

Title: 4D Simulation of Construction Process

Course: CE5390 & CE4377 – Building Information Modeling

Instructor: Dr. Jaeyoon (Jason) Kim

Name: Jeniya Sultana (80852000)

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Project Overview

This report documents the process of creating a 4D simulation for a construction project using Autodesk Revit and Navisworks Manage.

To build the 4D simulation:

- I used Autodesk Revit to model all building elements and exported the model as an .nwc file.
- Then, using Autodesk Navisworks Manage, I imported the model and linked it with the Timeline2.csv schedule provided.
- I mapped each construction task from the CSV to the corresponding elements in the model using the Timeliner tool.
- A simulation was generated, exported as a video, and uploaded to YouTube.

To ensure accurate simulation, I followed a location-based scheduling approach. The building was split into three sections (A, B, C) using grid lines D and E.

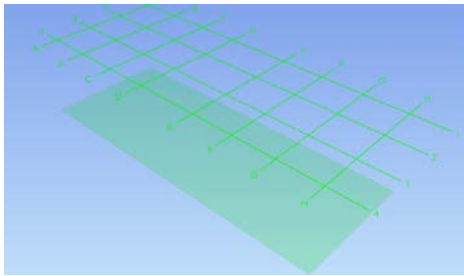


Figure 1: Start of foundation work

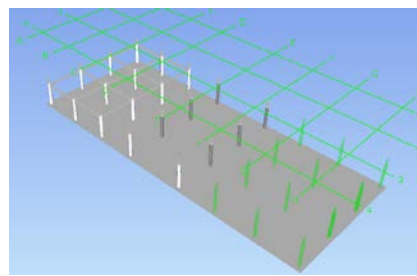


Figure 2: Progress of columns and beams

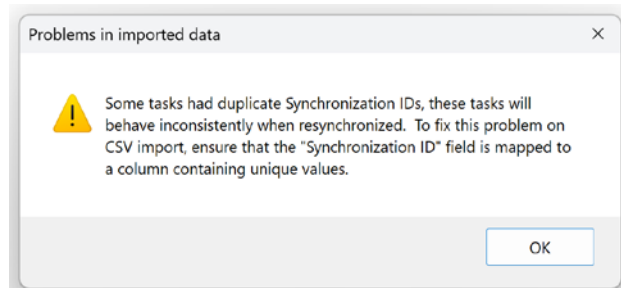


Figure 6: Duplicate Task ID in excel file

These issues led to improper simulation of Level 2 and Level 3 exterior wall tasks, resulting in skipped or missequenced animations and visible gaps in the construction timeline.

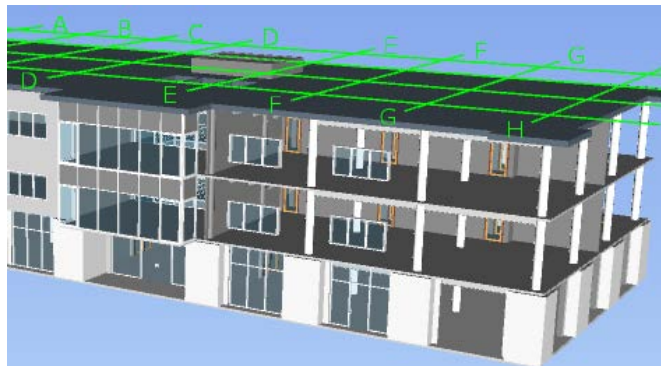


Figure 7: Visible gaps in simulation

Reflections

To mitigate the identified issues, it is essential to assign unique TaskIDs to each individual task to prevent conflicts and ensure proper synchronization within Navisworks. All predecessor IDs need to be carefully verified to confirm that they reference existing TaskIDs in the timeline, avoiding broken task dependencies. Additionally, separate selection sets should be created and assigned for each wall type at every level, which guarantees accurate element mapping and proper visualization during the simulation. Finally, a thorough review of all tasks in the Timeliner needs to be

conducted to confirm that each one is appropriately linked to its corresponding selection set before running the simulation. This simulation video can be found here: [Link1](#)

Modifications

After identifying the issues with TaskIDs 250 and 350, specifically related to Level 2 and Level 3 exterior walls and roofs, I made the following modifications:

- **TaskID Corrections in Revit:**
I revisited the Revit file and reassigned TaskIDs 250 and 350 accurately to the corresponding exterior wall and roof elements. This ensured the elements had the correct metadata before export.
- **Reimport into Navisworks:**
The updated Revit model was then re-exported and re-imported into Navisworks Manage. However, issues still persisted in locating elements using TaskIDs 250 and 350 within Navisworks.
- **Manual Selection and Set Creation:**
To address this, I manually selected the elements corresponding to TaskIDs 250 and 350 in the Navisworks model. I then used the "Save Selection" feature to create new selection sets for these tasks.
- **Predecessor Field Updates:**
I also modified the entries in the Pred1 and Pred2 columns of the schedule for TaskIDs 151, 152, 251, 252, 351, and 352, ensuring they referenced valid and existing TaskIDs. This helped eliminate broken task dependencies and improved the logical sequencing of construction tasks.
- **Reassignment in Timeliner:**
These newly created selection sets were attached to their respective tasks in the Timeliner tool.

After implementing these changes, the Level 2 and Level 3 walls and roofs were correctly linked to their tasks. I re-ran the simulation, and this time it displayed as expected without any visible gaps or missing components. This simulation video can be found here: [Link2](#)



Figure 8: Corrected simulation