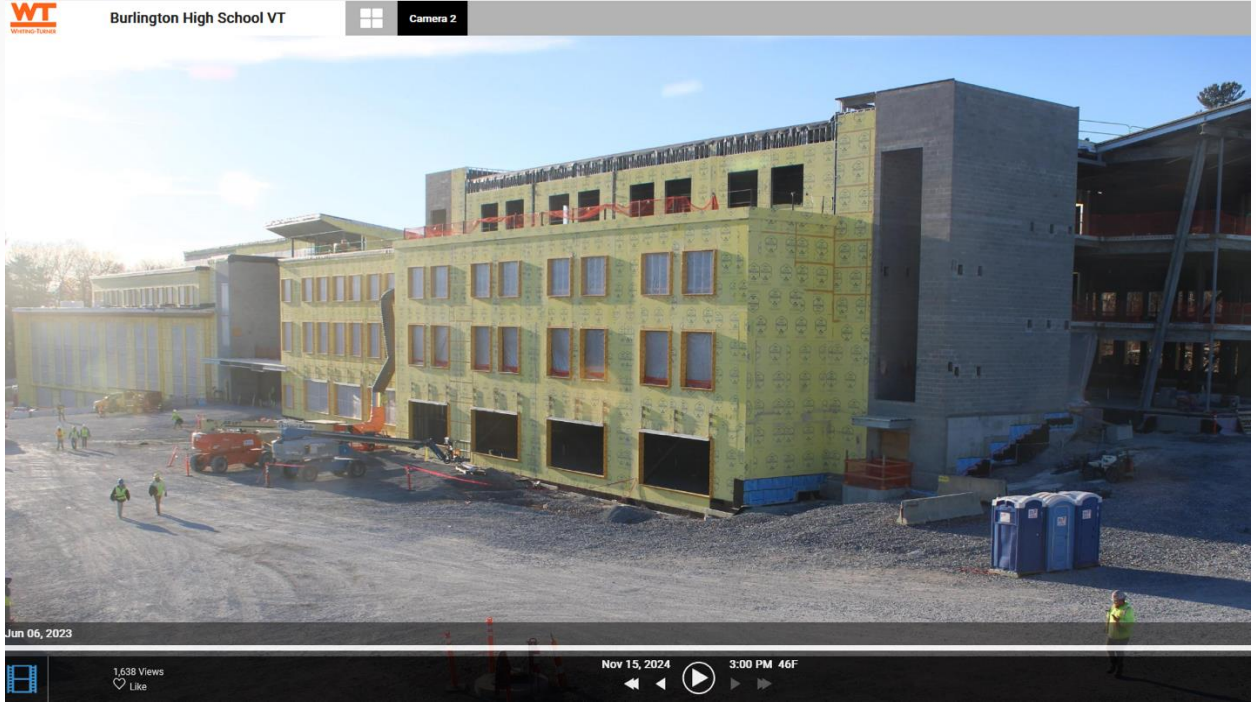


white + burke

VERMONT DEVELOPMENT CONFERENCE

Link to Webcam

(Link works in presentation mode only)

PLANNING FOR SUCCESS: LESSONS IN PRECONSTRUCTION FROM BURLINGTON HIGH SCHOOL

white + burke

VERMONT DEVELOPMENT CONFERENCE

Introductions

Alex Halpern, AIA
President

Brian Leet, AIA
Project Manager

Dylan Lozier
Project Manager

Josh Robinson
Project Manager

Facilitator: Paul Simon, *The Housing Initiative*

Project Overview

New High School & Technical Education Center

- **255,000 SF** (usable space)
- **Schedule**
  - **9 Months Building Abatement/Demo** (March 2023 – February 2024)
  - **5 Months Early Sitework Prep & Blasting** (May 2023 thru October 2023)
  - **30 Months Construction** (Oct 2023 thru April 2026)
- **$162M** (Gmax Contract)

AIA Learning Objectives

Using BHS as a case study, this panel looks at how advances in project delivery and construction methods can help address challenges facing every developer, including *environmental uncertainty, labor shortages, and escalating materials costs.*

BHS Impacts Everyone

1. Who attended the old BHS?
2. Who has kids who will attend the new BHS?
3. Who is a Burlington taxpayer?
4. Who lives in a community facing similar challenges at their schools?

Learning Objectives

Lesson 1
Early planning can reduce risk

Lesson 2
Coordinated environmental cleanup can help maintain schedules

Lesson 3
Use prefabricated components strategically

Lesson 4
Construction modeling is your friend

Lesson 1
Early planning can reduce risk

Investing in early planning, including alternate delivery methods, can reduce risk.

- Accelerated stakeholder input phase
- Decisive options selection
- Decision to engage a construction manager
- Comparative/reconciled estimating
- Fast track construction bidding
- Begin construction coordination modeling during design

Stakeholder Input

Create Program & Concept Options

NEW BURLINGTON HIGH SCHOOL & TECHNICAL CENTER

SITE PLAN OPTIONS OVERVIEW

MARCH 29, 2022
PROJECT: 2170

fff CLA DRA vhb BURLINGTON SCHOOL DISTRICT

Option **A** $**191.4** M

Option **B** $**182.3** M

Option **C** $**181.3** M

Option **C.1** $**186.5** M

Option **D** $**196.9** M

Narrow Down Alternatives

BHS-BTC Concept Options Selection Criteria

March 29, 2022

	OPTION A	OPTION B	OPTION C	OPTION C.1	OPTION D
Educational Support Ed. Plan Accommodation Flexibility Potential for Expansion Meets Educational Vision	Meets vision and flexibility goals. Longer, more sprawling building to accommodate work around Building A; spaces more spread out. Very limited expansion space.	Meets vision and flexibility goals. Good opportunities for future expansion	Meets vision and flexibility goals. Good opportunities for future expansion	Meets vision and flexibility goals. Good opportunities for future expansion	Safe, compact campus. Meets vision and flexibility goals. Some, but limited, expansion space.
Project Cost Construction Cost Interim Costs Extended Rental Costs	Additional cost associated with work around Building A,and delayed completion of site work. Majority of footprint on challenging soils. Parking structure adds up to $9M in cost.	Increased costs associated with relocated Building A programs during construction. Higher sitework costs offset slightly more compact building.	Only increased costs are associated with relocated Building A programs during construction	Additional cost associated with work around Building A, delayed construction of BTC, increased footprint on challenging soils.	Increased costs associated with new roads, traffic and pedestrian studies, traffic signals, retaining walls, and road permitting process, additional design fees, difficult soils.
Disruption Due to Remediation and Construction Impact on Theater/ Athletics/ Kitchen (Building A) Opening with incomplete sitework Active adjacent building demolition following opening Impact on Fields/ Site	Allows use of Building A until BHS opens. Opening with incomplete sitework. Active adjacent building demolition following school opening. In parking structure option: final bus drop-off not complete until 1+ year following school opening.	Requires demolition of Building A by June 2023.	Requires demolition of Building A by June 2023.	Allows use of Building A until new facilities are available on site. Opening with incomplete sitework. Active adjacent building construction following BHS school opening.	Allows use of Building A for one additional year. Building A removal required after one year, or opening without completed sitework/parking. Disruption to use of fields for project duration.
Schedule Final Completion Date Phasing Initial Occupancy Full Occupancy Potential Partial Delayed Occupancy	Delayed final completion due to demolition of Building A, subsequent sitework and potential parking structure after school opening.	Schedule drivers reduced to remediation and removal of all existing buildings and worldwide parts/supply chain unknowns.	Schedule drivers reduced to remediation and removal of all existing buildings and worldwide parts/supply chain unknowns.	Delayed final completion due to demolition of Building A, subsequent construction of BTC and sitework after BHS progress. BTC program in current spaces an additional 12-18 months.	Requires building new road before starting excavation for foundations across Institute Road. Requires negotiations and buy-in from neighbors to the west. Requires city agency coordination, approvals and council approval on property transfer and roadway design. More schedule unknowns. Much higher risk of delay to opening date.
Operating Costs Maintenance of Building Maintenance of Site Other Staffing Required (bussing/ traffic/ security/ cleaning) Energy Efficiency/Sustainability	Building over a larger site area with fewer levels will take slightly more energy to operate. Parking structure reduces snow clearing but adds garage maintenance.	Compact building with good solar orientation.	Compact building with good solar orientation.	Compact building with good solar orientation.	Compact building with excellent solar orientation.
Site Arrangement Circulation for drop-off/ pick-up/ buses Access to athletic fields Location of Bike and Car Parking Compactness/Sustainability	Requires parking structure for ideal bus drop off at upper level. Less compact structure. With structured parking, best car solution, without would create challenges to circulation from cars past BTC wing to BHS on north side. Requires removal and blasting at edge of Arms Forest.	Parking and vehicle circulation challenging around building footprint. Parking placed to west (visibile from Institute road) of BTC. Achieving full parking count may be challenging. Covered steps lead to building from the north. Highly compact building footprint.	Parking and vehicle circulation to north of BTC (ideal) with adequate turning space. Clear separation of BTC loading zones. More queuing space to drop-off point from North Avenue. Compact building footprint.	Parking and vehicle circulation to north of BTC (ideal) with adequate turning space. Clear separation of BTC loading zones. Tight to Arms Forest on northeast. More room of parking/future BSD to west. Compact building footprint.	Separates vehicles from pedestrians within the site. Excellent access to athletic fields. Parking close and relatively level to entrances. Highly compact building footprint. Drop off along North Avenue keeps cars off Institute Road.
Contextual Fit Appearance "Front Door" Image Clear Identity for Distinct Programs Impact to Abutters / City	Large 'blank' boxes of gym and auditorium flank entry on Institute Road. BTC hidden behind parking structure. Fewer available entry sides for clear identities. Little impact to abutters/city.	BHS fronts on Institute Road with windowed elements flanking entry. BTC entry faces west along drive and north at bus drop-off. Bus arrival to BHS includes under canopy descent along stairs. Little impact to abbuters/city.	BHS and BTC both front on Institute Road with windowed elements flanking entries.Bus arrival to BHS is direct to upper level of commons. Little impact to abbuters/city.	BHS and BTC both front on Institute Road with windowed elements flanking entries.Bus arrival to BHS is direct to upper level of commons. Little impact to abbuters/city.	BHS fronts on North Avenue to create a city landmark. BTC has west facing identity from campus parking. Both drop-offs have clear front doors. Major impact to abbuters/city including changed access to properties to the west.

Key
Very Good
Good
Fair
Poor

Thursday, April 21, 2022 - 373 Responses

High-Level Feedback

Which plan would you MOST like to see the board support? (You can see all the differences between plans here: https://bit.ly/3KmKnO4 or at www.bsdvt.org)

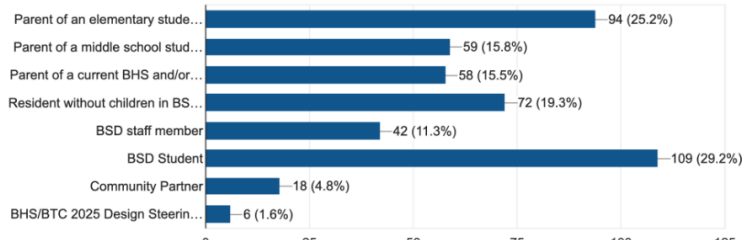
373 responses

Which plan would you LEAST like to see the board support? (You can see all the differences between plans here: https://bit.ly/3KmKnO4 or at www.bsdvt.org)

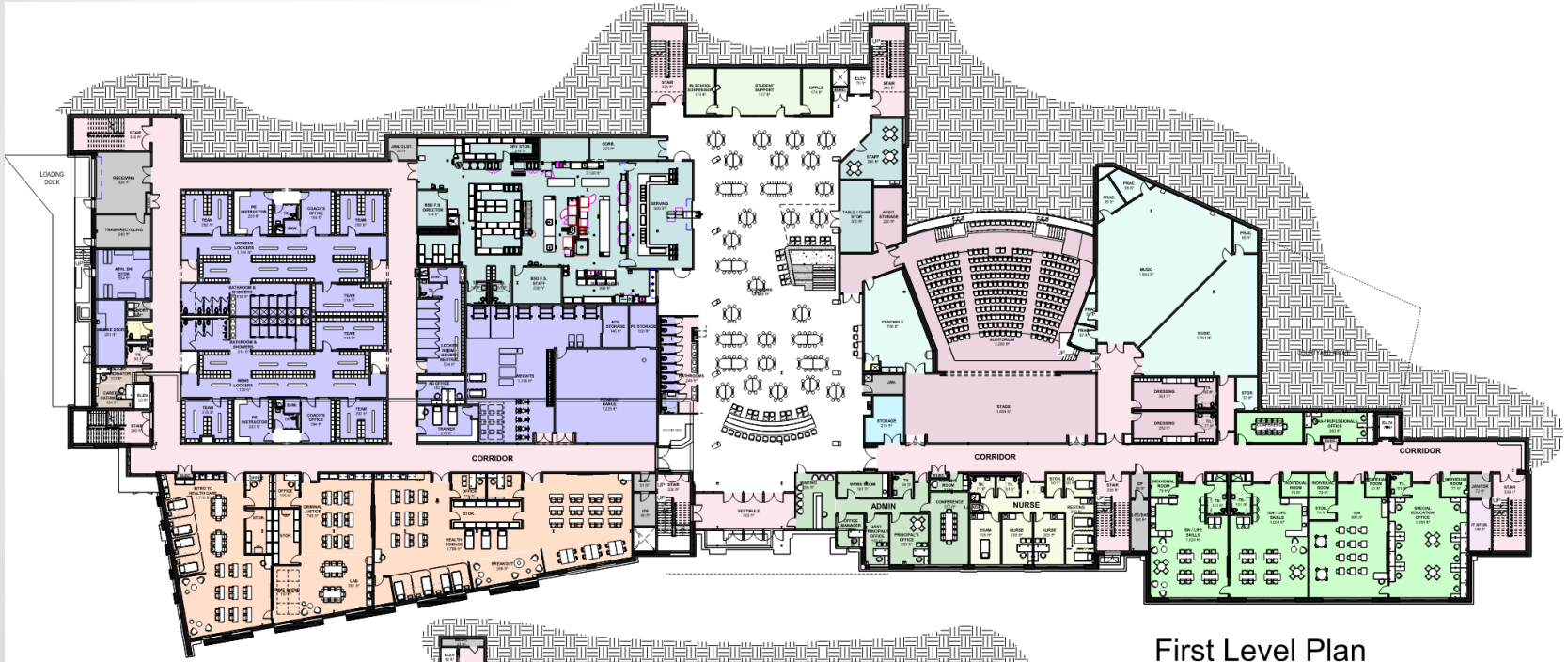
348 responses

What is your relationship to the school district?

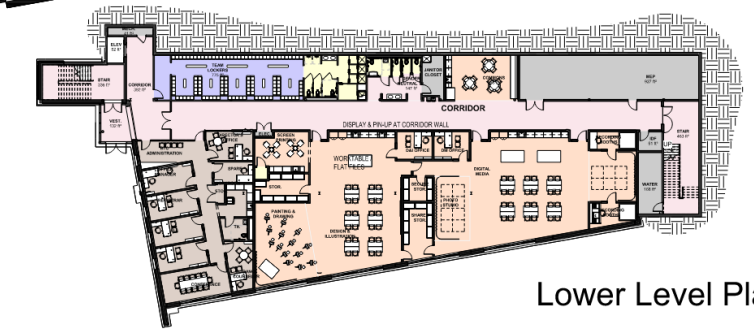
373 responses



Engage the Construction Manager



First Level Plan



Lower Level Plan

Compare Estimates

Photo by Alexander Grey on Unsplash

Fast Track Bidding / Design Completion

Zoning Permit
11/15

GMP #2 Set
Elevator, Roof
Switchgear/MDP, HVAC
2/24

Main Bid Set
6/23

Value Management
4/25

2022 | 2023 | 2024

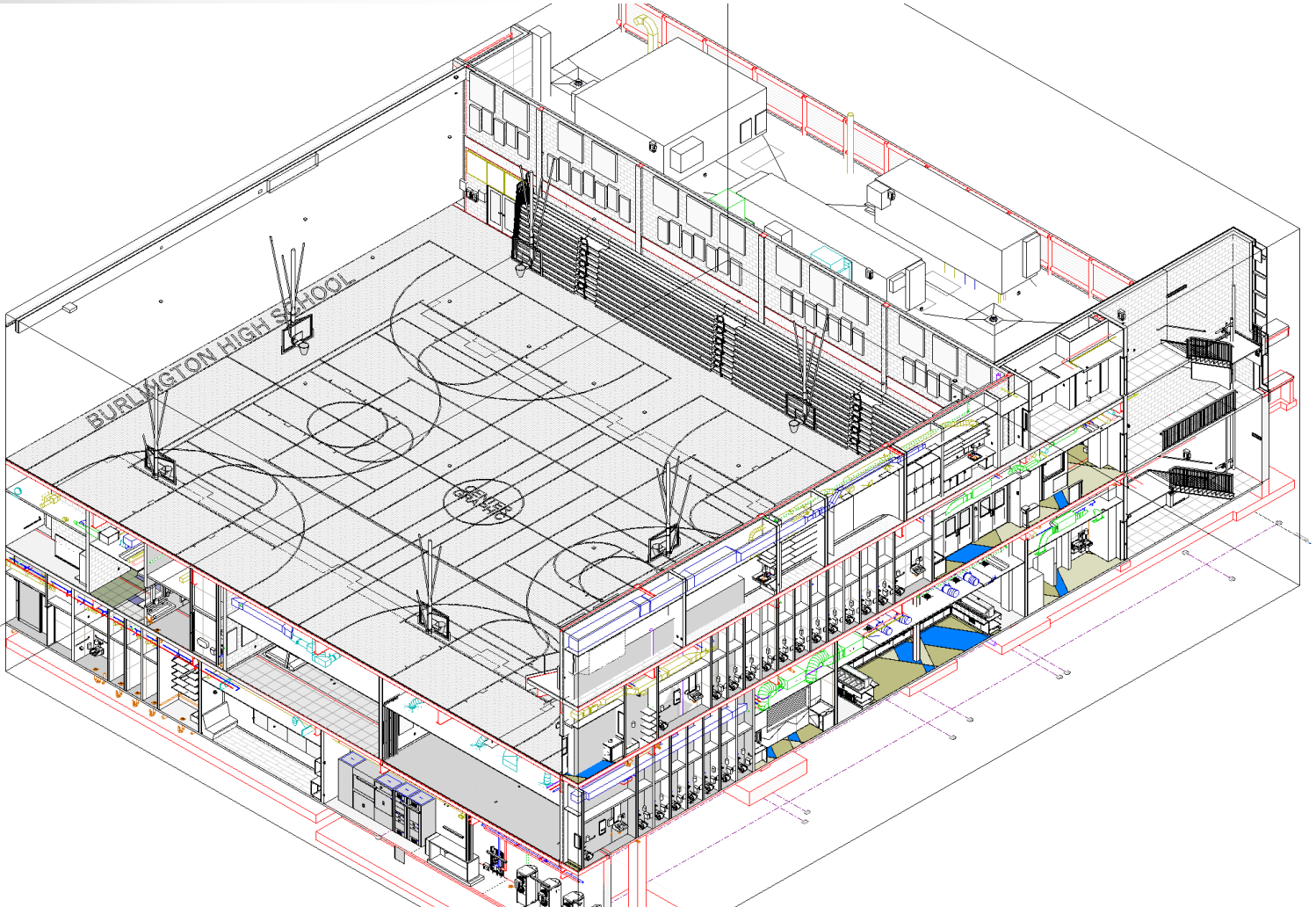
GMP #1 Set
Concrete, Steel, Site
1/20

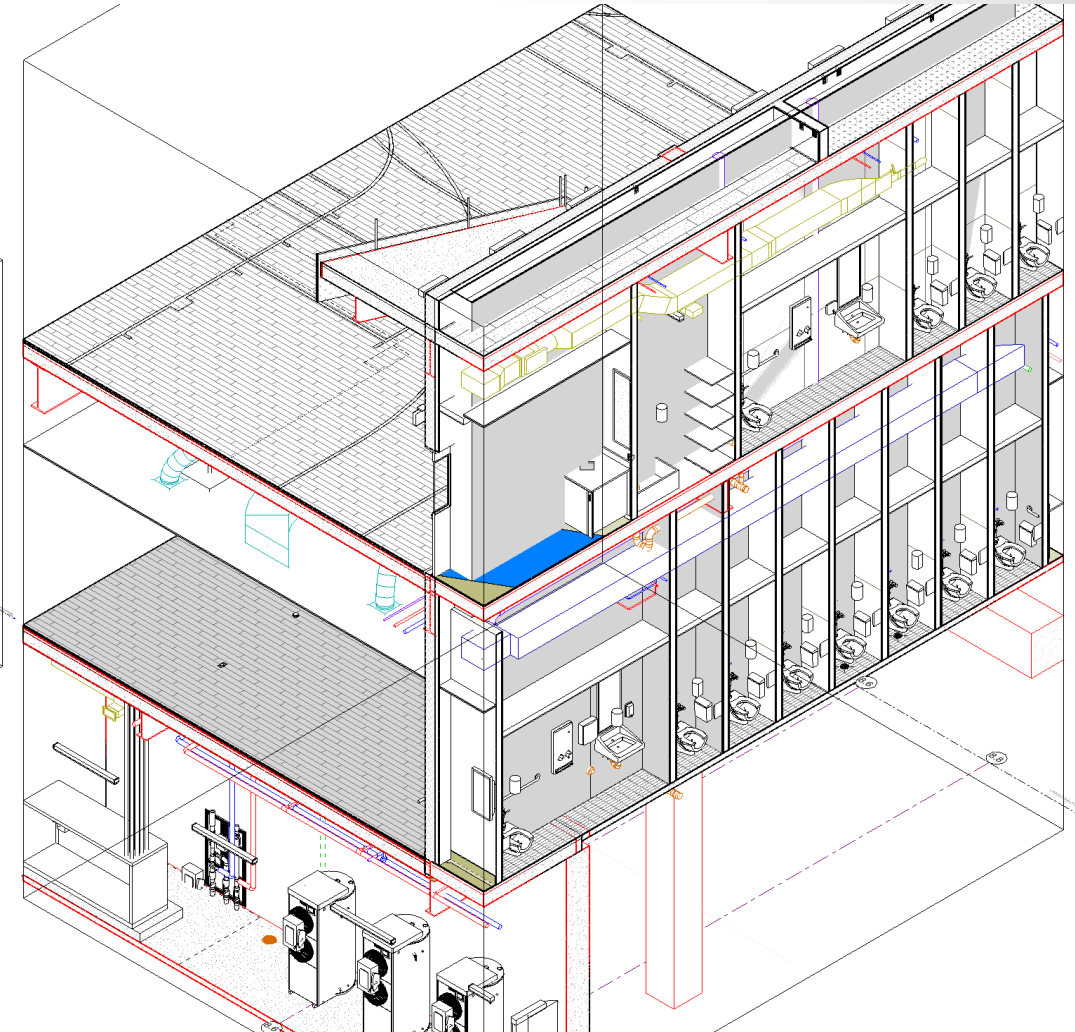
Structural Permit Set
5/12

Last Addendum to Set GMP #3
8/18

Initiate 3D Modeling During Design

Advanced Coordination – Take the model further sooner





Initiate 3D Modeling During Design

Programming and Concept | **Schematic Design** | **Design Development / Permit Drawings**

VHB – Landscape — Landscape DD / Permit Plans

CEA – Civil Schematic Plans — Civil DD / Permit Plans

DHDS – Theater DD Plans

DRA – Arch. Concept Plans

Traditional Drawings

3D Modeling

NV5 – Acoustics, A/V, Security

KRBS – Kitchen DD Model

LNC – MEP DD Model

HSE – Structure DD Model

DRA – Schematic Model

FFF (DRA / CLA) – Architecture DD Model

Initiate 3D Modeling During Design

Construction Documents **Bidding** **Construction Administration**

VHB – Landscape

CEA – Civil Schematic Plans

DHDS – Theater DD Plans

Traditional Drawings

Traditional Trades

3D Modeling

Firetech – Fire Protection Model

Omega – Electrical Model

VHV – Plumbing and Mechanical Model

Precision – Bridge Coordination Model

WT –Coordinated Reference Model

NV5 – Acoustics, A/V, Security Model

KRBS – Kitchen DD Model

LNC – MEP DD Model

HSE – Structure Model

FFF (DRA / CLA) – Architecture Model

DHDS – Rigging Model

Investing in early planning, including alternate delivery methods, can reduce risk.

Who has been on a project with HAZMAT?

1. BHS history – why was the building closed
2. Regulatory guidance and hurdles
3. Permits and Public Outreach
4. Contracting
5. Coordination with Construction Project

Lesson 2

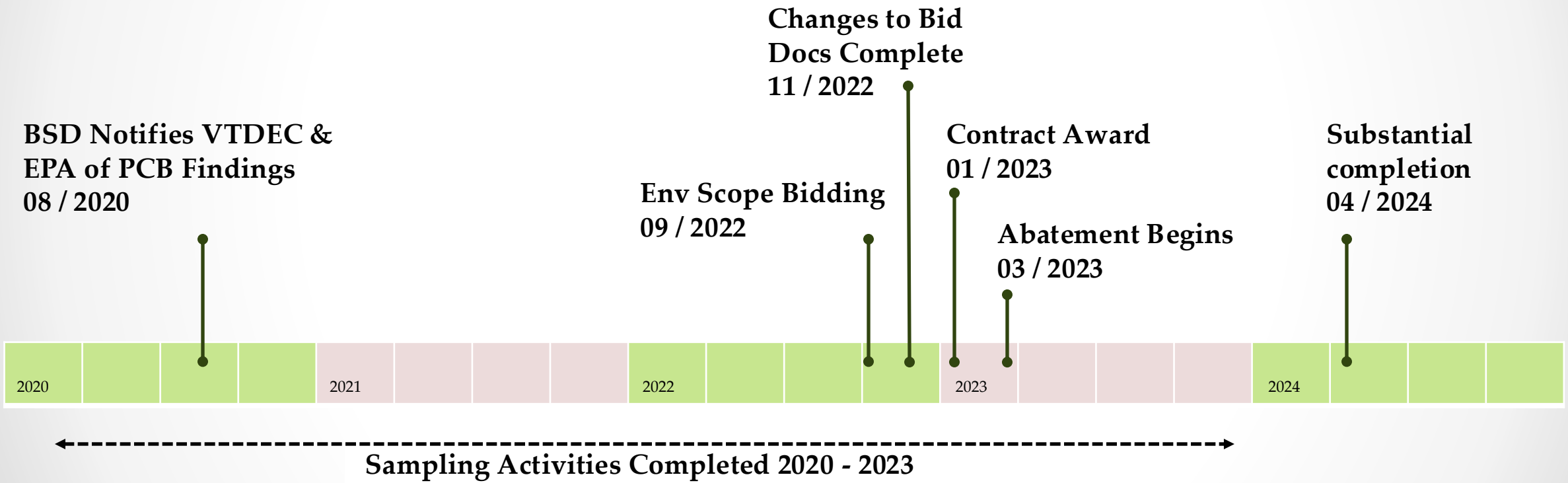
Coordinated environmental cleanup can help maintain schedules

Site Description

- Buildings A-E - 1964
- Building F - 1965
- Building G - 1985

- Roughly 245,000 SF
- Large acreage & difficult topography

Environmental Timeline



Lesson 2

Coordinated environmental cleanup can help maintain schedules

Environmental Project Team

Burlington School District
Owner

PCI
Owner's Project Manager

Fuss & O'Neill
Engineer of Record

EnviroVantage
Abatement and Demo Contractor

Whiting Turner
Construction Manager

SD Ireland
Site Contractor

Civil Engineering Associates
Civil Engineer

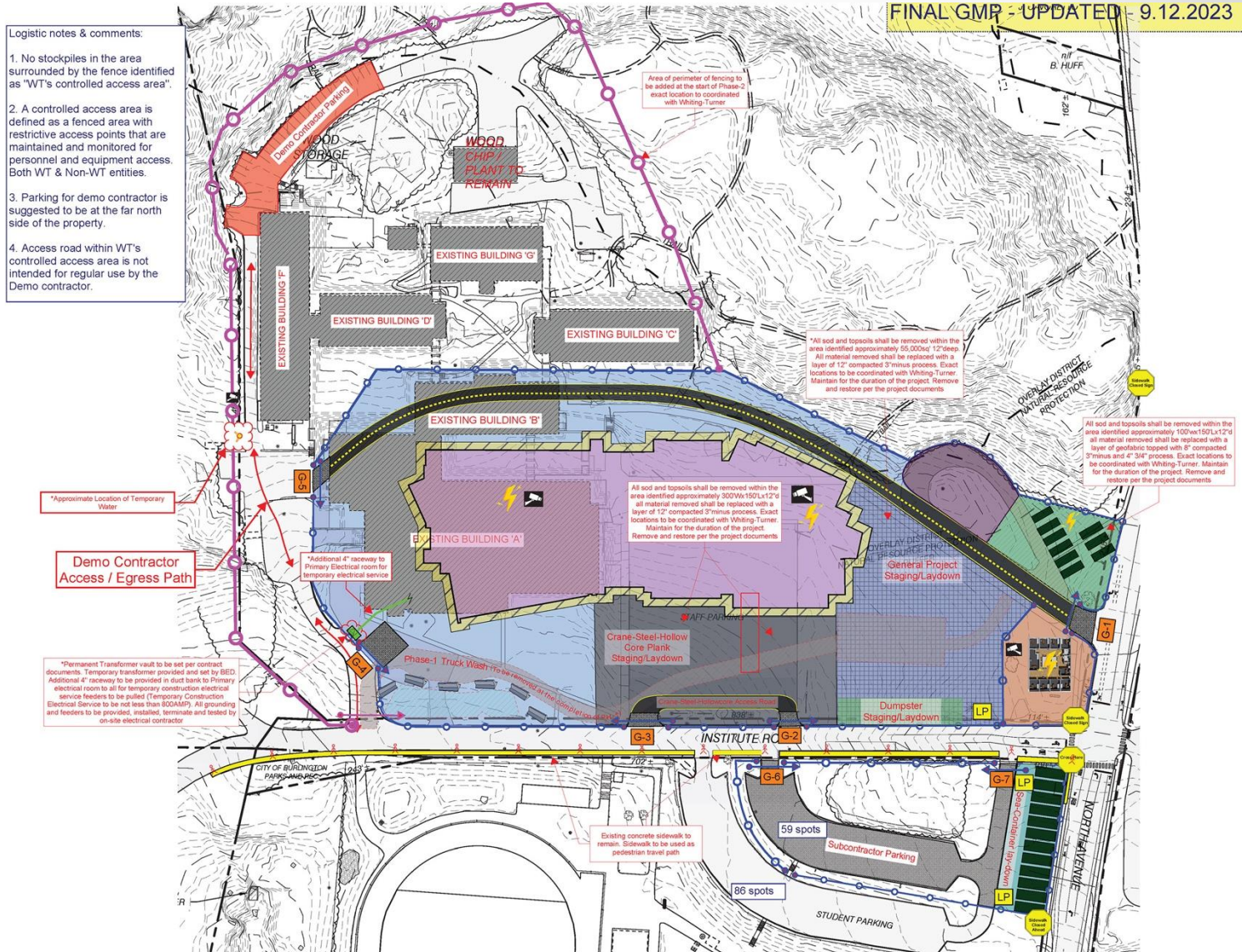
Environmental Abatement and Remediation Cost and Schedule

- Contractor base bid - $11.4 million
- Environmental contingency - $20 million for cleanup ($8.6 million)
- Total Cost - $15.2 million
- $3.8 million change orders and added scope
- Initial Schedule – 30 weeks
- Final Completion Schedule – 60 weeks

Lesson 2
Coordinated environmental cleanup can help maintain schedules

Worked with CM to identify our controlled access zone.

Incremental sign-offs with the state to allow construction activities to commence



Lesson 2

Coordinated environmental cleanup can help maintain schedules

Lesson 2

Coordinated environmental cleanup can help maintain schedules

Multidisciplinary Bidding, Design & Implementation

- Fuss & O'Neill team effort
  - Mechanical, Electrical, Structural, Civil and Environmental Services
- Coordinated utility decommissioning – electrical, sewer, sanitary, storage tanks, etc.
- Utility access for demolition and abatement (water, sewer and power)
- Site grading, stormwater, and soil erosion controls

Lesson 2

Coordinated environmental cleanup can help maintain schedules

Health & Safety Monitoring & Public Outreach

- Pre-Implementation Public Concerns Meeting
- Dust monitoring
- Materials management
- Truck wash station
- Full-time oversight
- Project meetings held with multiple adjacent property owners

Lesson 2

Coordinated environmental cleanup can help maintain schedules

Lesson 2

Coordinated environmental cleanup can help maintain schedules

Soil Remediation

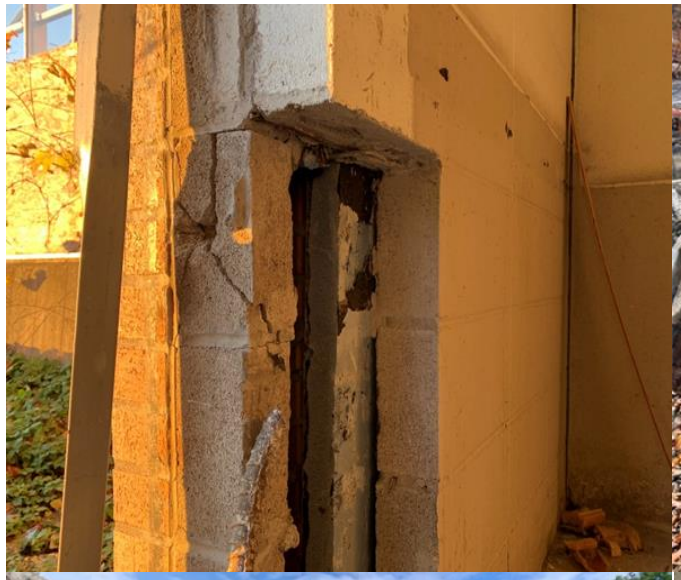
- Shallow bedrock encountered
- Full-time coordination with VTDEC and EPA
- Stockpiling of soil was necessary due to truck schedules and access to loading areas
- Soil management design changes – removal of all PCB regulated soils
- Coordination with utilities and design for new school

Lesson 2

Coordinated environmental cleanup can help maintain schedules

Scope Changes

- Additional PCB & Asbestos Materials
- Impacts to soil management
- Design changes & scope adjustment
- Added cost and time to address



Lesson 2

Coordinated environmental cleanup can help maintain schedules

Construction Coordination

- New construction and demolition occurring simultaneously
- Drilling and blasting
- Scope changes and handover between contractors
- Prioritizing demo activity based on needs for site turnover to new construction
- Sequenced turnover of construction areas

Utility Coordination

Coordinating with new construction

- Site turn over and coordination
- Collaboration between Abatement/Demo contractor and new construction contractor

Water and power disconnects

- Temporary water line installed for abatement
- Replacement of electrical transformers

Lesson 2

Coordinated environmental cleanup can help maintain schedules

Lessons Learned

- Project turnover and coordinated work areas saved the schedule
- Environmental contingency critical for the project
- Coordinated effort with VTDEC and EPA and setting of goals / expectations increased efficiency to problem solve
- Specifications and bid documents integral to ensure contractor understanding of project details and regulations
- Defining waste streams and pre-characterizing waste to expedite project schedule
- Communication between project team, consultant / engineers, and regulators essential to the project's success

Lesson 3
Use prefabricated components strategically

Identify your concerns early, incorporate solutions in the design phase….

When will scopes occur during the schedule?
And how much time do we have?

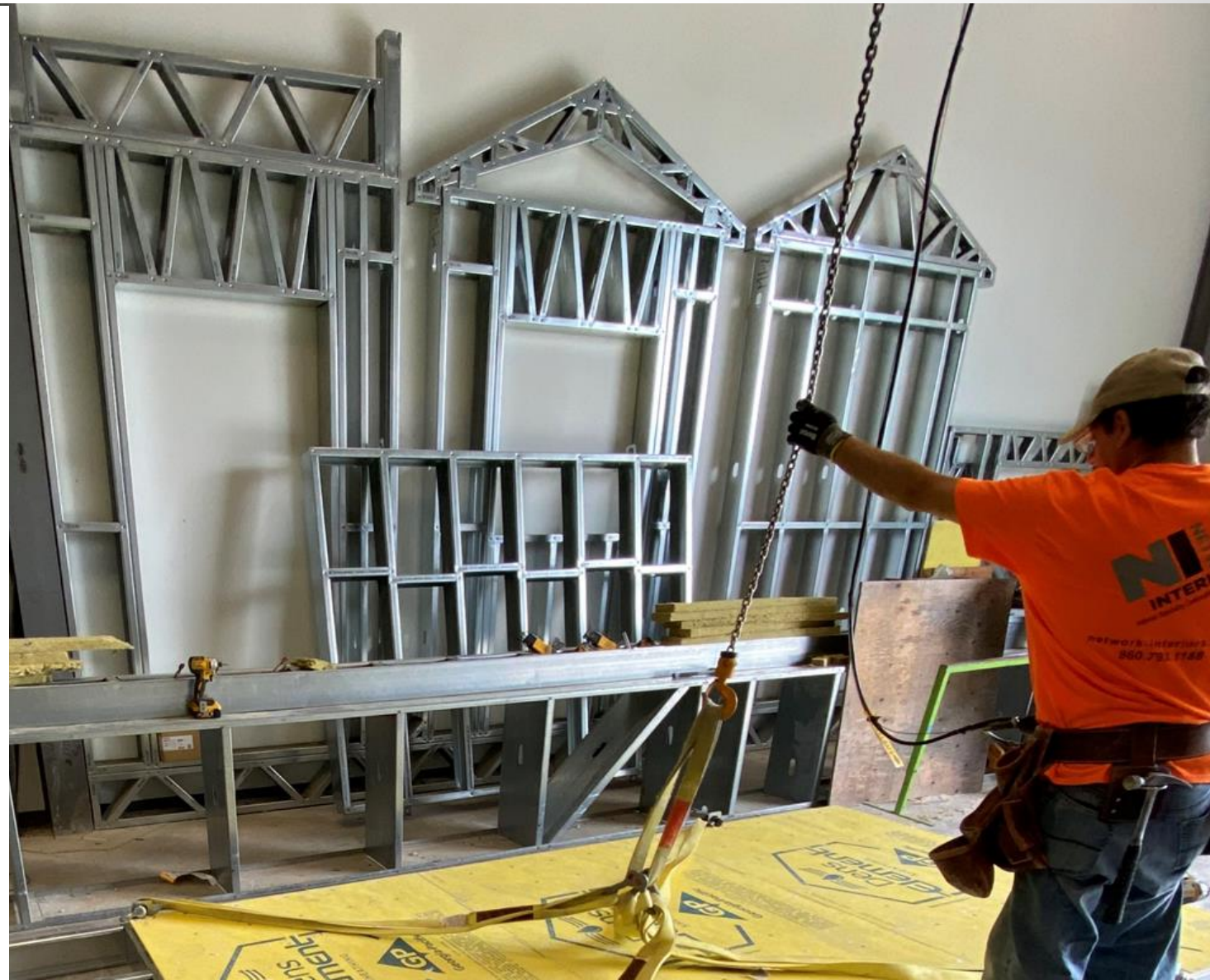
- What can be installed regardless of Hot or Cold weather?
- System components that can speed up production?

Do we have the right subcontractor available?
Manpower issues?

- Fabricate off-site – Modular / Pre-Fab from coordination model?
- Break packages up into smaller scopes?

Pre-fab exterior walls

- Built off-site
- Arrive in large sections
- Quick installation
- Faster pace to building close-in
- Less manpower on site



Pre-fab ductwork

- Fully coordinated 3D Model
- Fabricate and store ductwork off-site
- Set hangers utilizing the 3D model
- Shorter install time in the field
- Manpower efficiencies

Lesson 3

Use prefabricated components strategically

Pre-fab piping systems

- Fully coordinated 3D Model
- Fabricate and store pipe spool pieces off-site
- Set hangers utilizing the 3D model
- Shorter install time in the field
- Manpower efficiencies

Hanger Install

Fully coordinated MEP model

PRO

- Install hangers early and in exact locations
- Easier access to areas with less people
- Opens up more work early

CON

- Design changes could have a higher impact

Hollow Core Plank

- Off-site production, while foundations are going in
- Erection occurs in parallel with steel
- Working surfaces become available sooner
- Weather is not an issue

Pros/cons of prefab plank

PRO -

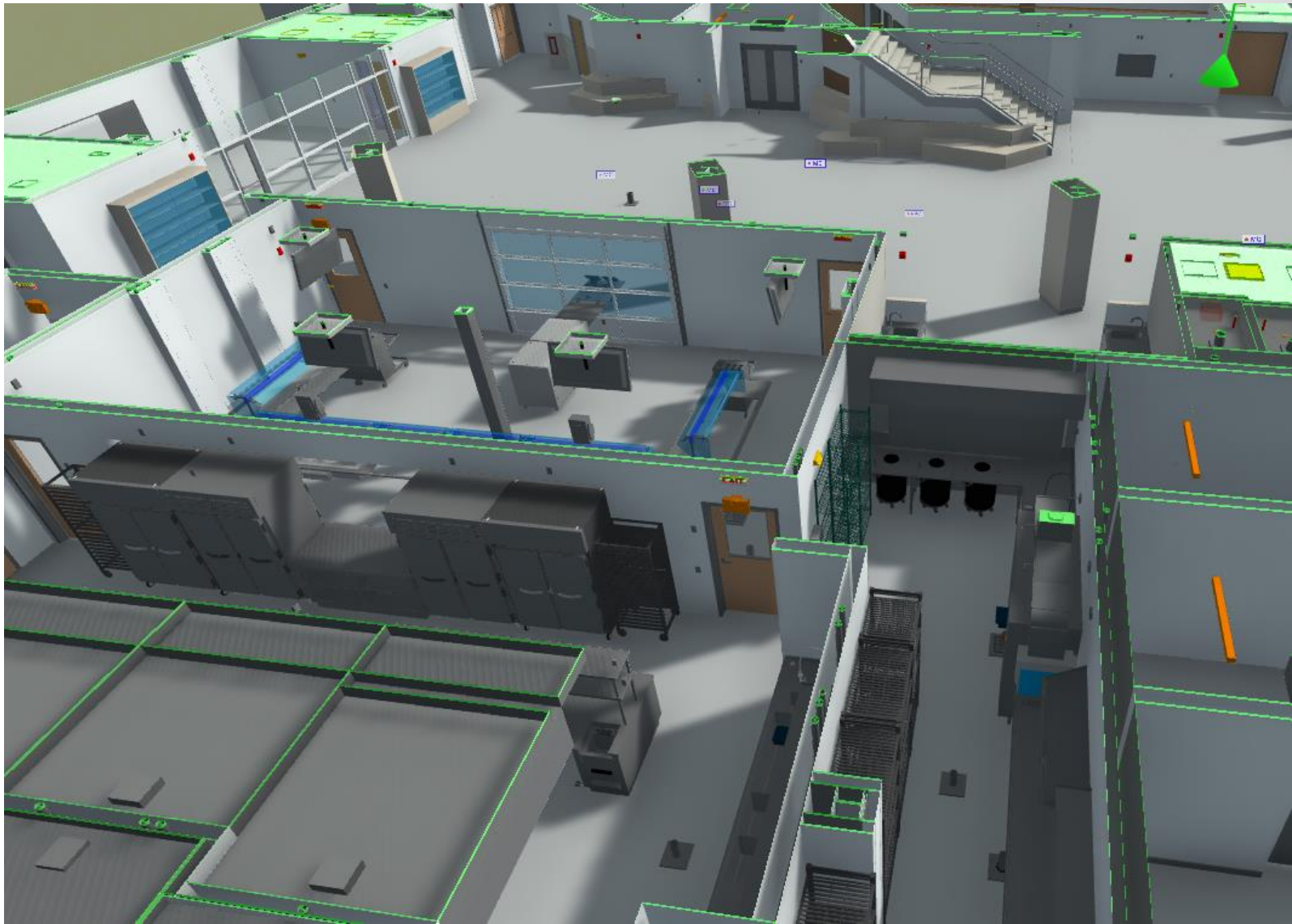
- Speed to working surface
- No weather constraints

CON -

- Early coordination w/ penetrations req'd (all penetrations)
- Future penetrations
- Topping slabs

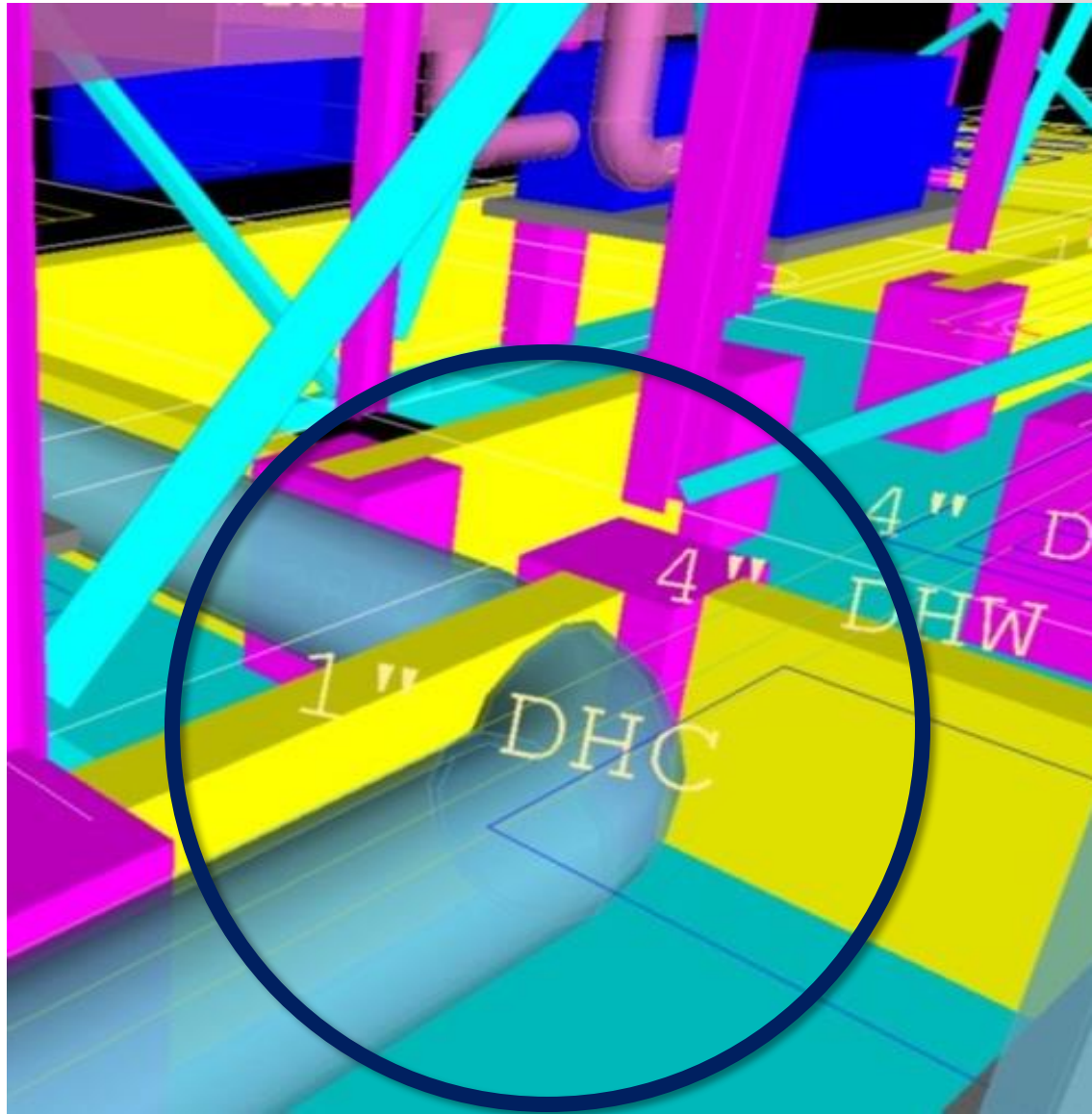
3D Troubleshooting

- See issues early
- Correct problems without having areas built
- See impacts of changes



Lesson 4
Construction modeling is your friend

Intensive coordination modeling for construction shifts design team attention during early construction phases and allows simultaneous fabrication of prefabricated assemblies.



Owner Benefits

1. Schedule
2. Faster construction
3. Clashes are figured out in the model and not at the site

Lesson 4
Construction modeling is your friend

Time spent in early design process x fast tracking

Impacts of early coordinated models

Prefab Wall Panels

PRO

- Install Speed
- Speed to weather tight
- No weather constraints

CON

- early coordination w/ other elements (storefront/windows/facade elements)

Pros/cons of sub-contractor led modeling

DESIGN COORDINATION MODEL

Architectural + Structural + Mechanical + Electrical + Plumbing + Fire Protection + Kitchen Consultant + AV Consultant

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SUBCONTRACTOR LED MODELS

Omega + VHV + FireTech+ Prefab walls + Canatal + Canam trusses + Others

QUESTIONS?

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