

Career Episode 1

Road and Drainage Design Project

A) Introduction

[CE 1.1]

Work: Road and Drainage Design Project

Duration: March 2016 – June 2016

Location: Australia

Organization: Deakin University, Australia

B) Background

[CE 1.2] The work was executed specifically for Professional Transportation System unit Master course. It was implemented under the university's professor guidance. The project was executed according to an individual step and it work according to unit guide.

[CE 1.3] The project work was two-lane road design and drainage project which was done wherever needed according to Australian guidelines. The data was specifically utilized in the design calculations and the road width and length worked with earth cutting volume and filling. These were associated with the precision calculations and all project major steps were evaluated with the results which were accomplished using the civil engineering skills. I worked on splitting the project activities into various sections and associated work goals were accomplished within the defined project timeline.

[CE 1.4] The work main purpose was based on connection of point A and point B for a two-way road. There were varied elevations for two points which worked with the contoured area. The basic need was based on obtaining appropriate route with design speed minimum curves specifically set to 80km/hr. Drainage design was executed along the road wherever needed for avoiding the road surface waterlogging.

[CE 1.5]



[CE 1.6] Duties:

- I worked on route presentation from all possible factors like smallest length of road, which typically passed with minimum turns from contour lines.
- I mapped the activities on paper before design activities implementation.
- I executed the work activities which was linked with passing the minimum contour lines along with assisting adequately in managing cutting and filling of earth mass.
- I executed design calculations with consideration made on the related safety factors.
- I did project progress monitoring under the professor's assistance and it resulted in getting the desired project results.
- I analyzed the necessity of curves that were based on terrain topography.
- I understood the tool which was specifically for the ditch, paving, and border alignment.
- I made super-elevation, set back a distance, and extra widening design calculations.
- I finalized and submitted the design four months before.
- I attained final feedback from the professor and got significant assistance from the supervisor.

C) Personal Engineering Activity

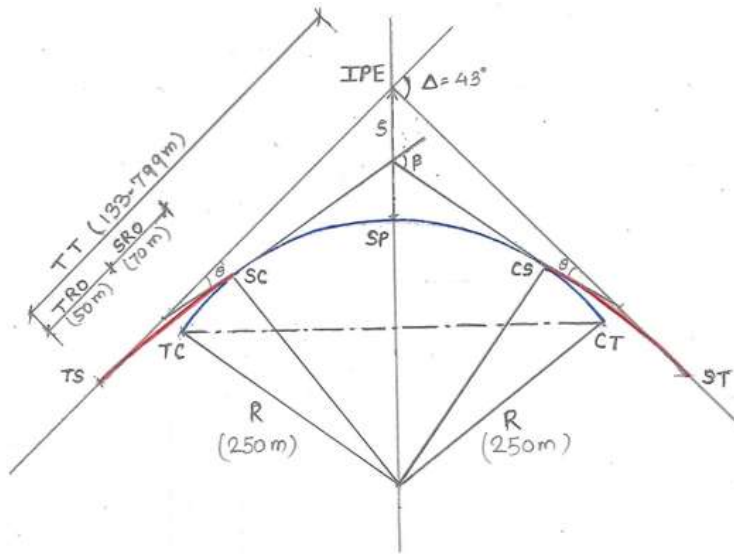
[CE 1.7] I worked on getting the needed work results which worked as an extensive step towards engineering knowledge and skills implementation. There was the inclusion made on the repetitive complex calculations for road designing. I did design elevation calculations for initiating the design of the complete profile of road which was coordinated well with plan outline. I adopted the appropriate gradient which worked within the allowable limits and made determination of the vertical and horizontal curves within the allowable limits. Also, I made an analysis on the crucial work stages which was based on finalization of the road horizontal alignment. I did curves detailed designing calculations and provided ease and effortless approach towards driving experience along

with transition curves which were integrated into the design. Also, I made proposed speed limit consideration on the super elevation stage of the road which was incorporated and calculated into each curve design via the specified route. I made vertical alignment designing and executing alterations with the stopping sight distance consideration. I made cross-section evaluation at regular intervals which were dependent on detailed elevations demonstration on center-line point. The drainage design part was adopted by keeping in mind the expected runoff over the road surface depending on the local rainfall intensity.

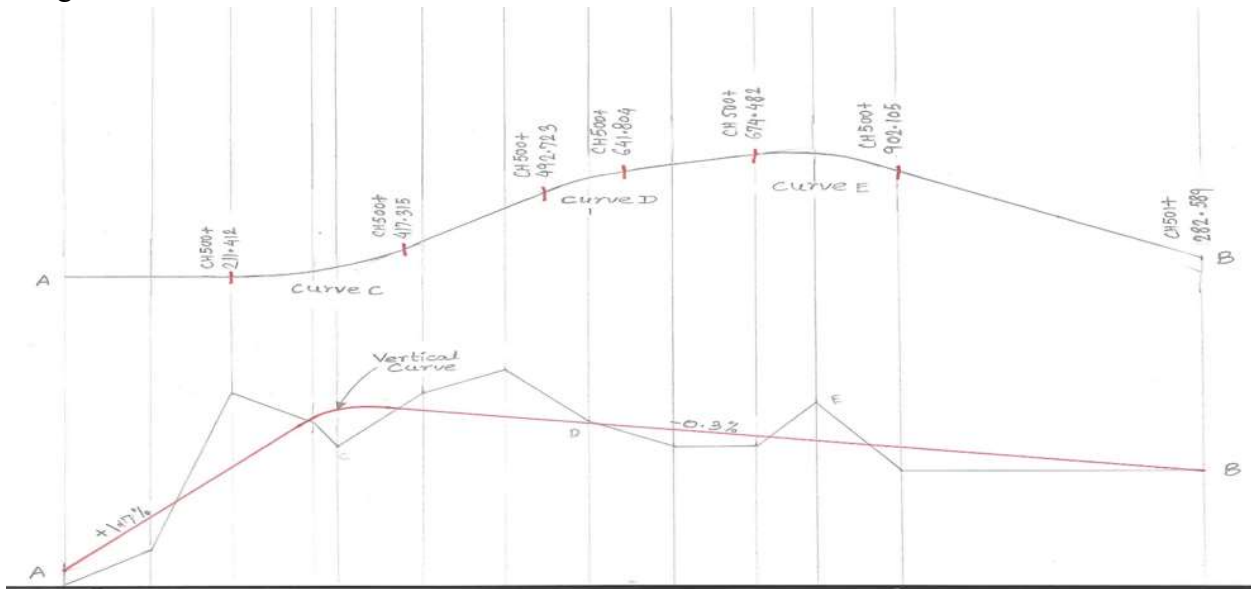
[CE 1.8] The road project was designed as per the Austroads guidelines while keeping in mind the specific requirements of the project. As a part of road construction, earthworks estimations were also carried out during the project. Furthermore, to support the mathematical calculations detailed diagrams and charts were prepared to illustrate details of important design elements. I did mathematical calculations and obtained the error during calculations which led towards wrong results. I fixed the calculations and all the typical calculations were rechecked as even small mistake could lead towards wrong design in the end. There were scenarios faced in which I made adequate research which ultimately led towards getting the desired work results.

[CE 1.9] I did horizontal alignment which worked as an important element and the proper designing resulted in higher performance related to safety, speed, comfort, and efficiency. Additionally, it resulted in economy saving and enhancing highway capacity. The horizontal alignment design needed horizontal curves and design speed understanding. I included the straight lines in the design which were termed as tangents and these were linked with curves provisioning for altering direction. I included super-elevation, set back a distance, extra widening, and transition curve design. I provided horizontal curves that worked with the intersection point of two straight highways alignments for changing the direction. I altered the direction which was for ensuring and comforting the passengers. I analyzed the necessity of curves that were based on terrain topography, property restrictions imposed, provided access for the certain locality, and unavoidable reasons restriction. I made utilization of existing right of way with earthwork quantity minimization and it was followed with existing amenities preservation along with maintaining topographical features consistency of the terrain. The design activities were divided adequately with each step implemented appropriate for obtaining the defined project results.

Horizontal curve design details:



Longitudinal section of the road:



[CE 1.10] I did super-elevation calculations which were the transverse slope mainly provided with counteracting for centrifugal force effect and reducing the vehicle tendency for overturning and skidding laterally in an outward manner with pavement outer edge raising. It worked with the inner edge and I executed the road designing with the utilization of the model and it was followed by drawing the project with the existing norms. It was executed from planning till implementation. I did stripping and sub-cut surface calculations which allowed sub-surface layers designing. I calculated the cross-slopes and offered linked cross-slope mechanism which allowed the slope variation and it specifically dependent on the super-elevation main alignment. I worked on enlarging the pavement which was done with a mixing road model where the sectional concept

was associated with the "support line" technique and it was termed as a string. I realized that the tool mainly worked for the border, paving, and existing ditch alignment. It allowed preserving the outbuildings in regard to the points of construction which acted well with support lines. I considered the construction coded points in which drawings were executed and the tool was utilized for ensuring the road platform width variations management which assisted in creating and completing the design.

[CE 1.11] The first step was to finalize a road alignment from point A to B considering the factors such as length of the road, topography, number of curves, coordinating the horizontal and vertical curve and earthwork limitations. I initially prepared couple of options, however, I finalized on a single option while achieving optimum results using my engineering skills. For example, one of the alignments was passing through dense set of contours which would have resulted in steeper gradient and it would have required excessive earthwork excavation. As balancing the cutting and filling of earthwork and analyzing it through mass haul diagram was one of the objectives of the project. In addition to that, the super-elevation step was the difficult step which was needed to be sorted using technical expertise. Therefore, I made super-elevation, extra widening, and transition curve design implementation which was provided with horizontal curves and it linked well with intersection point alignment for altering the direction. Furthermore, one of the tasks was to calculate the earthwork quantities by taking a cross-section at every 100 meters. Considering the road alignment and the curves I had to vary the intervals to capture the optimum point for a cross-section which captures the cutting and filling through various modes like through curves and gradients. It helped me to produce the mass haul diagram with more details. All the related project milestones were accomplished using civil engineering skills.

D) Summary

[CE 1.12] I worked on capabilities development during the project that was utilized on-site works in designing part. It also assisted me in understanding the civil engineering principals and it was linked into the workflow and executed the work done accordingly. The project also included understanding and reading from numerous literature associated with the roads designing and road infrastructure. I made knowledge execution on paper which assisted me adequately in getting decent grades in the unit for road design successful execution.