

CES502058

[Model Civil Engineering Structures Like Digital Twins Without 3D Scanning]

Yoann Clouet
EIFFAGE

Florent Couderc
EIFFAGE

Learning Objectives

- Design without expensive tools
- Discover a new approach to software
- Adapt and deepen the workflow as needed
- Use a common exchange format to collaborate with partners

Description

Is it possible to model a civil engineering structure like a digital twin without 3D scanning?

In this case study, learn how the Marseille subway stations project successfully replicated 62 station platforms in four months. We will demonstrate how to use Civil 3D, Subassembly Composer, Dynamo, and Excel to reduce the time needed by four, thereby reducing costs. We will share the project details, budget, workflow using adaptive profiles, and the possibilities of developing this idea further.

This workflow can be compatible with any project, and this case study should improve your skills and offer new possibilities. Through this presentation, you may discover a new approach to using Civil 3D now and in the future.

Speakers



I have been working for 2 years at Eiffage in France as BIM Modeler in civil engineering. I am in my fifth and last year of study about BIM management. I like the digital world and especially the building industry. I use in particular Revit, Autocad, Civil 3D, and InfraWorks.

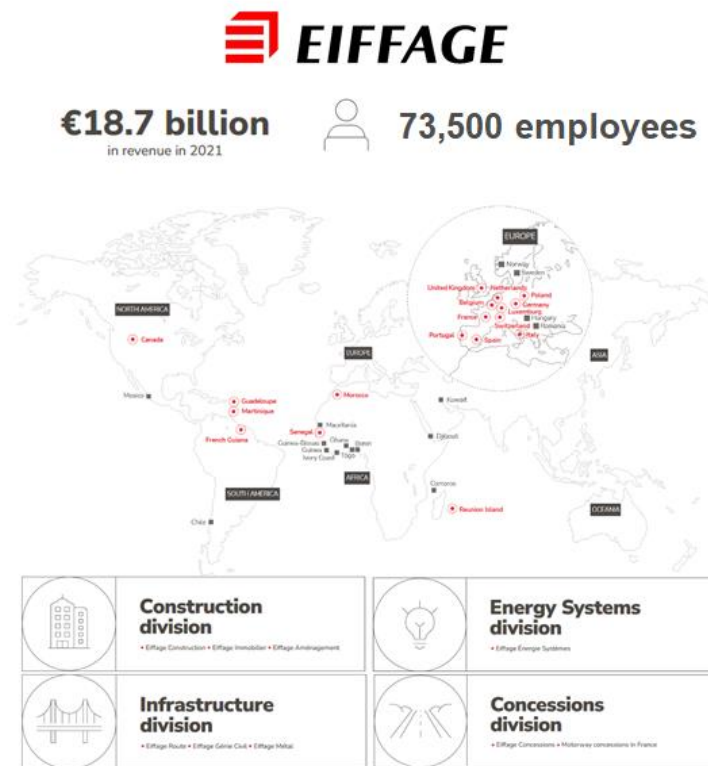
 [LinkedIn](#)



I spent 8 years as a civil engineer in charge of maritime construction sites on the southern France shoreline, working on complex projects during which I always kept an eye on ways to improve our processes with the help of digital solutions. Since May 2022, I am in charge of data & AI innovation strategy for the regional civil engineering department of Eiffage, and I am working on bringing improvements on both user experience for operational staff and business insights for deciders.

 [LinkedIn](#)

Our company



Eiffage is one of Europe's leading construction and concessions companies. The Group generated revenue of €18.7 billion in 2021 in Europe and internationally.

Eiffage employs seventy-three thousand people to work in construction, property development, urban development, civil engineering, metallic construction, roads, energy systems, and concessions.

You can see the highest viaduct in the world, built by Eiffage in 3 years. Millau Viaduct is three



hundred and forty-three meters high and two thousand four hundred meters long, comprising seven concrete piers and a steel deck.

Introduction

This case study aims to illustrate a linear project in which a solution was implemented to create a digital twin of a structure without 3D scanners or expensive equipment. The aim is to use only the software we already have. You need to identify your requirements and then adapt the process we propose to your needs.

The challenge

3 key points

Time



We have 4 months to create 60 cross sections per platform.

In total, 3 720 drawings.

Digital twin



To share information and use the 3D model as a base for work.

We require to create a digital twin.

Share



2 partners

We need to find a common exchange format that allows everyone to read documents.

The project

The Marseille Subway network modernization program consists of replacing the manual subway with an automated subway.

The project includes 29 stations and 62 platforms, each of which will be equipped with platform gates also designed to be environmentally sustainable. The project provides a complete solution including the reinforcement of the platform edge, supply, and installation, testing, and commissioning of the platform gates.

So if we want to add equipment, we need to check some special features in relation to the platform edge.

For example:

- Will the size of the new Subway train conflict or not with the platform edge?
- Or can the shape of the platform edge be maintained in the future?

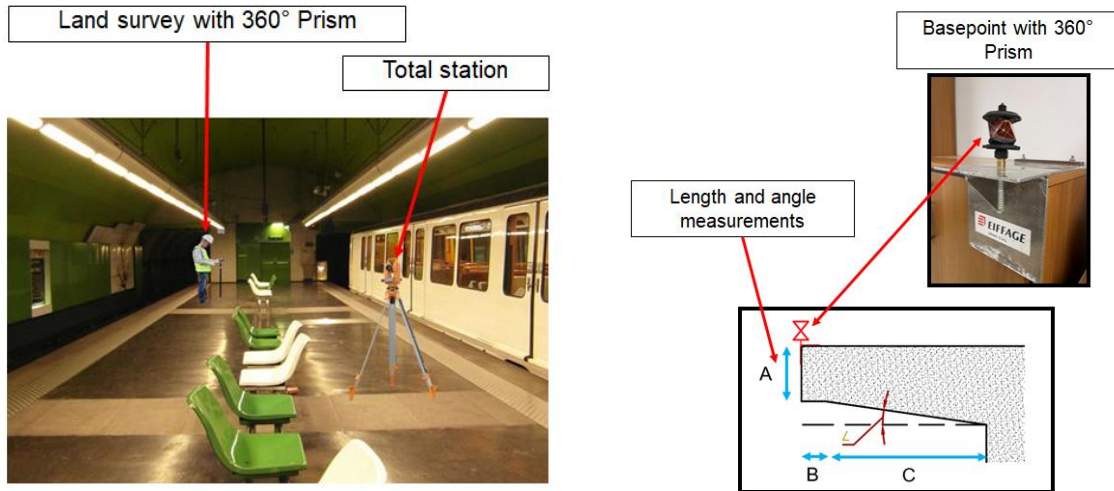
There are many special features to deal with; in this case study, we will look at some of these issues.



3D RENDERING

Model without expensive tools

To get the input data, a land surveyor goes on-site with his equipment and picks up topographic points of the Subway platform. To do this, we use the following tools:

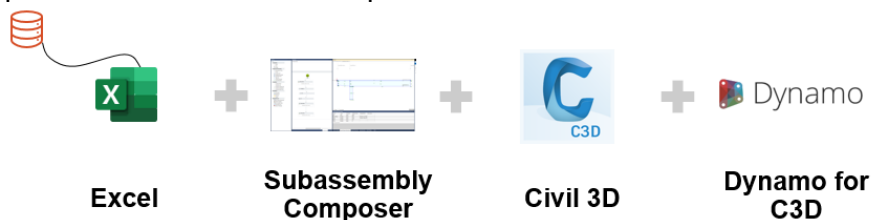


- Trolley designed and drawn by Eiffage with Inventor



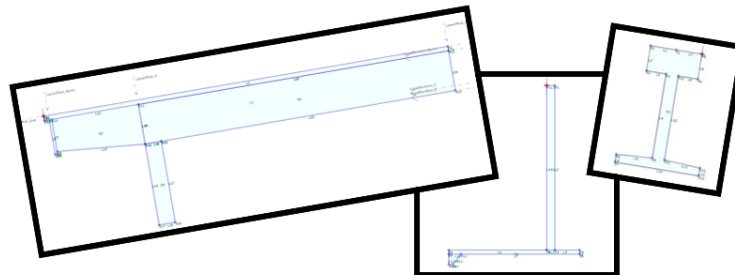
The process

These tools are not expensive and provide accurate information with 5 mm tolerance. The data is exploited and we can use this process:



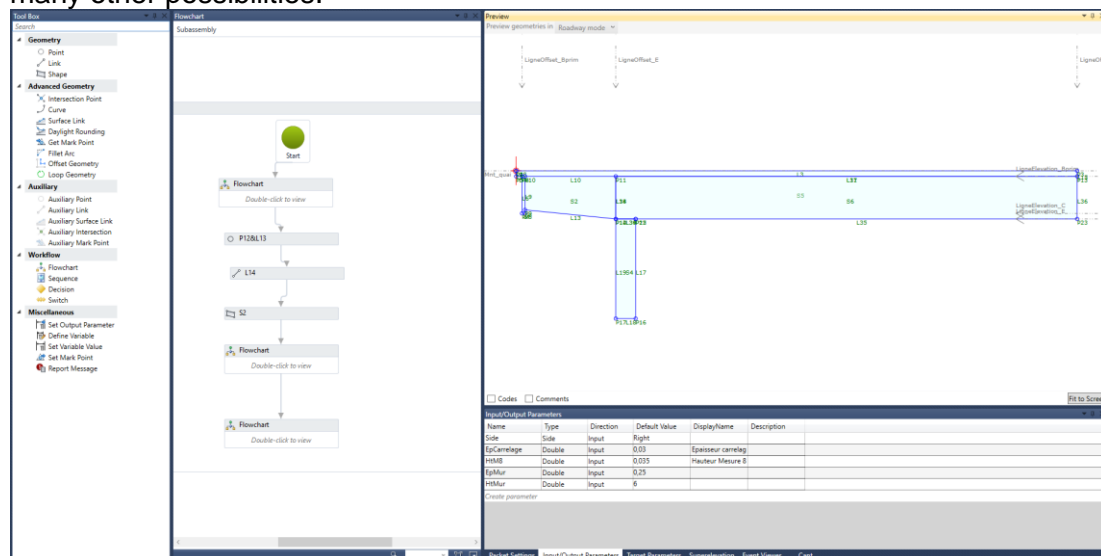
Discover a new approach to software

Generally, we use C3D for road design, earthworks, pipelines, etc., but rarely to create a 3D model with specific forms. Using Subassembly Composer and C3D offers infinite possibilities.



Subassembly Composer

In our case, we only use the target parameter and input parameter. However, it offers many other possibilities.

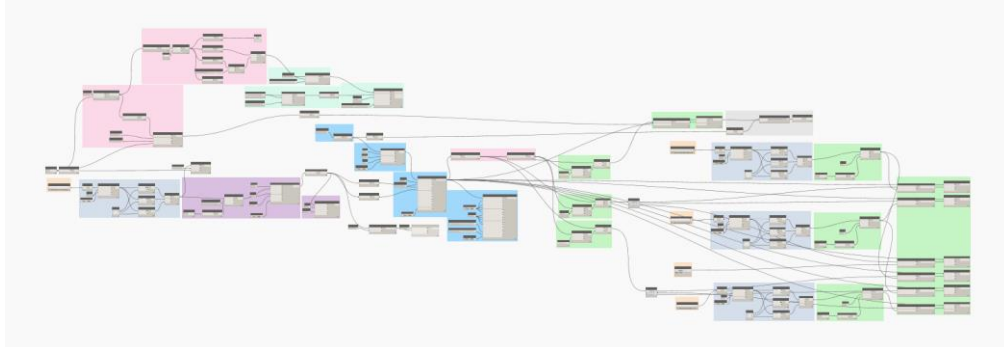


Adapt and deepen the workflow as needed

This workflow can be used for any linear project. Therefore the structure of the Dynamo script is exploitable again; you just need to adjust some of the parameters to meet the requirements. To do this we use 2 Dynamo scripts:

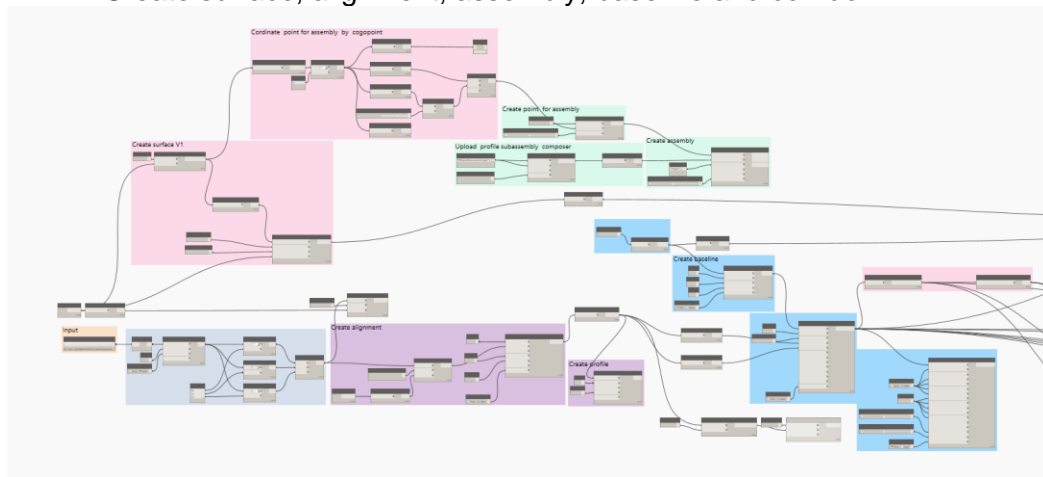
Some advice: If you have some imported Excel files in Dynamo, I prefer to open them independently on my computer because it is faster like this.

Create corridor with alignment, baseline and assign target parameter

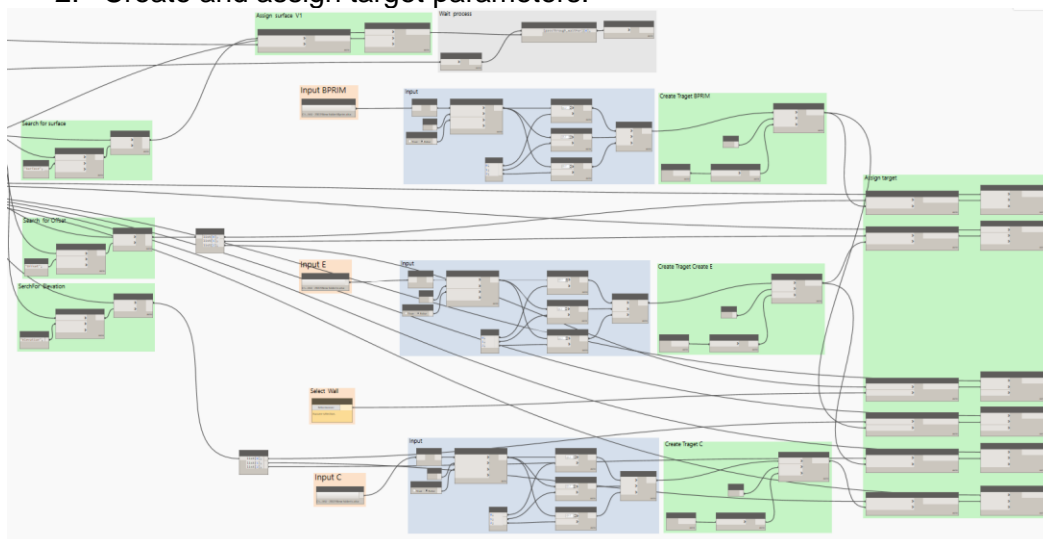


This script splits into 2 parts:

1. Create surface, alignment, assembly, baseline and corridor:

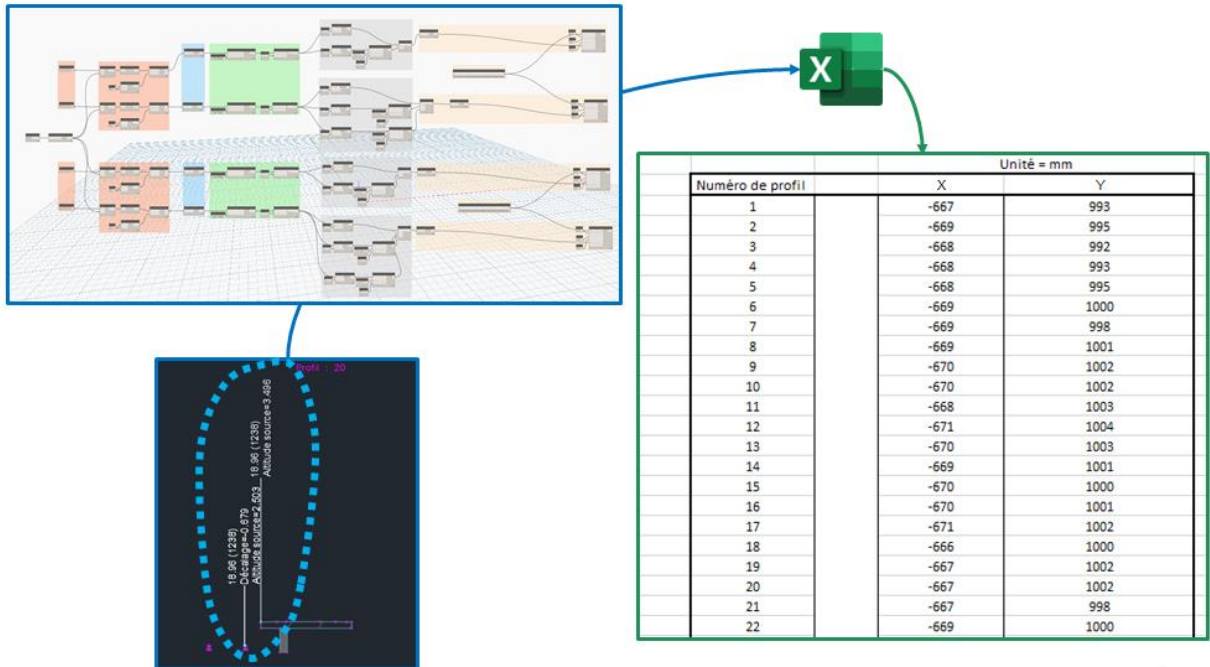


2. Create and assign target parameters:

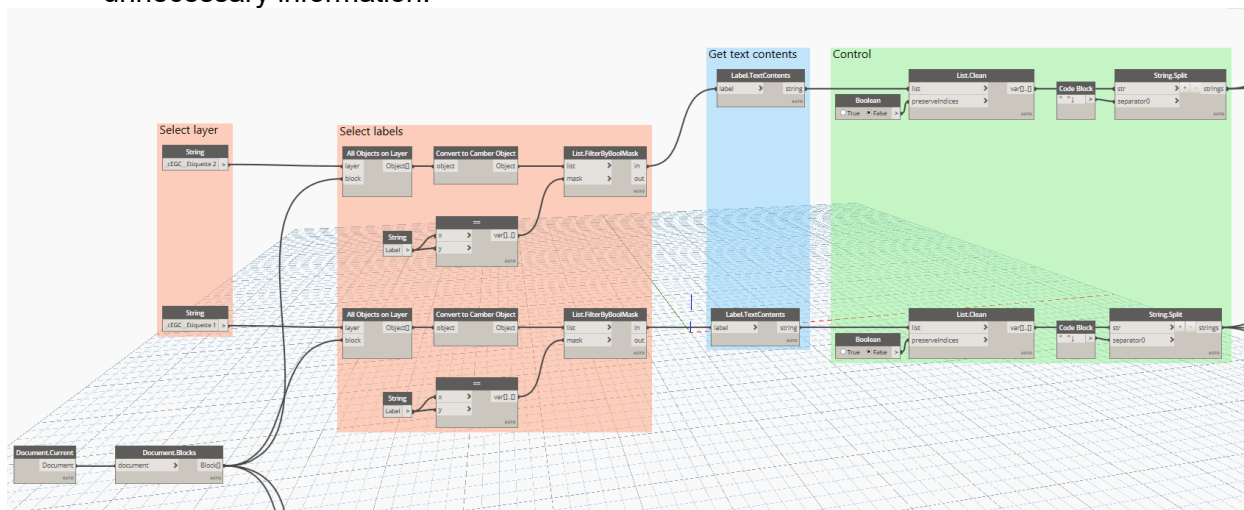


Export labels sections views

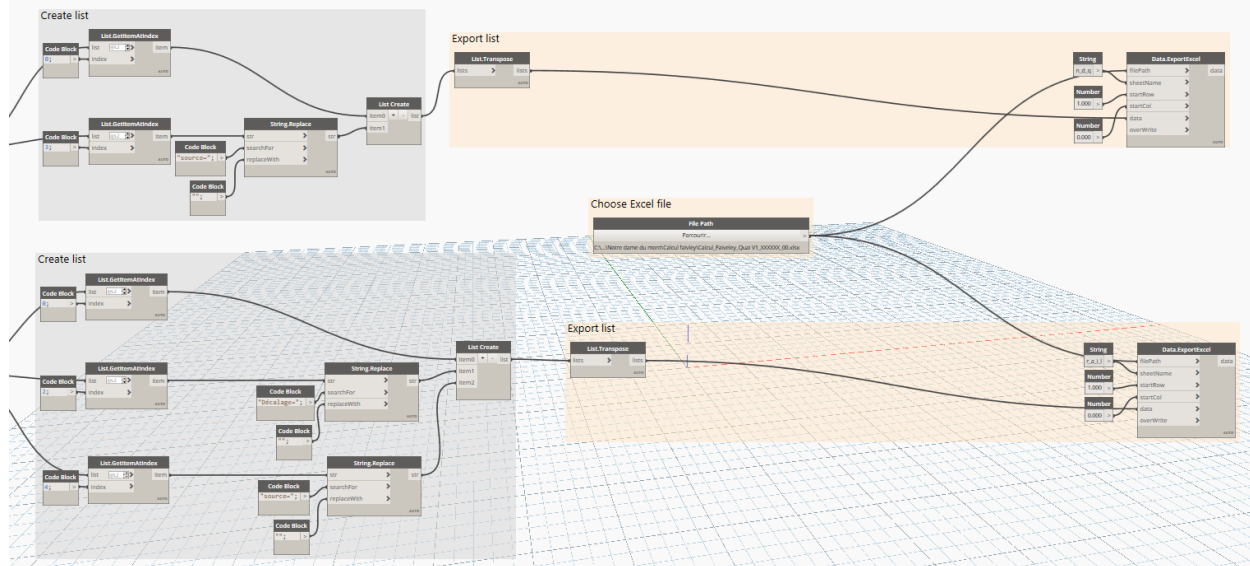
With this Dynamo script we can export to Excel all information by section view labels.



In our case, we select labels by layer to get text content, and then we filter and delete the unnecessary information.



The second part consists to create list to export data.

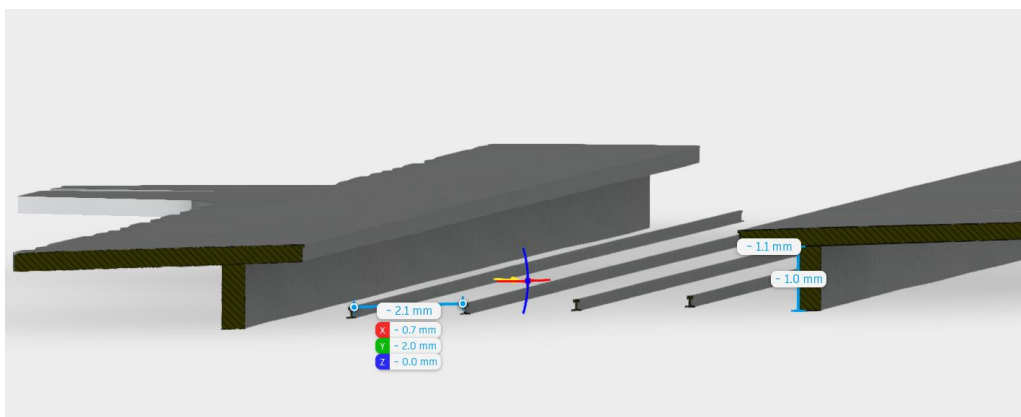



Collaborate with partners

The standard format of the output allowed us to exchange with our partners who are unfamiliar with data processing, which is the foundation for a successful project. Dwg format is actually popular because it works on any industry software.

Moreover, we can export solid 3D and use rendering in a lot of software. For example, we can use Autodesk free viewer online to share the 3D model. We can measure, create sections views, add annotations, etc.

Autodesk Viewer Online:



For more information :  yoann.clouet.ext@eiffage.com





www.linkedin.com/in/yoann-clouet-794a2818b