



## APPLICANT 3 – A RE-WORK OF A RAILWAY SYSTEM

What does/did your project aim to achieve? Please write up to a maximum of 300 characters

It aimed to reduce road congestion and pollution by providing a high-speed electric rail connection between the two prosperous cities in Chile. The rail connection is fully sustainable as it would be powered by a new geothermal plant making the net production of CO2 zero. This railway link will turn a 2-hour polluted journey into a completely green 15-20 minute commute from between each city. The project also revitalises parts of the disused railway line and will encourage economic development.

Please describe and explain your project making clear and direct reference to your supporting documentation. Please write up to a maximum of 1000 characters

Due to the high seismic activity in the area, the design of the track and other infrastructure had to be able to withstand high magnitude earthquakes. I solved this by creating my slab track based on the Shinkansen's design with reinforced concrete track and padding to help mitigate the effects of the P-Wave. I also designed a custom fastening assembly, to secure the track down safely and deal with the vibrations caused by the maximum operating train speed of 400km/h, the second-fastest globally.

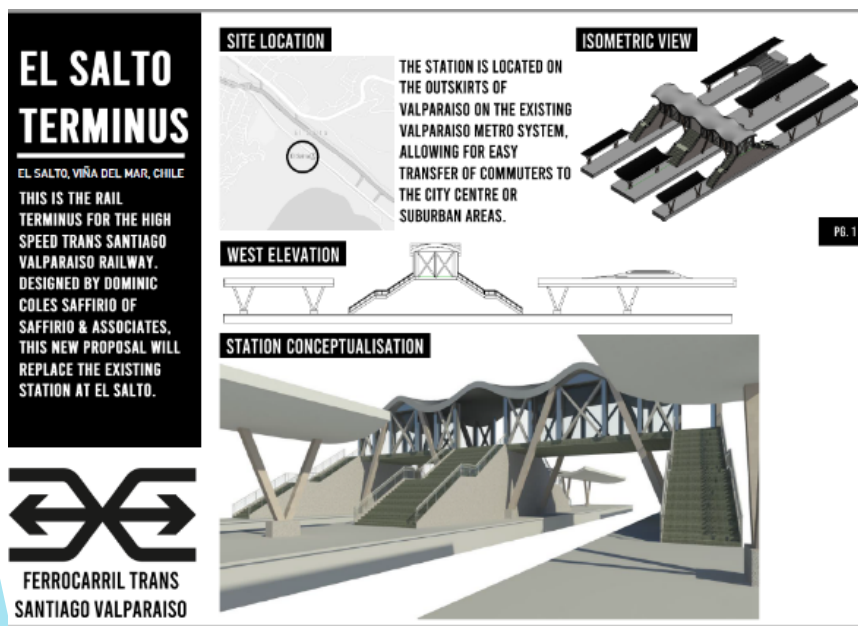
What have been the successes and failures of you project so far? Please write up to a maximum of 500 characters

As the rail line passes through the mountains, I needed to create tunnels and bridges, so I used Civil 3D to calculate the elevation profile and start to plan out the required earthworks and infrastructure. The cross-section of the track uses multiple shallow gradients to reduce tunnel length, as it is expensive but also creates the 'piston effect'. Currently, I am designing the tunnels, and I have designed perforated hoods at the entrance and exit of the tunnel to minimise the compression wave.

What lessons of an engineering nature have you learnt from working on this project? Please write up to a maximum of 500 characters

I have learnt that I need to pay attention to the smallest details that may hinder the overall efficiency of the railway line. I also taught myself how to use engineering programmes such as Fusion 360 for the fastening components, Autocad, Civil 3D and Revit for the terminus design which was a big challenge. I also researched heavily into structural engineering for the design of the rail terminus at Valparaíso, as well as researching fluid mechanics for the design of the 18km long major tunnel.

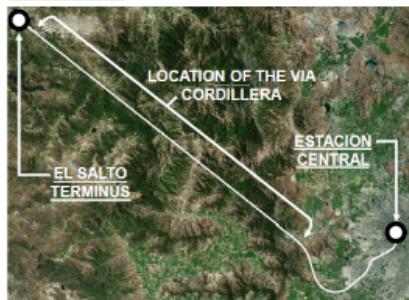
### VISUAL EVIDENCE





**TRANS SANTIAGO VALPARAÍSO RAILWAY CONNECTION DEVELOPMENT**

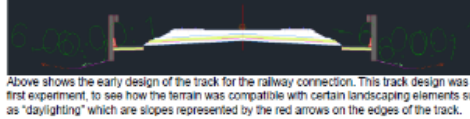
**SITE PLANNING**



This shows the mapping of the proposed Trans Santiago Valparaíso Railway Connection. The longest length of the track is over 70km long, and is called the 'Via Cordillera' due to it crossing the mountains, as 'Via Cordillera' translates to 'through the mountains'. It will allow the train to travel at its highest operating speed of 400km/h through rural mountain countryside.

**TRACK DEVELOPMENT AND EXPERIMENTATION**

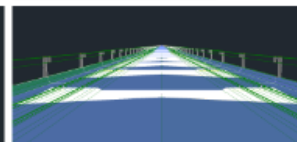
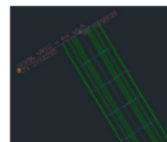
**TRACK ASSEMBLY DESIGN**



Above shows the early design of the track for the railway connection. This track design was my first experiment, to see how the terrain was compatible with certain landscaping elements such as 'daylighting' which are slopes represented by the red arrows on the edges of the track.

**TRACK ASSEMBLY DESIGN**

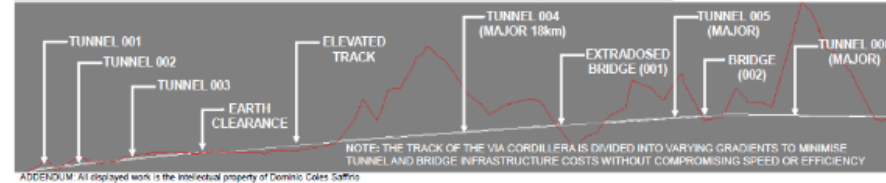
**PRELIMINARY RENDER OF TRACK**



This shows the experimentation with applying the assembly onto an aligned test track to see the possible outcome for the high speed railway system.

This is the preliminary render of the assembly above applied to the test track to see it in a 3d format. It has a double track design, for the trains going eastbound and westbound. This early design has unnecessary features like the handrail, which will be revised in later designs.

**ELEVATION PROFILE AND MAPPING OF REQUIRED INFRASTRUCTURE (VIA CORDILLERA)**



Item	Qty	Part Number	Part Name	Part List Description	Material	Mass
1	1	RFS-F0001	Nail	Running nail used for track (STANDARD TRACK)	Steel	4.2184+04 g
2	2	RFS-F0002	Nail Insulator	Attaches C Clip to Tie Plate (Dark Grey Durable Paint Finish)	Steel, Carbon	88.195 g
3	1	RFS-F0003	Nail Tie Plate	Supports Insulator (Dark Grey Durable Paint Finish)	Steel, High Strength, Low Alloy	1707.807 g
4	2	RFS-F0001	C Clip Fastener	Fastens down Rail (Dip Coating)	Steel, Carbon	426.303 g
5	1	RFS-F0004	Rail Pad	Concrete (Reinforced No Rebar)	Plaster, Gypsum	10.632 g
6	4	RFS-F0005	Nail Splice	Secures Nail Splice (No Finish)	Polyethylene, High Density	10.632 g
7	4	RFS-F0006	Nail Splice	Secures Nail Insulator (Metallic Black Paint Finish)	Steel, Mild	124.781 g
8	1	RFS-F0007	Concrete Sleeper	Secures Tie Plate (No Finish)	Concrete	2.321E+04 g
9	4	RFS-F0008	Rebar	Reinforces Concrete (No Finish)	Steel, Carbon	186.238 g

**ISOMETRIC VIEW (WIREFRAME)**  
FULL ASSEMBLY OF FASTENING COMPONENTS  
SCALE 1:2.5

**ISOMETRIC VIEW (REALISTIC)**  
PLEASE CLICK ON LINK TO EXPLOSION VIDEO: <https://vimeo.com/258141040>

**EXPOSED REBAR FOR ATTACHMENT TO SLAB TRACK PLATE**

**INVERSE ARRANGEMENT FOR C CLIP FASTENING (RFS-F0001)**

**AA (1:5)**  
**B-B (1:5)**

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**MARKER'S COMMENTS**

This project is extremely impressive and this particular application writeup is included just to show the level that some students achieve. It looks like the sort of project that consumed the applicant's every waking moment! Not only has the applicant delved into architectural engineering but also civil engineering, structural engineering, fluid mechanics and mechanical engineering, and the CAD work is outstanding. One criticism would be that the last section of this write up – lessons learnt - does not really tell us what *lessons* the applicant has learnt but more about *what* the applicant had to learn and do.