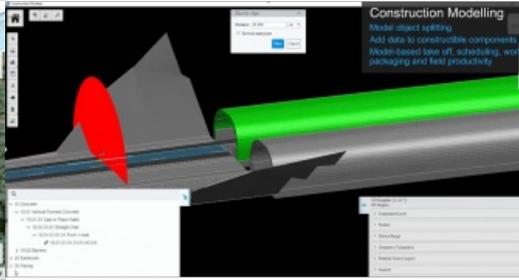
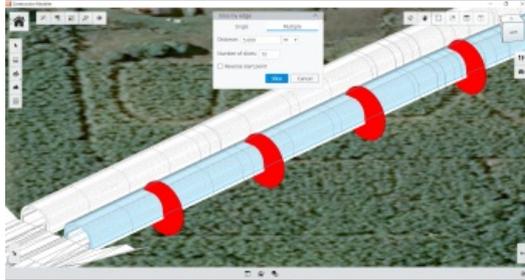
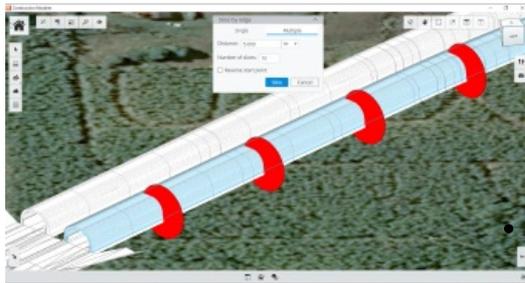


What is 4D Construction?



As 3D building information modelling (BIM) continues to be the technology-enabled process for design delivery, construction firms have looked for ways to leverage these 3D BIM models for downstream construction workflows. Now, engineers are incorporating 4D modelling to their workflows. The concept adds a time dimension to the 3D CAD model that enables teams to analyse the sequence of



events on a timeline and visualize the completion of construction tasks. This concept can be extended to 'nD', where additional dimensions represent other types of information added to the 3D model context.

Engineers, construction managers, and contractors are leveraging 4D construction modelling to drive significant value in workflows that once involved a lot of risk and inefficiencies during the construction phase of a project. Some examples include:

- *Model-based scheduling and simulation.* A 4D model allows planners and construction staff to visualize the construction sequencing including staging (for example, cranes, material storage and site access). The 4D model helps identify errors in the plan and

optimize the path of construction. It is also a better way of communicating the plan to the entire construction team. It is better to build virtually first than to find mistakes in the field.

- *Model-based QTO and Estimating.* A model-based approach in which means, methods, quantity calculations and cost codes are linked to model objects and allow for more accurate estimates, enable rapid iteration if designs change, and enable cost to be part of the project plan optimization. Having this information enables organizations to put together more accurate tenders.
- *AR/VR and Model-based Field Inspection & Progress Tracking.* A georeferenced construction model can be brought into the field using web and mobile apps to provide data access and capture in the field with the 3D model as context. The process ensures that field staff, for example, are collecting data about the correct constructed asset because they use its model object (virtual representation) as a reference for the task they are completing.



Bentley's SYNCHRO Modeler is an application that is delivered with SYNCHRO 4D for construction estimators, planners, and VDC engineers to create construction models leveraging 3D design models.

The bottom line is that developing a construction model from the design BIM model to drive 4D workflows results in projects that are more likely to be on time and profitable.

The Current Situation within Heavy Civil Projects

So, if 4D construction modelling is this useful, why is it not used on every project, and why do we see only very little adoption on civil (horizontal) construction projects? It is often easier for construction to leverage model-based workflows when they have the design model. This is not always the case and specifically for civil projects this happens less often (than on building or industrial plant projects) as infrastructure owners (for example, DOTs) do not specify 3D models as the design deliverable to contractors. That is changing, however, as countries like the UK drive BIM specification and as design/build delivery models gain acceptance.

Also, unlike building or plant BIM models, civil design models are not very usable for 4D. And, that has been the case since the first 4D software tools became available in the last decade. Building and plant models are delivered with a high degree of componentization and related engineering information. For example, a building model includes objects such as doors, windows, walls, lights, pipes, and so on, that are very discreet and can be directly connected to a construction schedule. Civil models are not componentized in this way and therefore require a secondary processing steps that turn model objects into *constructible components*. For example, a 25-mile civil roadway/corridor model is often one long object unless split by a bridge or interchange. This type of model object is not a constructible component since it does not represent how that 25 miles of road surface, aggregate, barrier wall, and curbing will be constructed. As a result, it cannot be directly connected to time or cost, which has been a dilemma for the past decade and has required construction firms to rebuild the models into many model objects within the design authoring tools. This presents an obstacle to adoption as it requires a high degree of knowledge of complex design modelling solutions.



SYNCHRO Modeler turns design models into constructible models, enabling model-based workflows like quantity take-off (QTO), Planning and Field Operations with a simple tool that makes models accessible to all construction team members.

Finally, a solution that will enable 4D civil construction

Many civil construction firms have had to take matters into their own hands employing VDC engineers that were proficient in civil design modelling software or attempting to develop their own in-house solutions. All that is about to change as Bentley Systems, a leader in developing civil design and engineering software applications, has expanded its industry leading 4D modelling solution horizontally to address civil projects. Specifically, Bentley's [SYNCHRO 4D](#) offering has expanded its new SYNCHRO Construction portfolio to address the above issues. SYNCHRO 4D includes a modelling environment purpose-built for construction firms that allows them to:

- Easily navigate any model (civil, industrial, or building) and aggregate models.
- Split model objects, including civil models, into constructible components. This includes splitting of meshes and solid model objects along alignments, object edges, and within polygons. The process allows engineers to easily create models that are constructible based on project phasing (construction work areas) or means and methods (work packages).

Now, all project types and all model object classes can be part of 4D construction workflows. And, it's about time this became easier for heavy civil construction.

<https://www.gim-international.com/content/article/what-is-4d-construction>
