection	$87,678	$5.05	$101,487	$5.25	$13,809	$0.20	
1530	Plumbing	$1,317,045	$75.87	$1,645,679	$85.12	$328,634	$9.25	Pending More Cost Detail
1530	HVAC	$1,566,010	$90.21	$1,849,985	$95.69	$283,976	$5.48	Pending More Cost Detail
1600	Electrical	$1,693,987	$97.58	$2,133,650	$110.36	$439,663	$12.78	Pending More Cost Detail
9995	CM Contingency	$295,195	$17.00	$351,982	$18.21	$56,787	$1.20	
	Direct Costs	$ 9,061,265	$ 521.96	$10,879,901	$562.73	$1,818,636	$40.77	

Construction – Use Cases

Construction – Where have we been?

- Document Reviews, Material Tracking, Submittal Reviews
- Large Teams track large scopes of work.
- Coordination efforts for MEP trades have either been in the field or by hand with the help of computer modeling.

Submittal Tracking

		Design		
Submittal #	Description	Spec Section	Item Type	Target Submit
233416	Centrifugal HVAC Fans	1.2A1	Product Data	
233417	Centrifugal HVAC Fans	1.2A2	Shop Drawings	
233418	Centrifugal HVAC Fans	1.2A3	Wiring Diagrams	
233419	Centrifugal HVAC Fans	1.2A4	Product Certificates	
233420	Centrifugal HVAC Fans	1.2A5	Maintenance Data	
233421	Centrifugal HVAC Fans	1.5A	Attic Stock	
233422	Centrifugal HVAC Fans	3.5	Demonstration	
233423	HVAC Power Ventilators	1.2A1	Product Data	
233423	HVAC Power Ventilators	1.2A2	Shop Drawings	
233423	HVAC Power Ventilators	1.2A3	Wiring Diagrams	
233423	HVAC Power Ventilators	1.2A4	Maintenanc Data	
233423	HVAC Power Ventilators	1.5A	Attic Stock	
233423	HVAC Power Ventilators	3.4	Demonstration	
233600	Air Terminal Units	1.3A	Product Data	
233600	Air Terminal Units	1.3B	Nameplate Data	
233600	Air Terminal Units	1.3C	Shop Drawings	
233600	Air Terminal Units	1.3D	Wiring Diagrams	
233600	Air Terminal Units	1.3E	Maintenance Data	
233600	Air Terminal Units	1.4A	Attic Stock	
233600	Air Terminal Units	3.4	Demonstration	
233713	Diffusers, Register, and Grilles	1.3A	Product Data	
233713	Diffusers, Register, and Grilles	1.3B	Coordination Drawings	
233713	Diffusers, Register, and Grilles	1.3C	Color Samples for Initial Selection	
233713	Diffusers, Register, and Grilles	1.3D	Samples for Verification	
233713	Diffusers, Register, and Grilles	1.4	Attic Stock	
233723	HVAC Gravity Ventilators	1.3A	Product Data	
233723	HVAC Gravity Ventilators	1.3B	Coordination Drawings	
233723	HVAC Gravity Ventilators	1.3C	Color Samples for Initial Selection	
234100	Particulate Air Filtration	1.3A	Product Data	
234100	Particulate Air Filtration	1.3b	Shop Drawings	

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 - GENERAL

1.01 SUMMARY
- A. This Section includes the following:
  1. Venturi type air valves
- B. Related Sections include the following:
  1. Section 23 3100 - HVAC Ducts and Casings (Support)

1.02 SUBMITTALS
- A. Shop drawings including, but not limited to, the following:
  1. Manufacturer's name and model number
  2. Identification as referenced in the documents
  3. Capacities/ratings
  4. Materials of construction
  5. Sound rating data
  6. Dimensions
  7. All other appropriate data

1.03 REFERENCED STANDARDS AND DESIGN CRITERIA
- A. Duct Reheat Coils: Ratings shall be certified in accordance with ARI Standard 410.
- B. Where any of air terminal devices are indicated on drawings to control space conditions in conjunction with reheat coil, that reheat coil shall be furnished as an integral part of or standard accessory to devices specified below. See related work above.
- C. Unless shown or indicated otherwise, control panels of terminal devices shall be mounted on the same side of air terminal device as reheat coil piping connection for all air terminal devices furnished with reheat coils.
- D. Unless otherwise stated, units shall be system pressure independent and maintain air volume within ± 5% of required airflow regardless of system air pressure. Inlet velocity pressure sensor shall be multi-point center averaging type and be capable of amplifying pressure signals.
- E. Unless otherwise stated, unit casings shall be constructed of galvanized steel or aluminum meeting SMACNA or ASHRAE Standards, but not lighter than 22 gauge.
- F. Joints and seams of air terminal devices shall be sealed with appropriate sealant to minimize casing air leakage. Seal joints and seams not factory sealed in field as specified in Part 3.
- G. Unit performance shall be certified in accordance with ARI Standard 880 including sound rating data certified for both casing discharge and radiated sound levels from 125 through 4000 Hz.
- H. Unit manufacturer or manufacturer's designated representative will be required to verify air terminal device performance and adjust or replace device within warranty period when it is determined that problem exists in area served by device.

1.04 CONTROLS COORDINATION
- A. Control Contractor shall furnish all actuators, linkages if required, differential pressure transmitters, controllers and any other devices required for unit control that are not provided by unit manufacturer for unit manufacturer's factory mounting. Unit manufacturer and Control Contractor shall coordinate for proper factory installation.
- B. Unit manufacturer shall factory install devices furnished by Control Contractor to result in complete functioning unit. Unit manufacturer shall be responsible for reviewing compatibility of devices furnished by Control Contractor with units being provided.
- C. Control Contractor shall be responsible for calibrating single duct air terminal device actuators and controllers through TAB work for scheduled airflow rates.

PART 2 - PRODUCTS

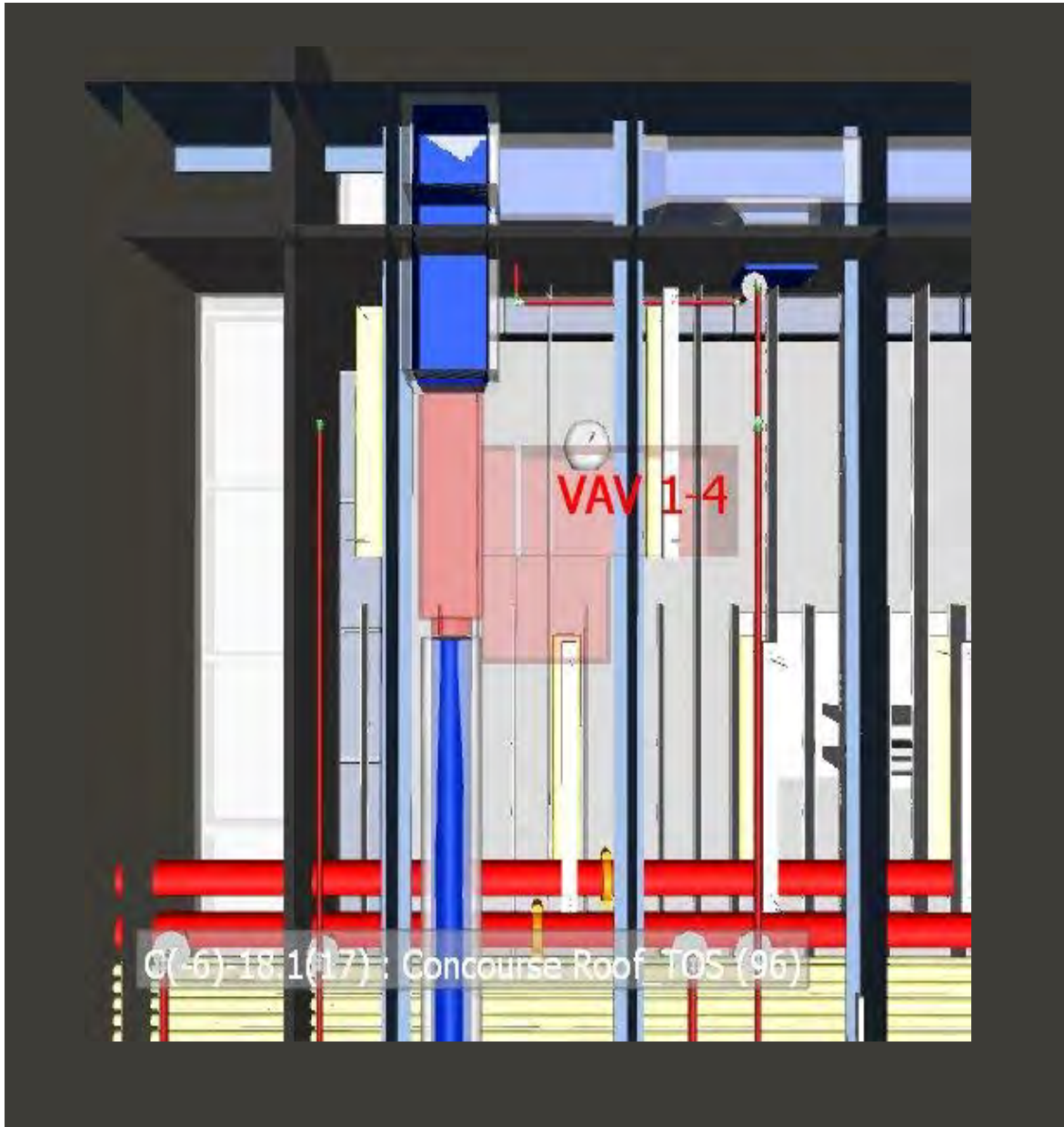
2.01 VENTURI TYPE AIR VALVES – DIRCTLY BAS CONTROLLED
- A. Manufacturers: Phoenix Controls or Price.

Construction – Use Cases

Construction – Where are we heading?

- Investments in Data and Software
  - Utilization of Building Information Modeling to coordinate MEP systems
  - Utilization of programs to sift through submittals and documents and provide deliverable lists.
- Investments in Physical Equipment
  - Smart-Machines for Field operations
- Investments in People
  - Training our people to utilize new software to make us more efficient

- GOAL: Increase Efficiency



Construction – Use Cases

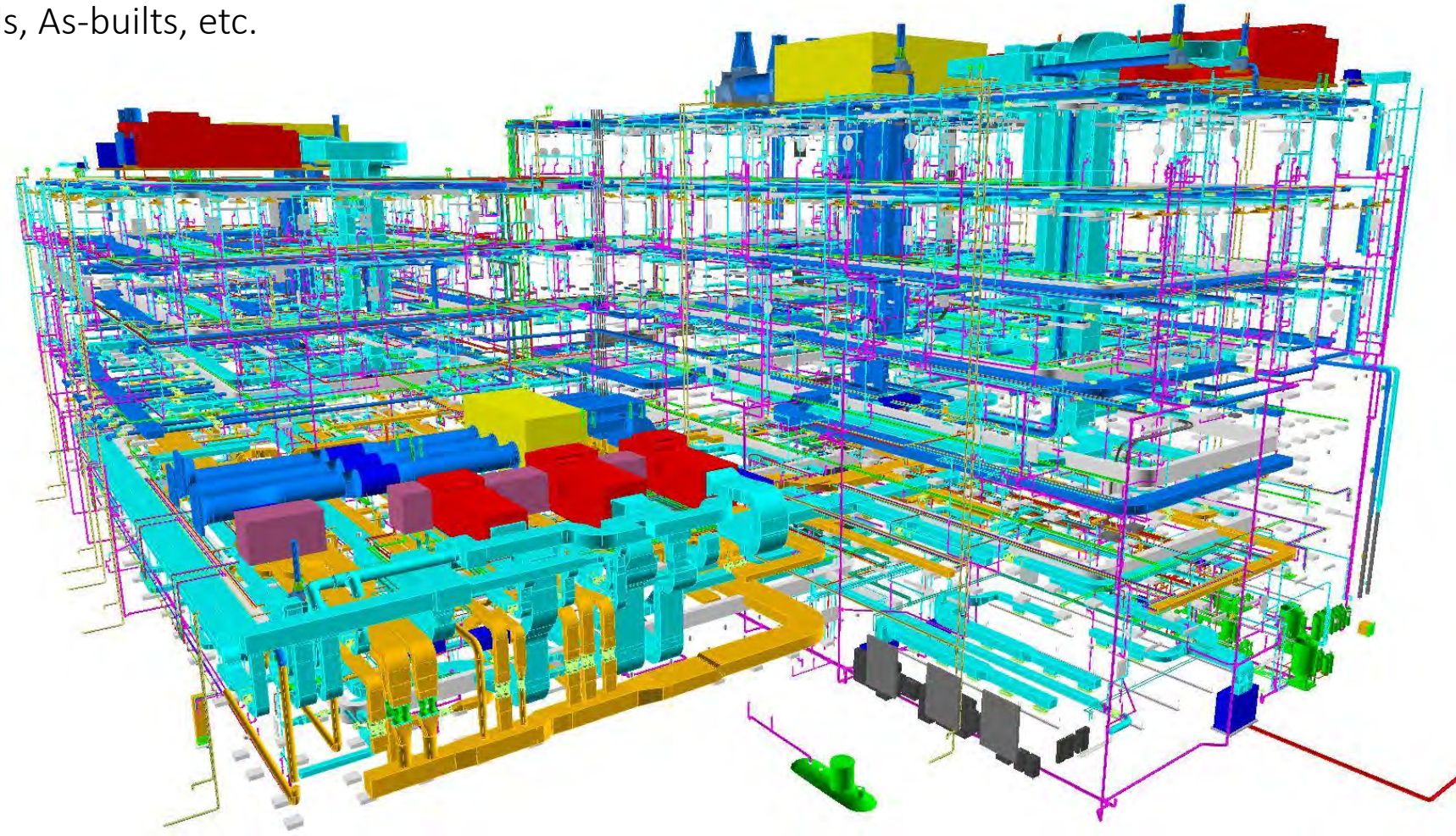
Post Construction – Where have we been?

- Large Quantities of Documentation delivered to Clients and Design Team in an Unusable Manner
- Documentation is usually not curated to client's needs
- Documents are usually either thrown away or forgotten.

Construction – Use Cases

Post Construction – Where are we heading?

- Fully integrated Building Information Modeling that is turned over to Client and integrated into Maintenance model.
  - Complete with O&M Manuals, As-builts, etc.
  - Replacement Parts List
  - Warranty Tracking

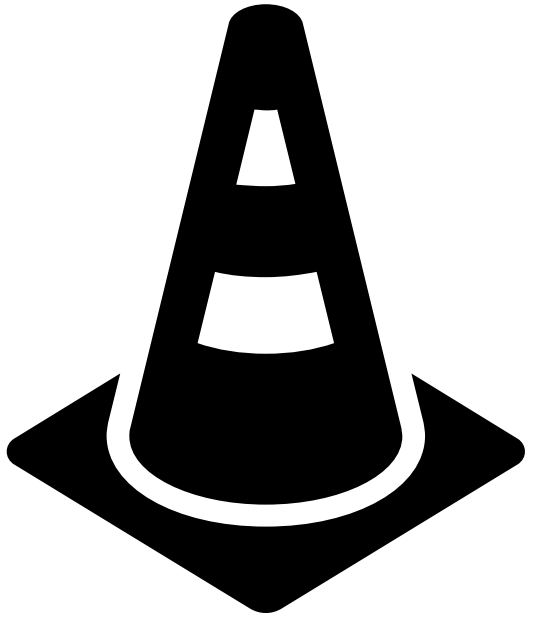


- GOAL: REDUCE RISK

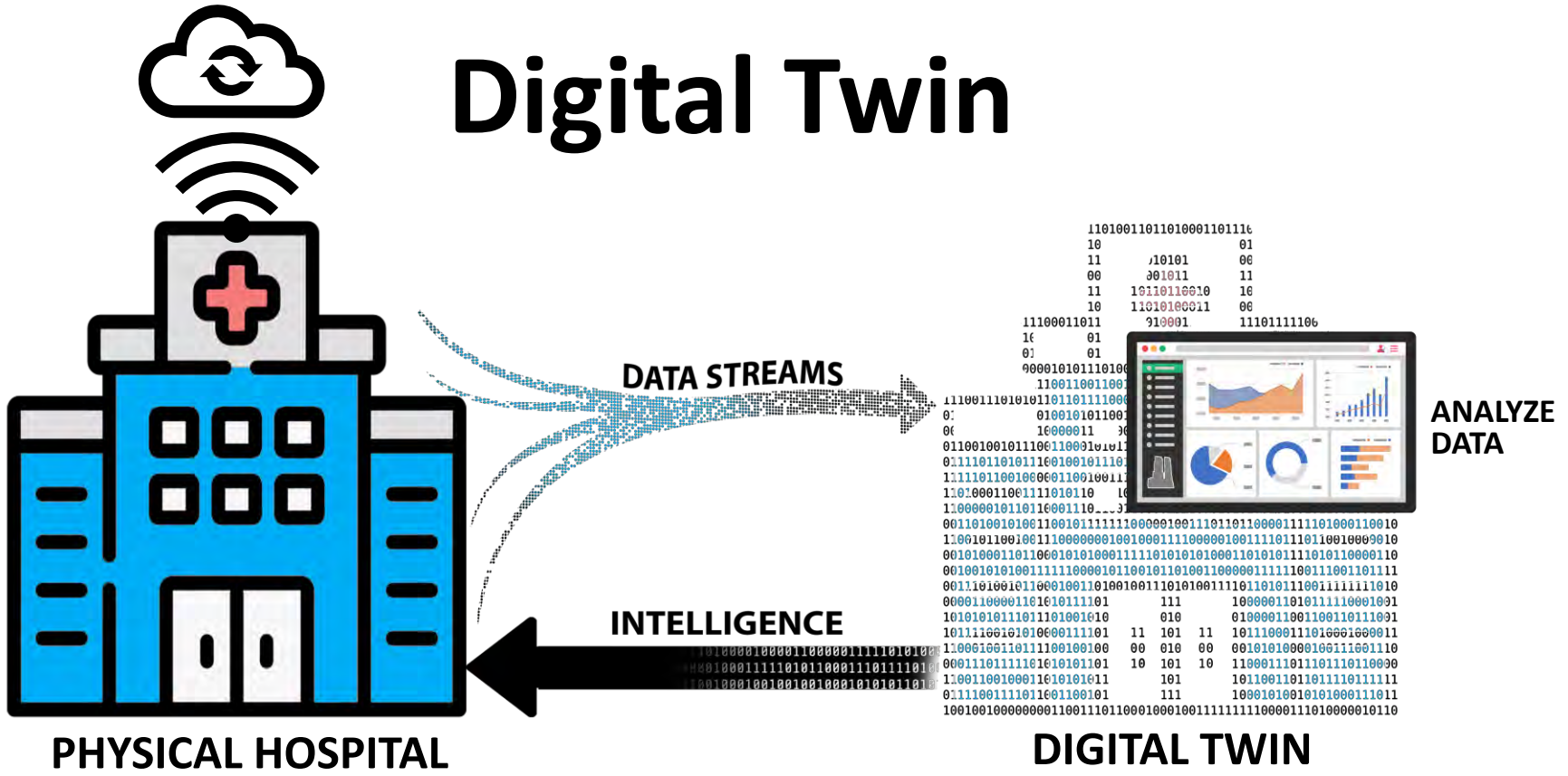
Construction – Use Cases

Potential Pitfalls to Digitization in the Construction Industry

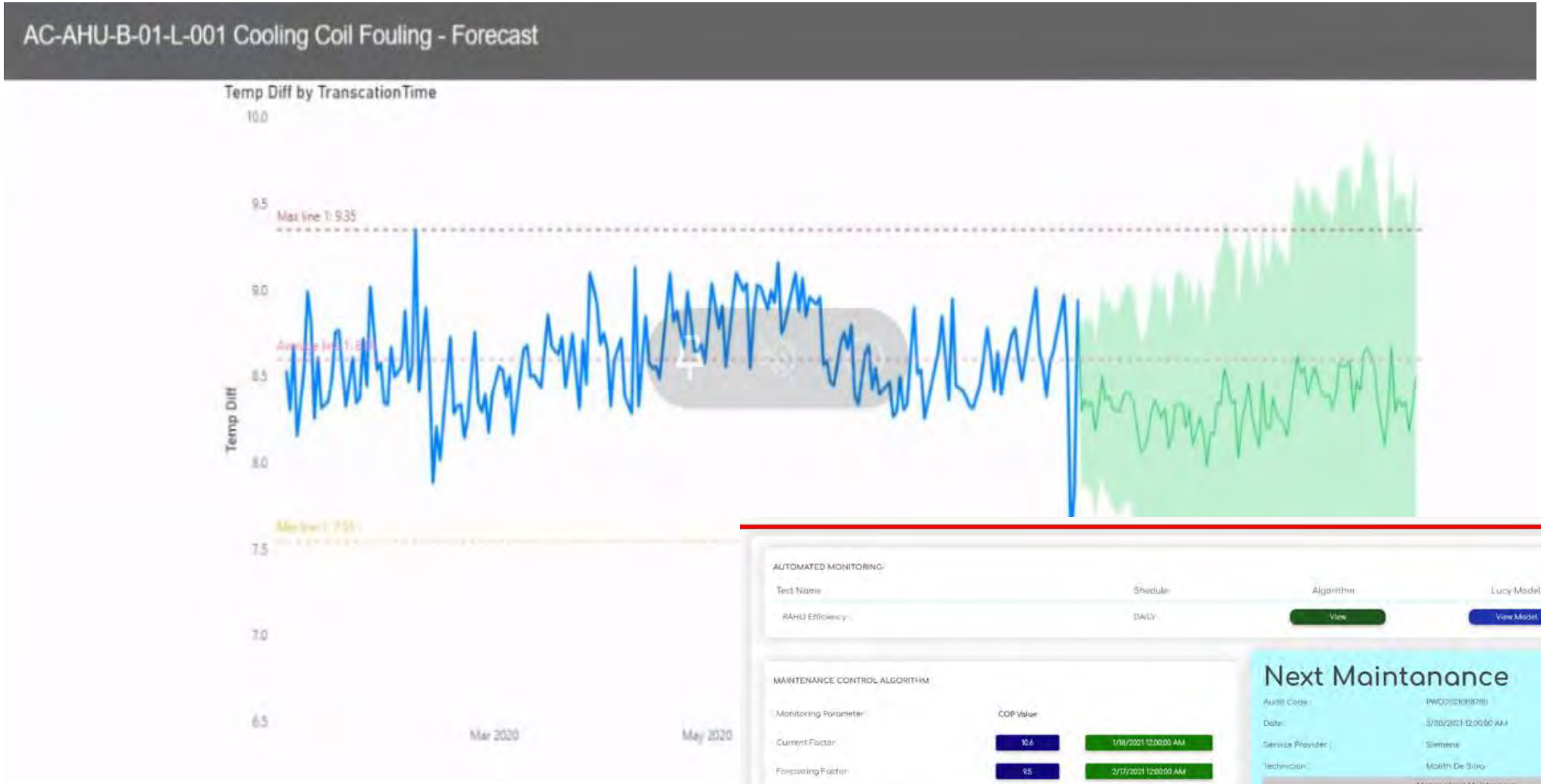
- Garbage In = Garbage Out
- Experienced Oversight is still needed as we move towards digitization
- Design and client standards must be established early



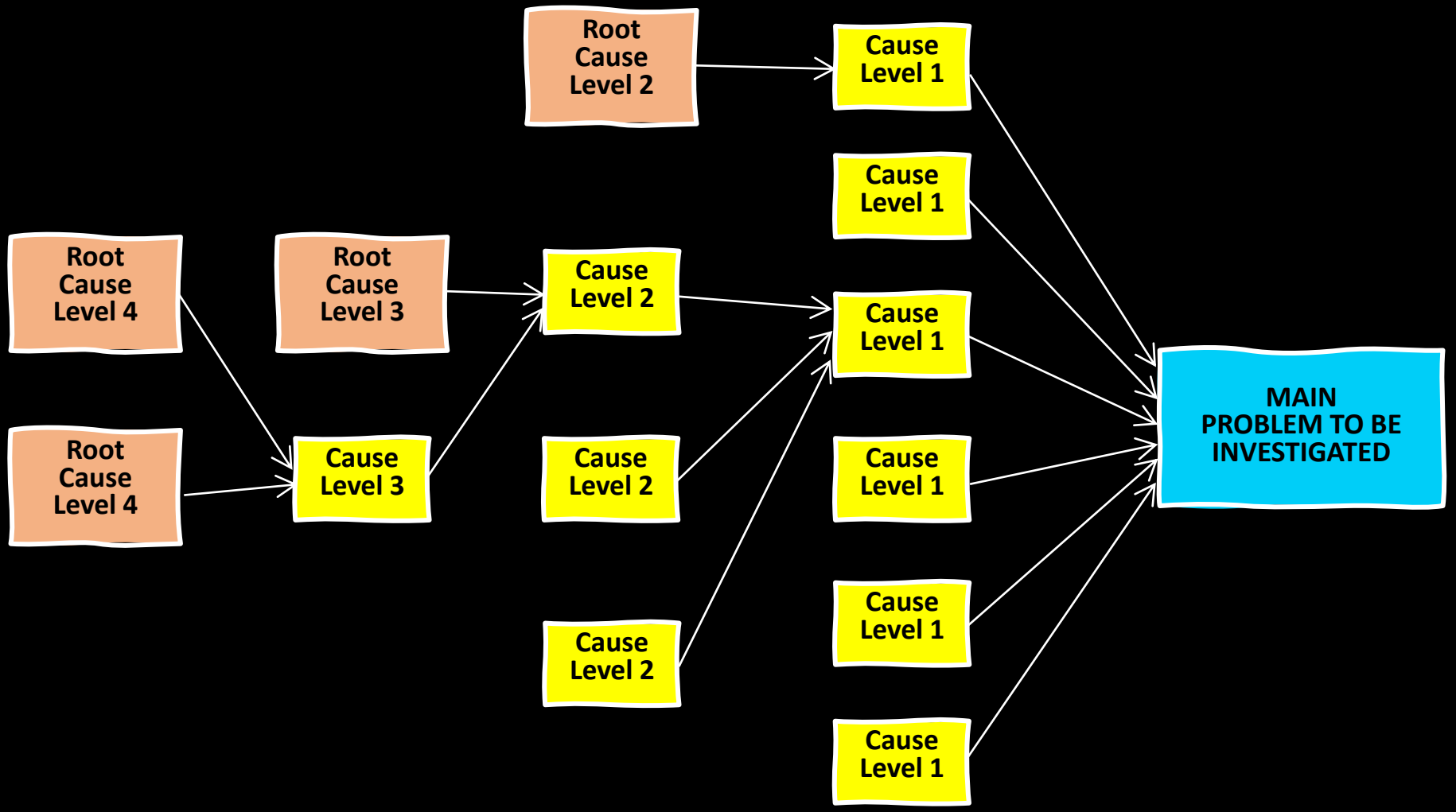
Operational – Use Cases



Operational – Use Cases



Operational – Use Cases



Operational – Use Cases

- Extend Employees Capacity with Knowledge Assistance
- Make Better Data Driven Decisions
- Preserve Data for Future Work

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Design Digitization

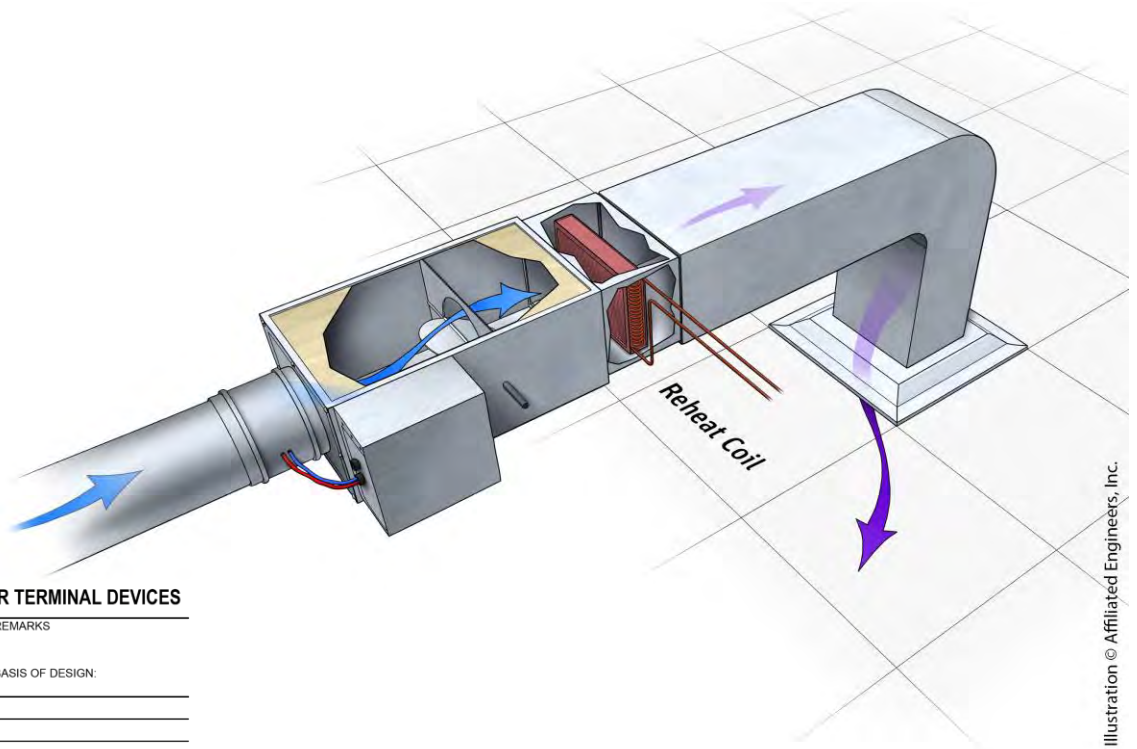


Illustration © Affiliated Engineers, Inc.

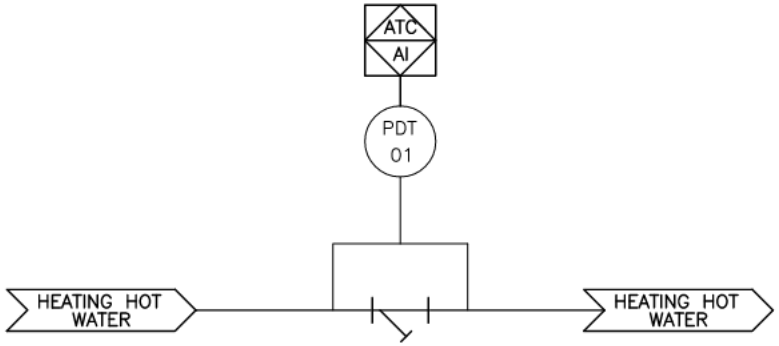
VARIABLE AIR VOLUME AIR TERMINAL DEVICES

MARK SAT	AIR TERMINAL					REHEAT COIL								REMARKS
	MAX. AIRFLOW (CFM)	OCC. MIN. AIRFLOW (CFM)	UNOCC. MIN. AIRFLOW (CFM)	MINIMUM INLET SIZE (IN)	MAX. UNIT PD (IN WG)	REHEAT AIRFLOW (CFM)	CAPACITY (MBH)	WATER FLOW (GPM)	EAT (°F)	LAT (°F)	EWT (°F)	HHW DT (°F)	MAX. WATER PD (FT WG)	BASIS OF DESIGN:
1-1	430	180	130	8"	0.50	180	6	0.6	55.8	89	120	20	-	
1-2	480	170	170	8"	0.50	270	9	0.9	55.8	87	120	20	-	
1-3	250	100	80	6"	0.50	100	3	0.3	55.8	85	120	20	-	
1-4	210	150	150	6"	0.50	150	5	0.5	55.8	85	120	20	-	
1-5	620	230	230	8"	0.50	320	11	1.1	55.8	88	120	20	-	
1-6	280	200	200	6"	0.50	200	6	0.6	55.8	85	120	20	-	
1-7	460	200	150	8"	0.50	230	8	0.8	55.8	87	120	20	-	
1-8	240	130	110	6"	0.50	130	4	0.4	55.8	85	120	20	-	
1-9	140	100	100	6"	0.50	100	3	0.3	55.8	85	120	20	-	
1-10	490	170	170	8"	0.50	260	9	0.9	55.8	87	120	20	-	
1-11	210	150	150	6"	0.50	150	5	0.5	55.8	85	120	20	-	
1-12	550	180	180	8"	0.50	290	10	1.0	55.8	87	120	20	-	
1-13	210	150	150	6"	0.50	150	5	0.5	55.8	85	120	20	-	
1-14	490	150	150	8"	0.50	300	10	1.0	55.8	85	120	20	-	
1-15	540	220	170	8"	0.50	270	10	1.0	55.8	89	120	20	-	
1-16	240	170	80	6"	0.50	170	5	0.5	55.8	85	120	20	-	
1-17	350	150	150	6"	0.50	190	6	0.6	55.8	87	120	20	-	
1-18	290	200	200	6"	0.50	200	6	0.6	55.8	85	120	20	-	
1-19	820	410	250	10"	0.50	410	13	1.3	55.8	85	120	20	-	
1-20	460	140	140	8"	0.50	140	4	0.4	55.8	85	120	20	-	
1-21	550	550	210	8"	0.50	550	17	1.7	55.8	85	120	20	-	
1-22	220	100	100	6"	0.50	140	5	0.5	55.8	86	120	20	-	
1-23	390	120	120	6"	0.50	240	8	0.8	55.8	87	120	20	-	
1-24	740	230	230	10"	0.50	230	7	0.7	55.8	85	120	20	-	
1-25	750	450	230	10"	0.50	450	14	1.4	55.8	85	120	20	-	
1-26	410	250	250	8"	0.50	260	10	1.0	55.8	91	120	20	-	
1-27	610	210	210	8"	0.50	320	11	1.1	55.8	87	120	20	-	

Data Storage (Data Lake / Data Historian)

Data In All Stages (Raw, Semi-structured, Or Structured) **Can Be Stored In Data Lake**

Data Naming



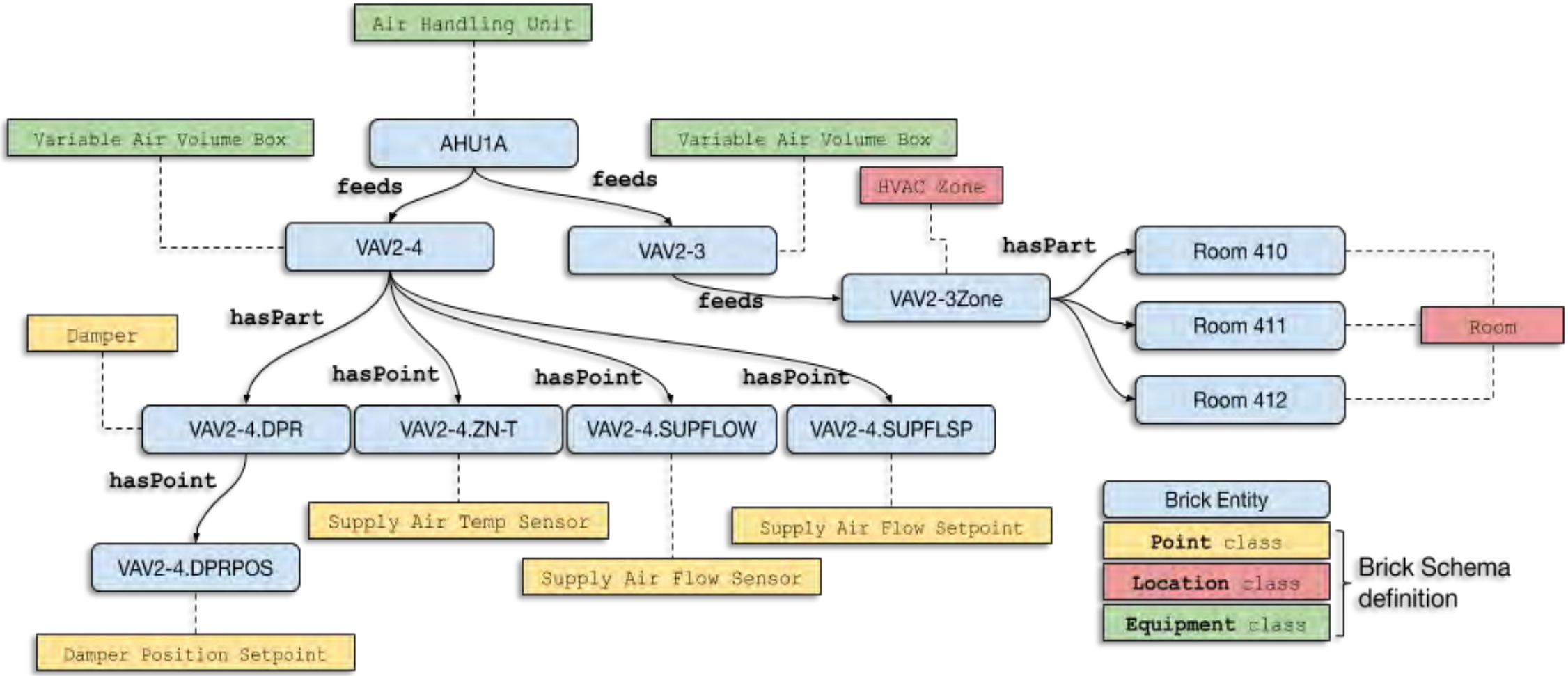
P = Physical
PD = Pressure Differential
V = Value
AN = Analog
PS = PSI

WORKSTATION				USER INFORMATION						
				POINT TYPE				ALARM CONDITION		
TAG	POINT DESCRIPTION	UNITS	POINT NAME (1)	ANALOG	DIGITAL	INTEGRATED	SETPOINT VALUE	HIGH LIMIT	LOW LIMIT	ALARM DELAY (MIN)
HARDWARE										
PDT 01	STRAINER DIFFERENTIAL PRESSURE	PSID	CEF05.HHW.STRXXX.XXX.PPD.VAN.PS	X						
SOFTWARE										
SDP	DIRTY STRAINER SETPOINT	PSID	CEF05.HHW.STRXXX.XXX.VPD.SPDP.PS	X			2.5			

NOTES:
(1) X'S SHALL BE SUBSTITUTED WITH THE 15–CHARACTER EQUIPMENT TAG THAT THE POINT IS ASSOCIATED WITH, FOLLOWED BY THE REMAINDER OF THE POINT NAME SHOWN. SEE SCHEDULES FOR EQUIPMENT TAGS.

4 HEATING HOT WATER STRAINER MONITORING CONTROL DIAGRAM
SCALE: NONE

Relationship Modeling



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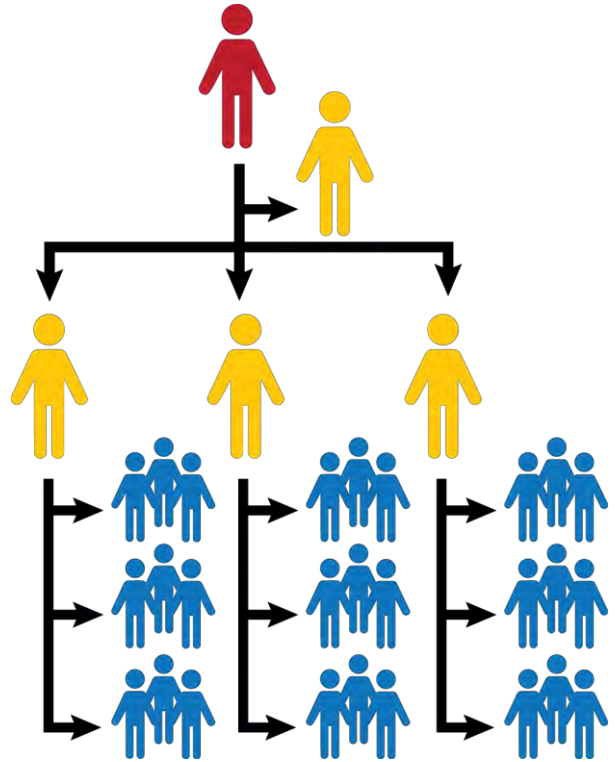
Cultural Changes

- CEO/CFO Must See Value for Future
- Trusting Data Not Instinct
- Wrench to Joy Stick- Training
- Extend Jobs, Not Replace Jobs



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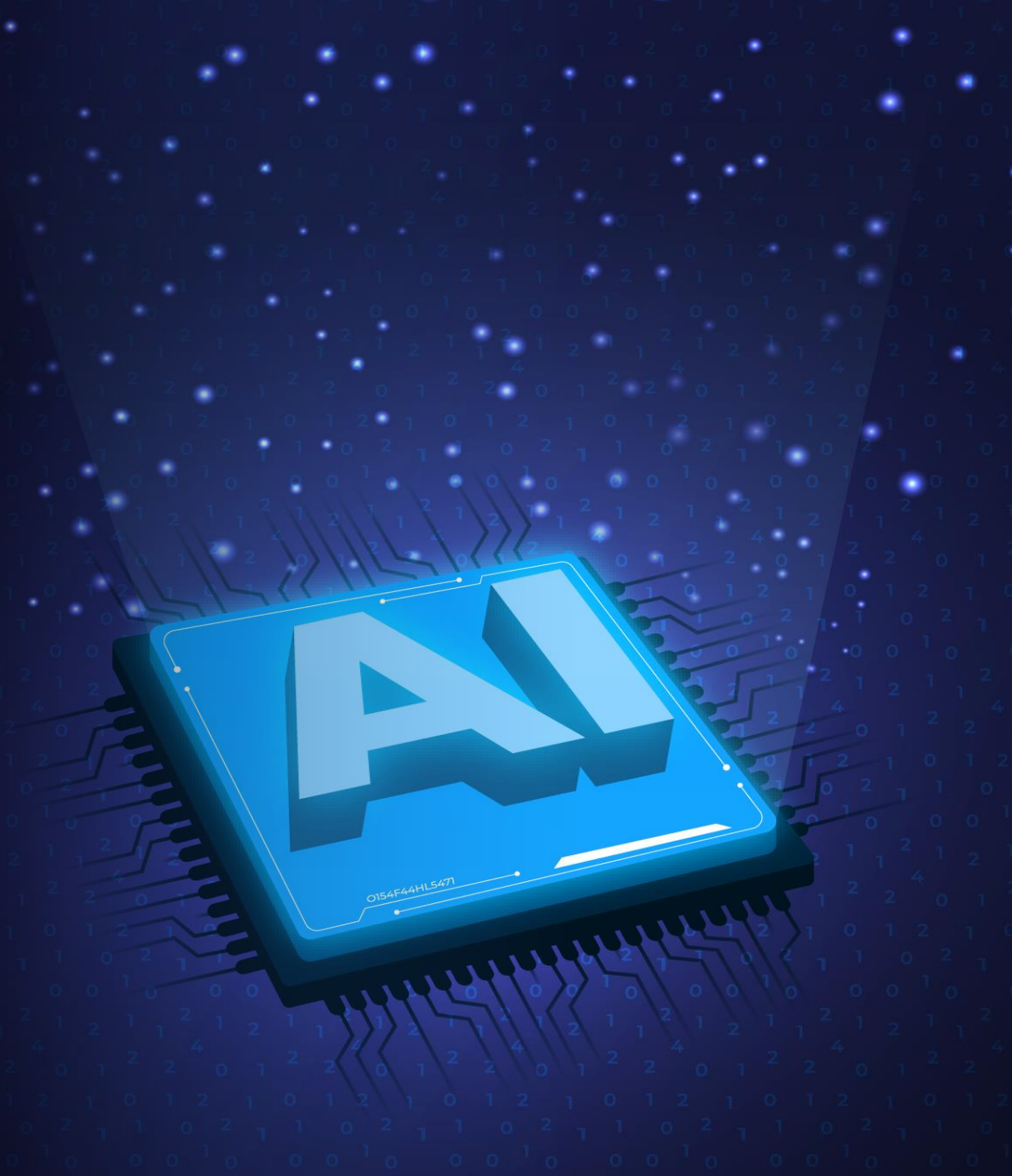
Summary

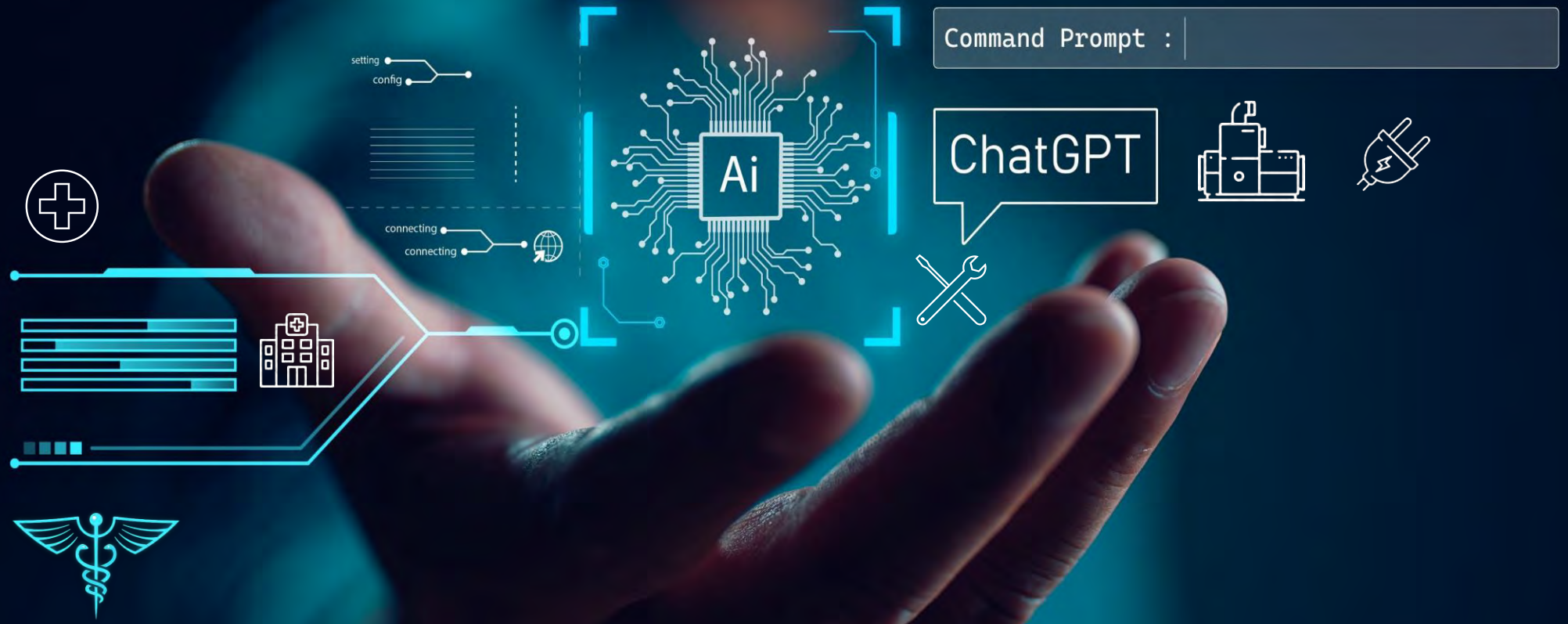
1. AI is here today

2. Basic Building Blocks – Data

3. Data Standards will help you get most of the available technology



Questions?


setting
config
connecting
connecting
Ai
Command Prompt :
ChatGPT