

Project Background

Our proposed project approach for the final project will include visualization and design & construction conflicts coordination. 34,000 square foot school project

We will utilize the following platforms to help execute our approach :

- Navisworks
- Microsoft Project
- Microsoft Excel
- Revit

Advantages and Objectives

Advantages to our project approach:

1. Imagine project coming to life on paper
2. Recognize critical clashes before work begins in the field to minimize unexpected costs
3. Efficiency

Objectives for our project approach:

1. Help improve efficiency of project deadline
2. Identify clashes in early stages
3. Improve coordination

4D Coordination

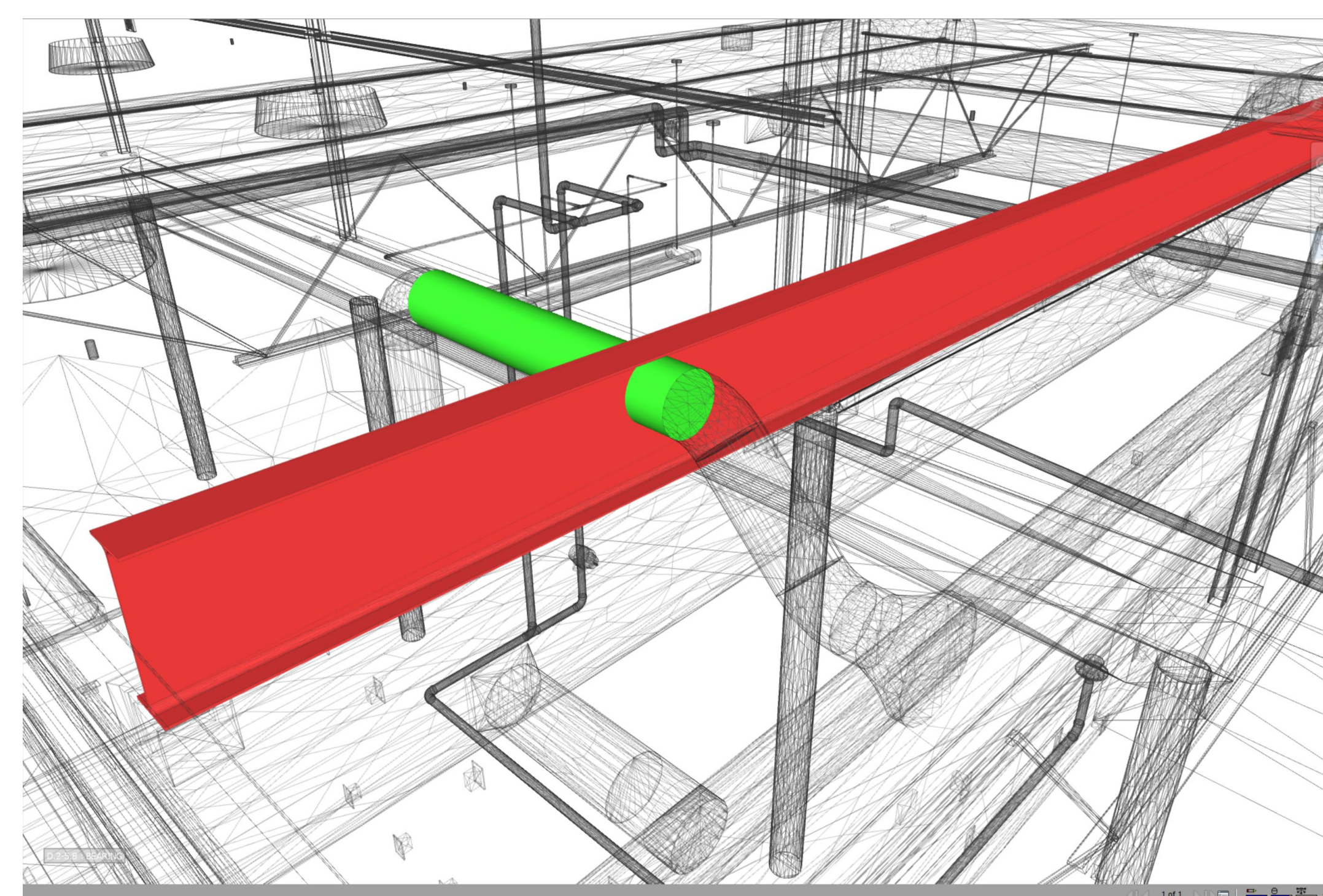
We utilized Navisworks and integrated it with a Microsoft Excel schedule to create a 4D simulation of the school's construction to review the efficiency of the sequencing of the construction activities.

Scheduling

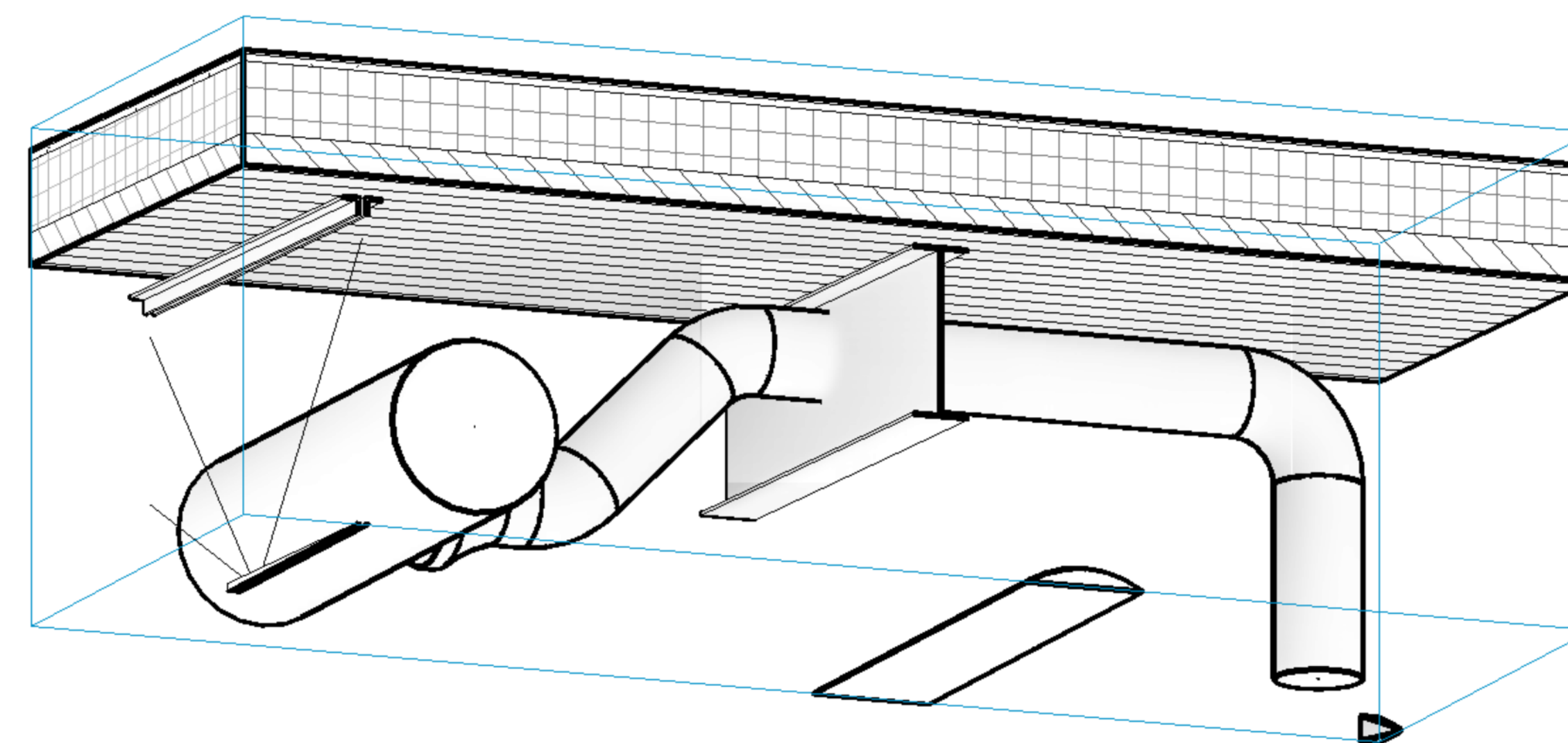
Microsoft Project for scheduling to allow us to run through the project and its sequencing on paper to review for efficiency in the scheduling of critical path construction activities.



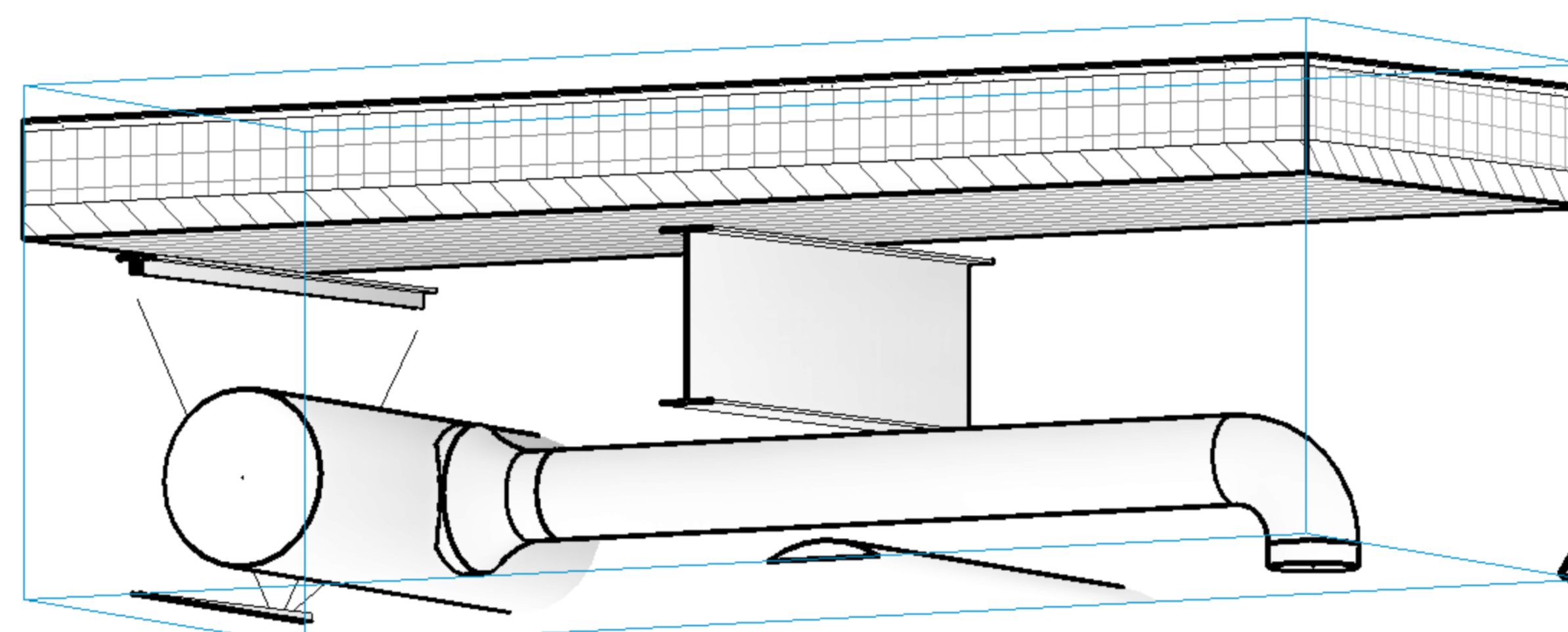
Clash in Navisworks



Clash prior to editing



Fixed clash using Revit section box



CLASH DETECTION REPORT

In our project, we focused on identifying key clashes between the structural components of the school and its MEP systems.

The following clashes pictured:

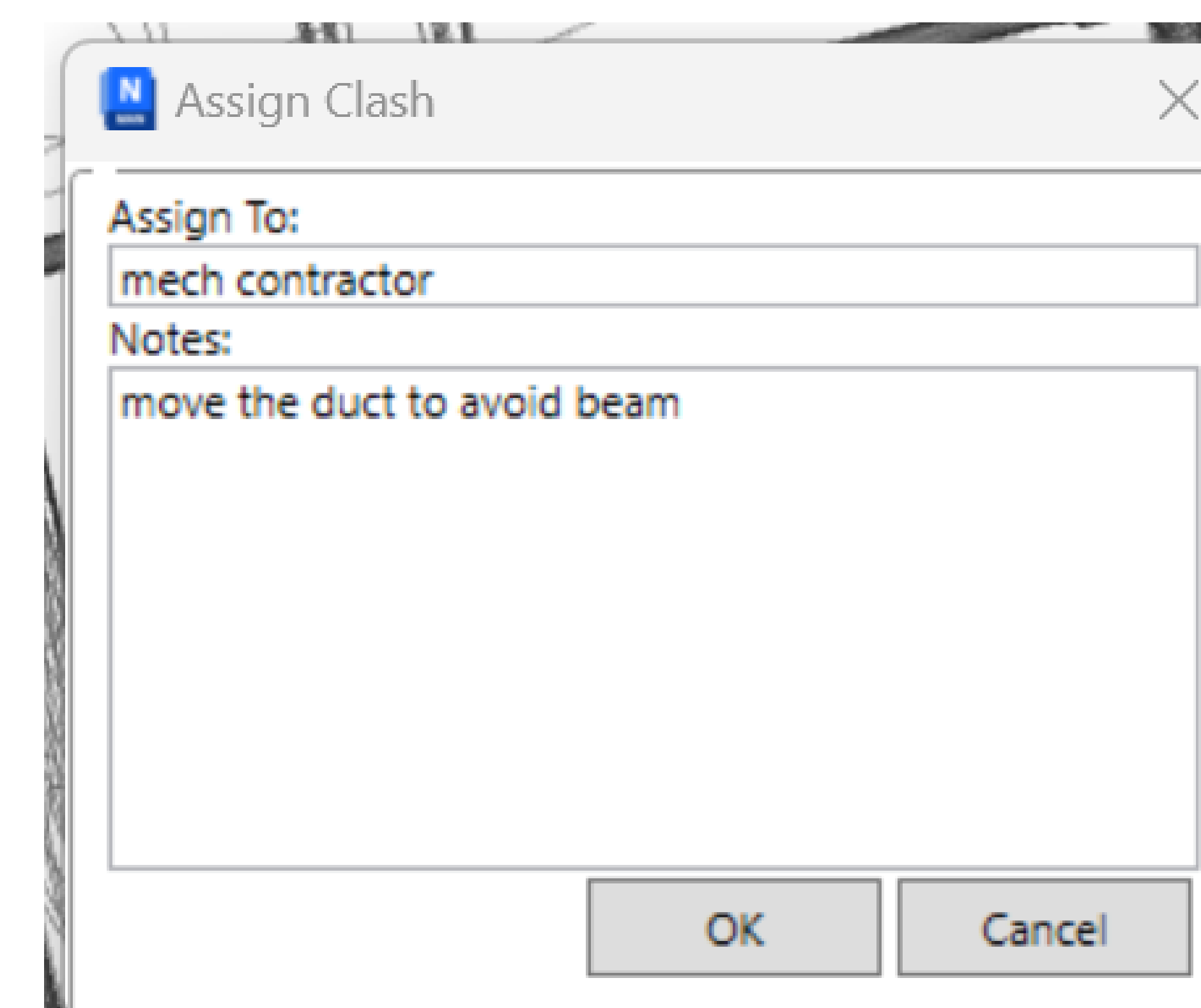
- Ductwork & Structural Beams
- Ductwork & Electrical Fixtures
- Plumbing & Steel Joist

It was important to note the above clashes as it is much less expensive to adjust the clashing components prior to fabrication than try to make the necessary modifications in the field with little detail.

Ability to resolve clashes shown below.

Used Revit, Naviswork

Ability to assign clash to proper contractor

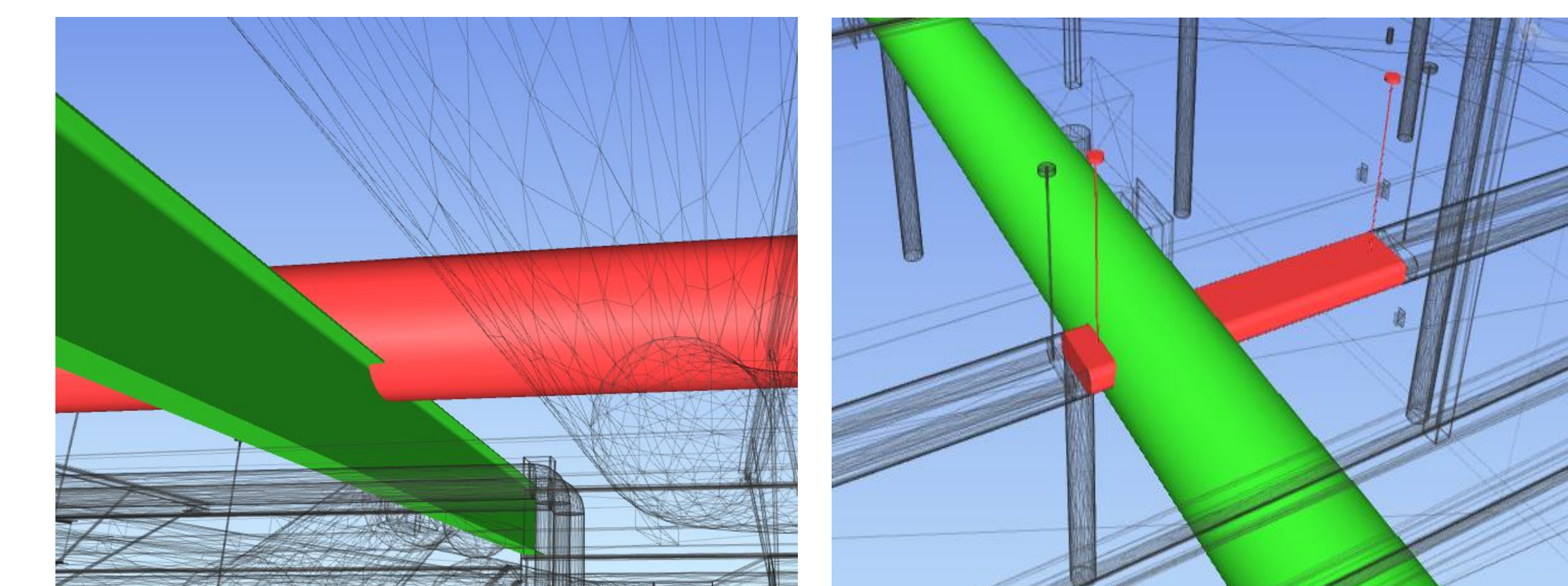


AUTODESK®
NAVISWORKS® Clash Report

Test	Tolerance	Clashes	New	Active	Reviewed	Approved	Resolved	Type	Status
Test 1	0.001m	206	206	0	0	0	0	Hard	OK

Image	Clash Name	Status	Distance	Grid Location	Description	Date Found	Assigned To	Clash Point
	Clash1	New	-0.142	F-9.2 : Level 10	Hard	2023/5/1 20:05		x:-13.973, y:-26.489, z:33.771
	Clash2	New	-0.142	F-9.2 : Level 10	Hard	2023/5/1 20:05		x:-13.973, y:-26.489, z:33.771
	Clash3	New	-0.131	B-16 : Level 10	Hard	2023/5/1 20:05		x:16.834, y:-13.292, z:33.816
	Clash4	New	-0.131	B-16 : Level 10	Hard	2023/5/1 20:05		x:16.834, y:-13.292, z:33.816
	Clash5	New	-0.131	B-15.2 : Level 10	Hard	2023/5/1 20:05		x:14.496, y:-12.996, z:33.819

Two different clashes: Left: round duct with steel beam Right: round duct with electrical fixture



Clash Detection Methodology:

1. Import and combine architectural, structural, and MEP Navisworks models into a single, integrated model.
2. Create selection sets of the various building components
3. Run clash detection between the above-referenced models to identify and note clashes between the various systems and components

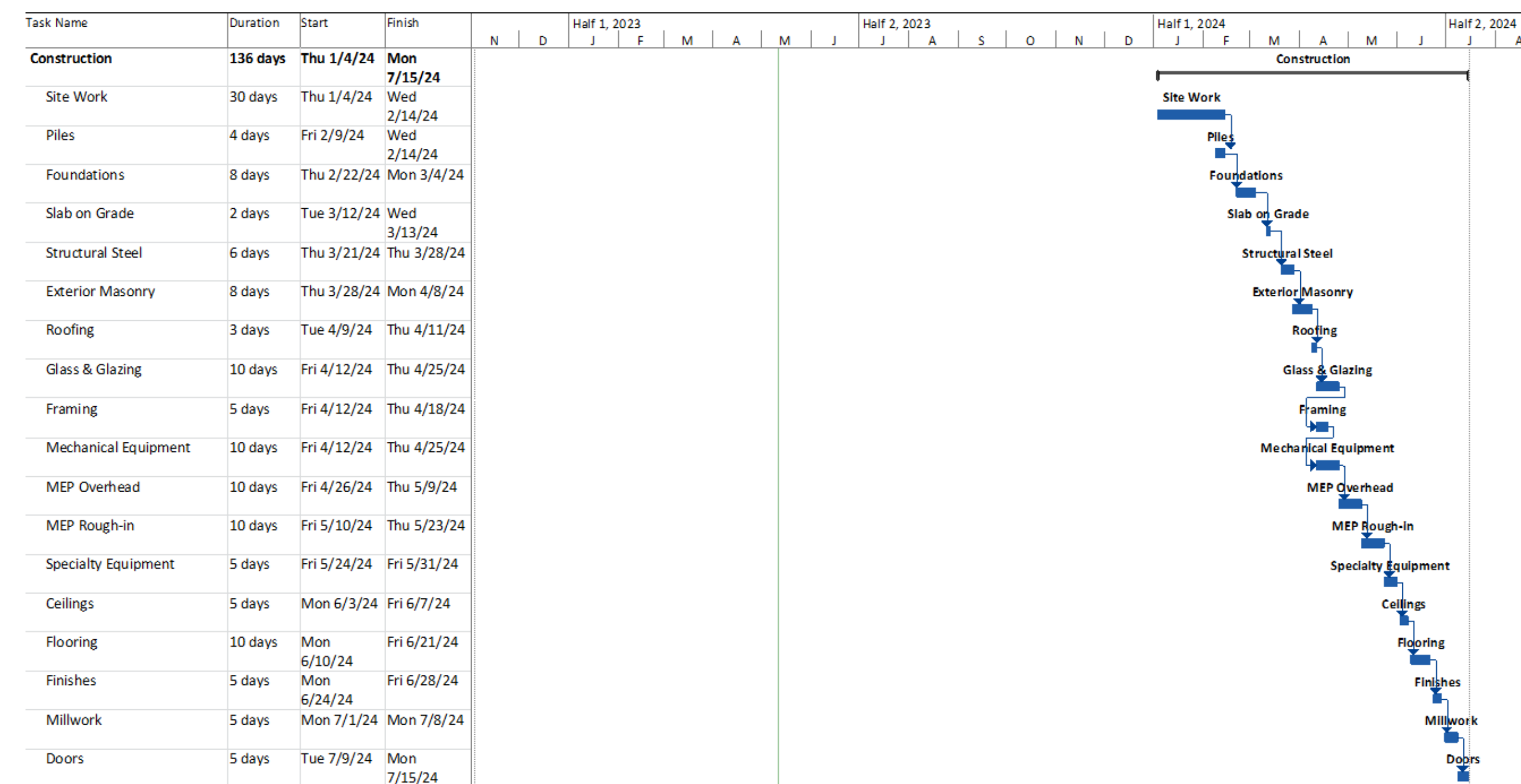
Project Scheduling:

In order to bring our 4D animation to life, we created a construction schedule breaking down the activities involved in constructing the school project.

The schedule allowed the following to occur:

- Review of construction sequencing on paper
- Improved visualization

Creating a schedule was a critical aspect to our project not only due to the fact that it was needed to create the 4D animation, but because it allowed us to paint the picture of the project coming together in our heads to start thinking of various conflicts that may come up and adjusting the schedule to prevent them ahead of time.



Project Schedule Challenges:

We ran into several challenges while brainstorming the schedule for our school project. Given that it is a school, it was crucial to identify the critical path so that the building could get up and running to welcome students.

The Timeliner in Navisworks allowed us to do the following:

- Review sequencing of construction activities to adjust for improved productivity
- MEP systems installation coordination and collaboration
- Identify critical path tasks and adjust those that were not critical path accordingly to ensure the most critical items receive priority

Active	Name	Status	Planned Start	Planned End	Actual Start	Actual End	Task Type	Attached
<input checked="" type="checkbox"/>	New Data Source (Root)	<input type="checkbox"/>	5/1/2023	7/6/2025	5/9/2023	N/A		
<input checked="" type="checkbox"/>	topo	<input type="checkbox"/>	5/1/2023	7/1/2023	N/A	N/A	Construct	Sets->topo
<input checked="" type="checkbox"/>	peds	<input type="checkbox"/>	6/2/2023	8/2/2023	N/A	N/A	Construct	Sets->peds
<input checked="" type="checkbox"/>	str foundations	<input type="checkbox"/>	7/4/2023	9/3/2023	N/A	N/A	Construct	Sets->str foundations
<input checked="" type="checkbox"/>	floors	<input type="checkbox"/>	8/5/2023	10/5/2023	N/A	N/A	Construct	Sets->floors
<input checked="" type="checkbox"/>	str coloums	<input type="checkbox"/>	9/6/2023	11/6/2023	N/A	N/A	Construct	Sets->str coloums
<input checked="" type="checkbox"/>	str framing	<input type="checkbox"/>	10/8/2023	12/8/2023	N/A	N/A	Construct	Sets->str framing
<input checked="" type="checkbox"/>	walls	<input type="checkbox"/>	11/9/2023	4/1/2025	N/A	N/A	Construct	Sets->walls
<input checked="" type="checkbox"/>	mechanical equipment	<input type="checkbox"/>	12/11/2023	2/10/2024	N/A	N/A	Construct	Sets->mechanical equipment
<input checked="" type="checkbox"/>	mep pipes fittings accessories	<input type="checkbox"/>	1/12/2024	3/13/2024	N/A	N/A	Construct	Sets->mep pipes fittings accessories
<input checked="" type="checkbox"/>	mep ducts fittings accessories	<input type="checkbox"/>	2/13/2024	4/14/2024	N/A	N/A	Construct	Sets->mep ducts fittings accessories
<input checked="" type="checkbox"/>	sprinklers	<input type="checkbox"/>	3/16/2024	5/16/2024	N/A	N/A	Construct	Sets->sprinklers
<input checked="" type="checkbox"/>	specialty equipment	<input type="checkbox"/>	4/17/2024	6/17/2024	N/A	N/A	Construct	Sets->specialty equipment
<input checked="" type="checkbox"/>	roofs	<input type="checkbox"/>	5/19/2024	7/19/2024	N/A	N/A	Construct	Sets->roofs
<input checked="" type="checkbox"/>	electrical equipment + fixtures	<input type="checkbox"/>	6/20/2024	8/20/2024	N/A	N/A	Construct	Sets->electrical equipment + fixtures
<input checked="" type="checkbox"/>	conduits + fittings	<input type="checkbox"/>	7/22/2024	9/21/2024	N/A	N/A	Construct	Sets->conduits + fittings
<input checked="" type="checkbox"/>	cable trays and fittings	<input type="checkbox"/>	8/23/2024	10/23/2024	N/A	N/A	Construct	Sets->cable trays and fittings
<input checked="" type="checkbox"/>	ceilings	<input type="checkbox"/>	9/24/2024	11/24/2024	N/A	N/A	Construct	Sets->ceilings
<input checked="" type="checkbox"/>	data+security devices	<input type="checkbox"/>	10/26/2024	12/26/2024	N/A	N/A	Construct	Sets->data+security devices
<input checked="" type="checkbox"/>	lighting devices + fixtures	<input type="checkbox"/>	11/27/2024	1/27/2025	N/A	N/A	Construct	Sets->lighting devices + fixtures
<input checked="" type="checkbox"/>	air terminals	<input type="checkbox"/>	12/29/2024	2/28/2025	N/A	N/A	Construct	Sets->air terminals
<input checked="" type="checkbox"/>	curtain wall mullions	<input type="checkbox"/>	1/30/2025	4/1/2025	N/A	N/A	Construct	Sets->curtain wall mullions
<input checked="" type="checkbox"/>	curtain panels	<input type="checkbox"/>	3/3/2025	5/3/2025	N/A	N/A	Construct	Sets->curtain panels
<input checked="" type="checkbox"/>	doors	<input type="checkbox"/>	4/4/2025	6/4/2025	N/A	N/A	Construct	Sets->doors

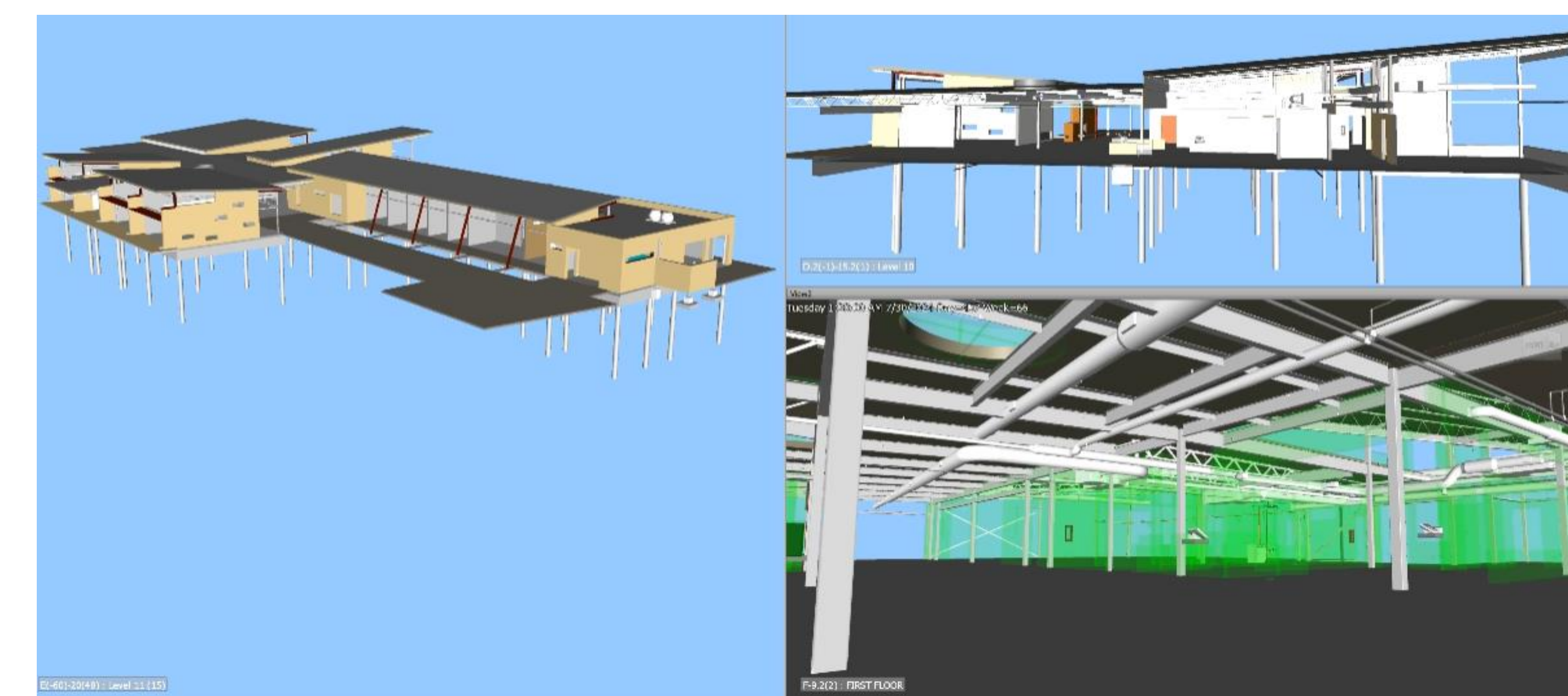
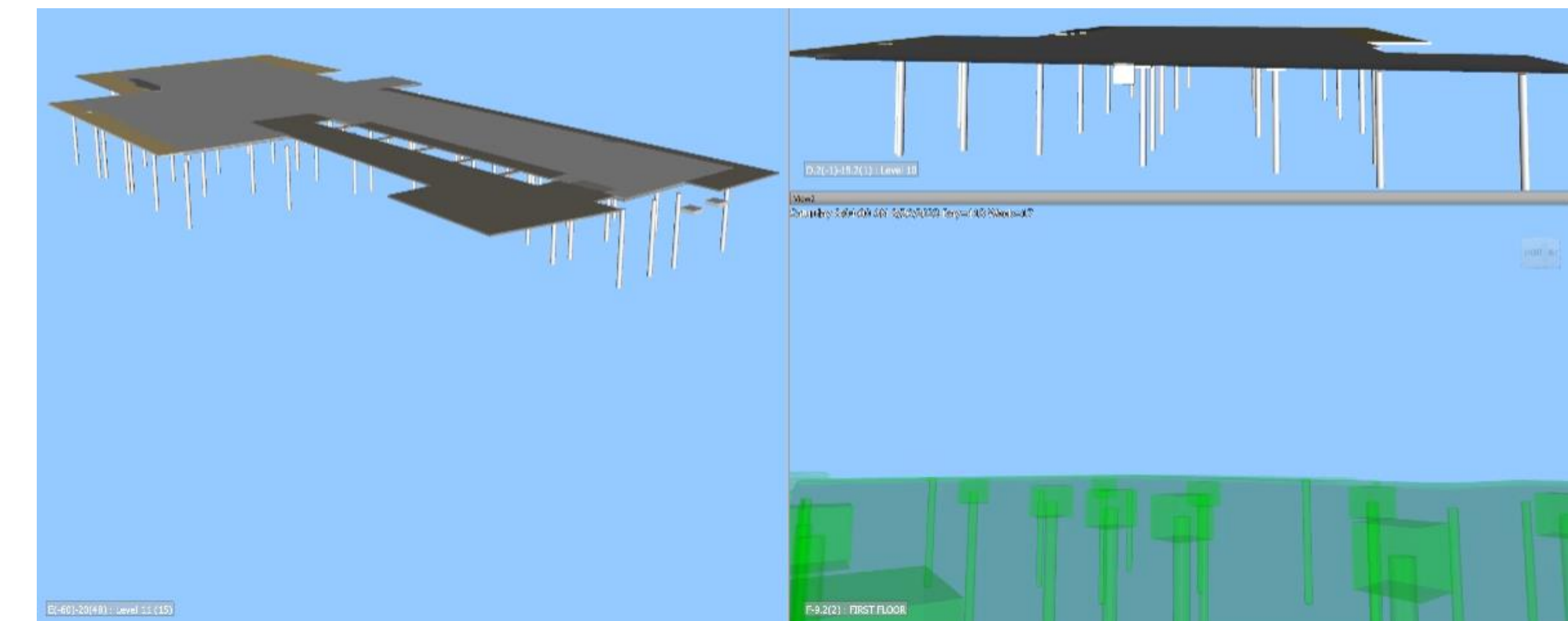
4D Analysis:

We created a 4D animation of the school construction by linking the project schedule to the various construction activities.

Doing so resulted in the following:

- Start to finish visualization of the project coming together
- Further analysis of construction activities sequencing

It was important to visualize the project in 4D to obtain a true understanding of how all the components of the school come together to form a complete school with foundations, structure, MEP systems, and finishes.



4D Animation Methodology:

1. Append the architectural, structural, and MEP models in Navisworks
2. Import Microsoft Excel schedule and link tasks to components of the school
3. Run 4D Navisworks simulation of the building construction from foundations through finishes