* **STEPS**

In the revit file, shared parameter file is created with the name 4D\_Task\_ID. Also, the type and discipline of it are chosen as “text” and “common” respectively. Required elements are assigned to the parameters. Then, a schedule is created with the help of MS Project. In this schedule, the beams and the columns of each level is divided into 3 construction phases. The start date of the the constructions of walls, windows and floor decks of a level is planned right after the finish date of the beams and columns of this level. The construction of stairs and railings will be started after all levels are completed. Lastly, roof construction will be performed. For all tasks, only one team is available, so the predecessor are arranged according to these. Also, the working hours are planned as 8 am-12 am and 13 pm-18 pm. Construction will be continued in 6 days a week. The task IDs in the created schedule is assigned to the parameters in the revit file. Final revit file and schedule are exported to the Navisworks. Sets are created for each Task ID. Rules are assigned for the timeliner and simulation run is started.

* **DISCUSIONS**

1. Main concerns while scheduling are the available team number and the construction phases. The number of team for each activity is one. Also, the construction phases of columns and beams are three for each level. Moreover, the construction of walls, windows and doors is performed for each level at once. The schedule is created according to these limitations. It is observed that in the simulation part, foundation work takes long time. In other words, creating long tasks to match the building elements cause unnecessary delays into simulation. This delay decreases qualification of 4D simulation. Therefore, foundation work should be divided into also 3 phases. It cannot be detected any clashes in this step because of lack of experience.
2. In real construction large building elements are divided into small parts and installed at different times. Therefore, more detailed schedule may provide more accurate scheduling. However, maybe, in simulation part, there cause a simulation errors. For example, two different processes applied different times may seem at the same time in simulation. This problem decreases the effectiveness of detailed 4D modeling.

On the other hand, large and complex projects detailed schedule’s model will be again complicated and evaluating this model will be hard to understand. As a result, 4D model becomes ineffective.

1. If there will be any change in the schedule, firstly, the MS Project file should be updated. The predecessors can be changed and the times for some activities can be constrained. In these cases, new arrangement should be done. In the end, this step of 4D modelling cannot be easy. However, when the new schedule is exported to Naviswork, the new arrangements may not be required. The new simulations can be run only.
2. The simulation part of 4D is the most impressive part. 4D simulation offers us to improve site use planning and coordination with ongoing operations. For example, during scheduling, before wall construction, windows were mounted walls. In design stages, it is a big planning mistake. Thanks to the 4D, this mistake was captured before construction phase; therefore, when building the walls, a chaos was prevented.

On the other hand, the creating sets for each Task ID is a time consuming part. A command can be developed for not to select the components one by one (i.e. columns were constructed in three phases). Also, national holidays are different from countries to countries. Every time, adding holidays by hand is too difficult. National holidays can be added to schedule, according to country.

1. Absolutely, we will gain a huge value from creating 4D model. There are many advantages. Before 4D modelling, design, bid and build phases follow each other. After completing design phase, the construction managers in the traditional approach bid for the project. Once the bid is is awarded, then the construction starts. It is a kind of time-consuming. However, 4D gives us them together. This provides cooperation and coordination of the entire project staff. It means every person can go into the details in the project. Departments in the project commnicate with each other easily. Each part continues at the same time. Therefore, it reduces total construction duration.

Some tools of BIM can also use at the job site offline. Only, this cannot measure its value. If an example is needed, at the site, the work done by workers does not match with the project. When it detects, a report can be written immediately taking a photo. Then, this report comes to the system. Therefore, everybody sees the problem, and the qualified person pays attention this problem, and qualified person solves it. Also, digital platform provides not to use lots of paperwork. Deliveries can be done in software. It is also an environmentalist approach.