DESIGNING A FLEXIBLE PAVEMENT OF DELHI MUMBAI GREENFIELD (PHASE-1 VADODARA BHARUCH HIGHWAY)

A

PROJECT REPORT

Submitted in partial fulfilment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision of

DR. AMARDEEP

Assistant Professor (Sr. Grade)

By

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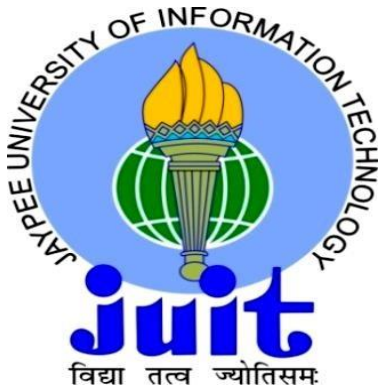
to



JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

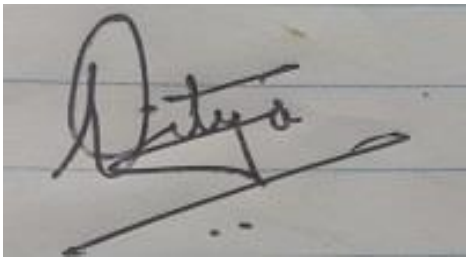
WAKNAGHAT SOLAN – 173234

HIMACHAL PRADESH INDIA MAY-2021

STUDENT'S DECLARATION

I hereby declare that the work presented in the Project report entitled "**DESIGNING A FLEXIBLE PAVEMENTOFDELHI MUMBAI GREENFIELD EXPRESSWAY (VADODARA BHARUCH EXPRESSWAY)**" submitted for partial fulfilment of the requirements for the degree of Bachelor of Technology in Civil Engineering at **Jaypee University of Information Technology, Waknaghat** is an authentic record of my work carried out under the supervision of **Dr. AMARDEEP**.

This work has not been submitted elsewhere for the reward of any other degree/diploma. We are fully responsible for the contents of our project report.



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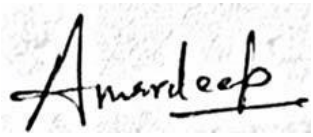
CERTIFICATE

This is to certify that the work which is being presented in the project report titled **"DESIGNING A FLEXIBLE PAVEMENT OF DELHI MUMBAI GREENFIELD (VADODARA BHARUCH HIGHWAY)"** in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering submitted to the Department of Civil Engineering, **Jaypee University of Information Technology, Waknaghat** is an authentic record of work carried outby **ADITYA NATH (171671)** during a period from October 2020 to December 2020 under the supervision of **DR AMARDEEP** Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat.

The above statement made is correct to the best of our knowledge.

Date: May



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ABSTRACT

The momentum research is devoted to contemplate the flexure asphalt of the

Vadodara Bharuch Highway which is an urgent piece of the Delhi Mumbai Greenfield Expressway. Currently it is involved in 5 stages and just one stage has been halfway finished at this point because of the pandemic circumstance and the normal to finish by 2022. The good exhibition of the asphalt will bring about higher investment funds as far as vehicle working expenses and travel time, which has been a direction on the generally speaking financial practicality of the undertaking.

This venture talks about the plan strategies that are generally being followed and looks at the overall benefits of adaptable asphalt. Presently, greater part of the Indian streets are adaptable asphalts, the ones having bituminous layers. Prior, there used to be shortage of concrete and, India went for adaptable asphalts with bituminous fixings. Presently, adaptable asphalt is liked over concrete solid streets as they enjoy an incredible benefit that these can be reinforced and improved in stages with the development of traffic. Likewise have examined about the level vertical arrangement and hallways with super rise in setting with the product utilized (OPEN ROAD).

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1.1 HISTORY OF EXPRESSWAYS

Some of the major expressway in INDIA

The most elevated class of Indian Road are the Expressway. A Expressway are being controlled-access roadways where passage and exit are constrained by the utilization of inclines that are consolidated into the plan of the freeway

Uttar Pradesh and Maharashtra are the solitary states which are putting resources into building an expressway through committed interstate partnerships

Most of the speculation needed for building expressways comes from the Focal Government

The Public Interstates Authority of India (NEAI) working under the Service of Street Transport and Parkways are accountable for the support and arranging of these freeways.

MUMBAI PUNE EXPRESSWAY

JAIPUR-KISHANGARH EXPRESSWAY

1.2

BRIEF INTRODUCTION ON FLEXIBLE PAVEMENT

To plan an adaptable asphalt past records should be analysed and subsurface investigations directed. The designing properties of the nearby stone and soil are set up, especially as for strength, solidness, toughness, weakness to dampness, and inclination to therapist and swell over the long haul. The applicable properties are resolved either by field test experimental evaluations dependent on the dirt kind or by lab estimations. The material is tried in its most vulnerable anticipated condition, normally at its

most noteworthy likely dampness content. Likely execution under traffic is then decided. Soils inadmissible for the last asphalt are distinguished for evacuation, reasonable substitution materials are reserved, the greatest slants of banks and cuttings are set up, the level of compaction to be accomplished during development is resolved, and waste necessities are indicated.

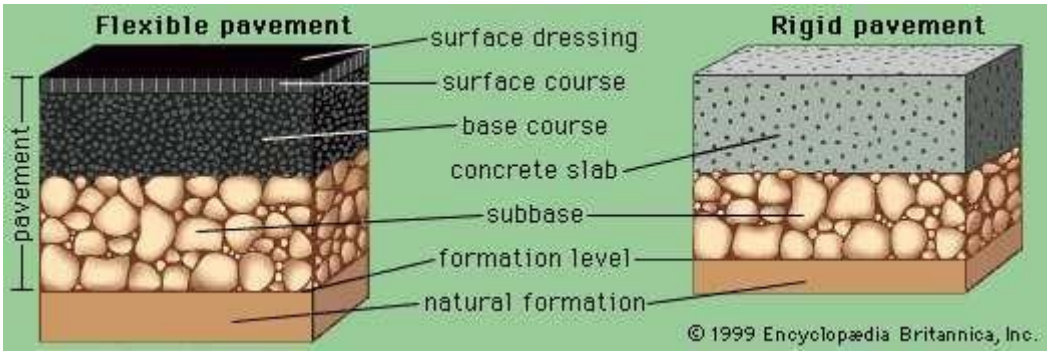
In a normal rustic asphalt (as demonstrated in the figure), the top layer of the asphalt is the wearing course. Made of compacted stone, black-top, or concrete, the wearing course

straightforwardly upholds the vehicle, gives a surface of adequate perfection and footing, and secures the base course and characteristic arrangement from inordinate measures of water. The base course gives the necessary enhancement to the strength, solidness, and sturdiness of the normal development. Its thickness goes from 4 inches (10 centimeters) for light traffic and a decent characteristic arrangement to in excess of 40 inches (100 centimeters) for hefty traffic and a helpless regular development. The subbase is a defensive layer and transitory working stage now and again positioned between the base course and the characteristic arrangement.

Asphalts are called either adaptable or unbending, as indicated by their relative flexural firmness. Versatile blacktops have base courses of broken stone pieces either compacted into place in the style of McAdam or adhered alongside bitumen to outline dark top. To care for helpfulness, the stones are for the most part under 1.5 killjoys in size and much of the time under 1 inch.At first, the bitumen should be warmed to temperatures of 300°–400° F (150°–200° C) to make it adequately liquid to blend in with the stone. At the street site, a clearing machine puts the hot blend in layers about double the thickness of the stone size. The layers are then altogether moved before the blend cools and hardens. To stay away from

the cost of warming, expanding use has been made of bitumen emulsions or reductions, in which the bitumen folio is either treated with an emulsifier or diminished with a lighter petrol

portion that dissipates in the wake of rolling. These medicines permit black-top to be blended and put at encompassing temperatures.



Cross sections of modern pavements (Left) Flexible asphalt-based pavement. (Right) Rigid Portlandcement concrete pavement.

The surface course of an adaptable asphalt shields the hidden base course from traffic and water while additionally giving satisfactory tire rubbing, creating insignificant commotion in metropolitan zones, and giving reasonable light reflectance for evening time driving. Such surfaces are given either by a bituminous film covered with stone (called a shower and-chip seal) or by a slight black-top layer. The shower and chip seal is utilized over McAdam-style base courses for light to direct traffic volumes or to restore existing black-top surfaces. It is moderately modest, successful, and impermeable and endures around 10 years. Its primary burden is its high clamour age. Upkeep typically includes further shower covering with a surface dressing of bitumen. Black-top surfacing is utilized with higher traffic volumes or in metropolitan regions. The surfacing black-top usually contains more modest and more wear-safe

stones than the base course and utilizes moderately more bitumen. It is better ready to oppose level powers and creates less clamour than a splash and chip seal.

Solid psychologists as it solidifies and this shrinkage is opposed by grinding from the hidden layer, making breaks show up in the solid. Breaking is normally constrained by adding steel support to upgrade the rigidity of the asphalt and guarantee that any breaking is fine and consistently conveyed. Cross over joints are now and then likewise utilized for this reason. Longitudinal joints are utilized at the edge of the development run when the entire carriageway can't be projected in one pass of the cleaning machine.

In places where the nearby characteristic material is inadequate for use as a base course, it tends to be "settled" with generally little amounts of lime, portland concrete, pozzolana, or bitumen. The strength and firmness of the blend are expanded by the surface reactivity of the added substance, which additionally decreases the material's porousness and henceforth its vulnerability to water. Uncommon machines appropriate the stabilizer into the upper 8 to 20 creeps of soil.In concluding whether to utilize an adaptable, inflexible, or balanced out asphalt, engineers consider lifetime cost, riding qualities, traffic disturbances because of upkeep, straightforwardness and cost of fix, and the impact of climatic conditions. Frequently there is little to pick among unbending and adaptable pavements. The properties of the base course material are normally controlled by lab tests, despite the fact that field tests are some of the time led to watching that the development interaction has accomplished the fashioner's plan. Planners regularly think about primary disappointment coming about because of a solitary over-burden and furthermore from harm gathering under the entry of numerous

standard burdens. Both of these sorts of disappointment are as a rule brought about by trucks.

1.3 DELHI MUMBAI GREENFIELD EXPRESSWAY

Envision having the option to go between the two greatest urban areas in India by the street at a

speed of 120 km/hour. Indeed, in a matter of a couple of years, this will be a reality once the Delhi-Mumbai Greenfield Interstate is built.

The Public Parkways Authority of India (NHAI) has continued to frame a Unique

Reason Vehicle (SPV) Organization to back the development and activity of the Delhi-Mumbai Greenfield Interstate self-exchanging way to deal with raise funds," an NHAI official said.

Traversing 1,275 km, it will be an 8-laned turnpike the which is projected to be finished by Walk 2024.

"The SPV has been enlisted by the name of DME Advancement Ltd and will be entirely claimed by NHAI. By skimming SPV explicit to a hall, NHAI is targeting broadening its asset base to build up a feasible and arrangement to extend it into 12paths later on. It will be India's longest Greenfield Freeway with a plan speed of 120 km/hour. The hallway will be totally access-controlled with a shut ringing.

An association of 75-way side comforts is moreover advanced toward either side of the turnpikes all at once time of kilometres. The errand has a capital cost of ₹82,514 crores which fuses a land acquiring cost of ₹20,928 crores.

Pondering the significance of this endeavour, the authority has decided to contribute the full worth and proceed with the new development. SPV will raise commitment on its bookkeeping report, while NHAI holds the operational control during improvement and O&M.

1.4 VADODARA BHARUCH EXPRESSWAY

Six lanning of Vadodara-Bharuch Section from km 108.700 to km 192.00 of NH-8 in the territory of Gujrat on BOT premise.

The arrangement of this bundle goes principally through plain developed and infertile zones. These locales are wealthy in modern creation. There are numerous mechanical domains and plants in these states both in broad daylight and private areas. Materials, synthetic, oil and petro-substance, paper and mash, precious stone, are situated in territory of Gujarat.

Bharuch by street which is approximately 79 km in distance and features the driving course from Vadodara to Bharuch. The drive from Vadodara to Bharuch by street will require near 1 hour 23 minutes

2.1 LITERATURE REVIEW

RESEARCH WORK ON OPEN ROAD SOFTWARE

Ms. K. A. Kamthe, Ms. D. M. Chavan;(April 2018):

Plan of street utilizing Open Roads programming In this paper they fundamentally centered around the planning of streets utilizing the product called Open Road Designer. This is the new innovation which is utilized for the mathematical plan of roadways. The writing concentrate from this paper is primarily about the correlation of planning of thruways with customary technique and Open Road programming strategy. In Open Road the mathematical plan should be possible in a basic way and this product gives precise outcomes and the planning of should be possible in both 2D and 3D view.

Neeraj and Mr.S.S Kazal;(July 2015): The paper manages the goal and variables to be considered for mathematical plan of roadway followed by the highlights, for example, interstate cross segment component, sight distance, flat arrangement and vertical arrangement on which the mathematical plan of parkways is based. This paper predominantly underscores on the significance of preparation and planning of the roadway. In this paper the creator clarified about the thought of things to come increment of the traffic and the street configuration speed is chosen in the previous stage really at that time it will be simple for planning the mathematical components of parkway later it will be difficult to plan and it prompts increment the expense of the development.

Karim Ismail, Tarek Sayed;(march 2012):

Hazard Optimal thruway plan: Methodology and contextual analyses. This paper clarifies about the danger of plan of expressway in sloping districts. In this the creator clarifying the

issues they are looking in the interstate of having short bends and confined option to proceed by this plan there is conceivable of impacts. For diminishing the recurrence of crashes, they accompanied the new mathematical plan of thruway by improving the option to proceed and in this paper, they clarified about the planner dealing with issues with the spending requirements for development of mathematical plan. For mathematical plan rules they followed the AASHTO for plan necessities.

Budiyono ;(2012) directed an examination about investigation harm of Road with the technique for PCI and elective arrangement (contextual analysis joint roads of Purwodadi - Solo Km 12+000 - Km 24+000). This examination said that as per arrangement and portrayal at visual discernment as base assess at treatment of harm of street of Purwodadi-Solo KM 12+000 - KM 24+000 harm type that happened is rascals of crocodile breaking, pushing, wretchedness, layering, fixing, and slippage breaking with predominant harm is harm of raveling comprehensively 216,943 m2 is surveying PCI acquired equivalent to 70,791 importance the including a state of (great), subsequently treatment of harm majored at street fragment having most reduced PCI from the start. There is at section 13, 5, 19, see the state of joint roads.

Wardhani Sartono (2008), directed an investigation about "evaluasi tingkat kerusakan Jalan dengan strategy asphalt condition record (PCI) untuk menunjang pengambilan keputusan" (studi kasus: jalan lingkar selatan, Yogyakarta). This investigation said that the pain types incorporated the crocodile breaking, block breaking, sorrow, longitudinal and cross over breaking, fixing, cleaned total, pushing, slippage breaking and enduring/graveling. The predominant ones were obstructed from breaking and gator breaking. The harms happened distinctly on certain pieces of the fragment. Hence, it was smarter to change the treatment for such harm for the trouble type. Treatment needs ought to be given to test unit 23 B (path 1) because of its littlest PCI esteem, which was 22, with (exceptionally poor) condition asphalt rating

Chasanah (2016), directed an investigation about "Evaluasi Tingkat Kerusakan Perkerasan Lentur Dengan Metode Pavement Condition Index (PCI) Untuk Menentukan Prioritas Penanganan Pada Jalan Solo-Yogyakarta Km 43.8 – 44.8 Km." This examination said that The

outcomes showed the sorts of harm happen the street are crocodile breaks, folding, gloom, potholes, and fixing by PCI technique. In light of the degree of harm, elective

Bonneson, (2018) et al. directed later exploration dependent on assessment of country even bend speed [12]. Regardless, there were totally different discoveries and approach than the ones utilized by Fitzpatrick, et al. [12,13]. Fitzpatrick et al. created flat bend speed forecast models for different conditions of vertical evaluation and utilized span as the lone variable model. Then again, Bonneson, et al's. 85th percentile bend models were intended for numerous digression approach speeds and incorporated a few factors. Bonneson, et al. (alongside some different analysts) inferred that this perspective (for example approach speed) essentially affects the decision of level bend speed. They likewise settled that drivers with bend calculation or speed will in general change or adjust their side grinding requests. Drivers will in general have lower requests on side grating on more steady higher speed bends (for example more prominent span) and can endure higher side grating on more keen bends. It was likewise closed, notwithstanding, that the impact of super-height on flat bend speed was not as significant as the effects of span and digression approach speed [12].

2.2 OBJECTIVES

Following are the goals of my investigation:

- The primary goals are to consider the plan of flexure asphalt by directing a street stock study and gather arrangement highlights.
- To lead a different study on a chose segment of arrangement.
- Analyse the Selected area by Open Road programming.
- Geometric highlights for the arrangement like the level arrangement and vertical arrangement.
- Creating halls and layouts.
- To give a cross-area utilizing the product and make plan and profiles.

METHODOLOGY

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3.1 DEFINING OBJECTIVES

A surveillance overview is done to analyze the overall attributes of the space for deciding the most possible course or courses for besides definite examinations. Surveillance overview of the streets is to be directed for the overall appraisal of the current circumstance and level of progress required.

Types of survey and investigation	New formation	Improvement/Strengthening works
Road inventory	-	Mandatory
Pavement Condition Survey	-	Mandatory

Pavement Evaluation Survey	-	Mandatory
Soil investigation	Mandatory	Mandatory
	Detailed investigation of landslides may be done compulsorily in Hill highways. Reference may be made to IRC SP:15	
Soil tests including Atterberg limits, wet sieve analysis, max dry density and OMC tests, California Bearing Ratio (CBR) test (soaked/ un-soaked or both) of the existing soil subgrade	Mandatory	Mandatory when widening or full depth reinstatement is proposed

a) Topographic reviews are directed ideally utilizing LIDAR and the information used to plot the LS and CS. The completed street level and the subgrade level ought to be fixed according to IRC:37-2018.

b) The underlying and practical state of the asphalt alongside the subtleties of the troubles ought to be introduced in an even structure with chainages. Photographs ought to be given.

© Pavement Condition Reviews allude to exercises performed to give a sign of the usefulness and states of being of the asphalts.

(D) Pavement assessment review directed for Underlying and Utilitarian Assessment of existing street.

The properties of soil at the subgrade level are required for road advancement works. The fundamental soil test for road improvement fuses a game plan of soil, atom size dispersal, sogginess content confirmation, unequivocal gravity, liquid cut-off and plastic limit tests.

b) The Subgrade soil is to be tried for its properties @ 1 preliminary pit/km and according to IRC:38-2018 if the length of the street is more than 10km. For more limited streets, at least 2 preliminary pit/km will be amazed and taken. All essential tests viz., Atterberg's cut-off points, Delegate thickness (IS:2720-Section 8), OMC, Doused CBR at max dry thickness and OMC, free Swell File alongside Wet strainer examination results will be directed and structure part of the DPR. Any place required, powerful CBR ought to be resolved according to IRC:37-2012 Proviso 5.1

3.2 ROAD INVENTORY

Street stock is led for gathering information by straightforwardly estimating the states of street.

Steps will be followed for street stock.

a) Categorize the street dependent on traffic.

b)

c) Photographs of the street will be taken for showing existing street conditions just as explicit tourist spots; during site examinations utilizing visual assessment or Dronebased/LIDAR based studies

c) Existing Carriageway (ECW) and Right of way (Row) of venture passages.

d) Visual asphalt condition study Recommendations according to IRC:81 Table: 3. Standards for Classification of Pavement Sections

Classification of road	Pavement condition
Good	No cracking, rutting less than 10mm
Fair	No cracking or cracking confined to single crack in the wheel track with rutting between 10mm and 20mm
Poor	Extensive cracking and/or rutting greater than 20 mm. Sections with cracking exceeding

Rules for Classification of Pavement Sections Classification of street Pavement condition Good No breaking, rutting under 10mm Fair No breaking or breaking kept to single break in the wheel track with rutting somewhere in the range of 10mm and 20mm Poor Extensive breaking and additionally rutting more noteworthy than 20 mm. Areas with breaking surpassing

e) Terrain grouping according to IRC:73 will be followed: Table: 4. Landscape Classification Terrain Classification Cross incline (%) Plain 0-10 Rolling 10-25 Mountainous 25-60 Steep Greater than 60 KIIFB Guidelines for Planning and Design for Roads and Highway Projects Page 9 of 59

f) Major/minor intersections going through and byroads with every single actual detail.

g) Existing Cross channel and waste subtleties, checking of land accessibility at bends for additional augmenting.

h) Existing holding structure subtleties.

I) Suggestions, area recognizable proof for transport narrows improvement/moving

j) Identification of areas for surpassing zone.

k) Off-road parking spots for trucks, cabs and auto carts.

l) Bridge stock did with the proposal of IRC: SP-52

m) Drainage and cross waste stock will be directed to gather current states of the construction

3.3 DATA COLLETION

VADODARA BHARUCH HIGHWAY

Vadodara and Bharuch are two metropolitan networks in Gujarat State, known for their quick strolls in industrialization. The metropolitan territories brag of organizations like cotton material, substance, equipment, ink, glass, furniture and customer stock with the entire belt between these two metropolitan regions wrapping a colossal range of present-day place focuses. Vadodara-Bharuch Interstate Restricted (VBTL) is an accomplished road asset. This 83.17 km stretch on NH 8 among Vadodara and Bharuch is fundamental for the Brilliant Quadrilateral and, thusly, outlines a critical association between the capital area of Delhi and the business capital of the country - Mumbai.

The degree of this INR 14.5 billion endeavour consolidated the extending of the current four-way road to a six-way apportioned road with top level comforts and a support establishment. An astonishing office with strangely arranged Cost Squares, VBTL stands statement of the planning significance of L&T. VBTL, a SPV with 100% shareholding by L&T IDPL, completed the advancement of this endeavour well before the booked zenith date and started its business exercises in June 2009.

The Organization will work and keep up the road asset for a concession season of 15 years

3.4 TRAFFIC STUDY

At Vadodara Bharuch roadway (km 156+000 of NH-8 close to Karjan Toll Plaza),

the portion of mechanized traffic is 99.9%. Consolidated portion of the various classifications of cargo vehicles is 46.7% of the complete traffic.

Of the absolute cargo vehicles, LGV represents 14.6%, 2/3 hub trucks establish 51.5%, MAVs contribute 33.3%,

while the leftover 0.6% is contributed by work vehicle/farm truck with trailer. Traveler vehicles represent 53.2% of the all out traffic of which the portion of vehicles/van/jeep is 71.1%, 2 wheelers comprise 21.1% and transports have a portion of 4.9%. Small transports and three-wheeler contribute a portion of 0.4% and 3.6% separately. Non-mechanized vehicles have a portion of 0.1%.

Average Daily Traffic (ADT)

The normal every day traffic was registered for Vadodara Bharuch Highway where the mid-block volume check study was finished. Day by day traffic volumes were found the middle value of to track down the Average Daily Traffic (ADT). Further, the ADT was likewise changed over to PCUs utilizing the transformation factors given in Table 4.4. Expressway and mode astute ADT esteems are given in Table underneath, and the pinnacle hour and pinnacle hour extent of all out day by day traffic (over normal 24-hour volume tally) are likewise introduced.

TABLE 4.4

Fast Vehicles		**Slow Vehicles**	
Vehicle Group	**PCU Factor**	**Vehicle Group**	**PCU Factor**
Car, Jeep, Van and Taxi	1.0	Bicycle	0.5

Auto Rickshaw / Tempo	1.0	Cycle Rickshaw	2.0
Two Wheelers	0.5	Animal Drawn	6.0
Mini Bus	1.5		
Standard Bus	3.0		
Light Goods Vehicle (LGV)	1.5		
2 – Axle Truck	3.0		
3 – Axle Truck	3.0		
Multi Axle Truck	4.5		
Agriculture Tractor	1.5		
Agriculture Tractor & Trailer	4.5		

Station No.	Chainage (km)	ADT		Peak Hour Flows		Peak Hour proportion in daily Vehicle Vol.	Peak Hour proportion in daily PCU Vol.
		Vehi.	PCUs	Vehi.	PCUs		
VADODARA	156+000	44,706	92,335	2,504	4,482	5.6%	4.9%
BHARUCH NH							

3.5 DESIGN CRITERIA

The asphalt planned has been completed for HIGHWAY having path design of new 6 path (2 x 3) partitioned carriageway and for interfacing streets and exchanges. The choice examinations are (I) Option 1: Conventional adaptable asphalt (ii) Option 2: Rigid asphalt. The itemized traffic reviews for the whole task street were led in March – May 2016 and refreshed in March 2019. In view of the traffic information and trade areas, Design time of the proposed HIGHWAY has been considered as 20 years for the Flexible Pavement and 30 years for inflexible asphalt. The plan traffic for the

adaptable asphalt of primary carriageway is around 175 msa. The adaptable asphalts of associating streets are intended for a most extreme traffic heap of 10 msa. For the venture single stage development is embraced keeping in see the intermittent upkeep of street. The adaptable asphalt is planned according to IRC 37, utilizing IITPAVE programming for pressure strain estimations. The plan of asphalt is finished by utilizing 90% dependability exhausts and rutting conditions. The Flexible asphalt piece has been worked out to be 50 mm BC, 120mm DBM, 250mm WMM and 300 mm GSB with practical overlay following long term. With arrangement of CTB, the asphalt creation has been worked out to be 50 mm BC, 60mm DBM, 150mm CTB and 250 mm CTSB The asphalt piece for associating street has been assessed to be 40mm BC, 50 mm DBM, 250mm WMM and 300mm GSB.

Leader Summary Es - 12 The Option 2 of inflexible asphalt has been intended to withstand the aggregate impact of the pivot load reiterations of various business vehicles applied over the plan life of 30 years. The asphalt sythesis for inflexible asphalt has been planned as 330mm. 150mm DLC, 200mm GSB with partition film. Hence, glancing as far as the speculations for beginning development of the asphalt for the new carriageway for the task street, Option 1 and Option 2 of adaptable asphalt with CTB and CTSB ends up being less expensive from introductory development cost. Adaptable asphalt with CTB and CTSB has likewise the least life cycle cost for the two segments. Subsequently, Initial development cost and Life Cycle Cost (LCC) is discovered to be least for the situation of CTB with BC and DBM for the two areas. Yet, for the instance of asphalt choice of CTB, CTSB with BC+DBM, there is an opportunity of proliferation of break from CTB to bituminous layer, consequently not suggested as best decision for a hefty traffic freeway. Break alleviation layer defers spread of break in bituminous layer yet when proliferation of break begins, whole segment harms and destroying of asphalt is required. It needs great quality control and restricted great project workers are accessible. Considering all angles traditional asphalt is most appropriate among all the adaptable asphalt piece.

3.6 DESIGN USING OPEN ROAD SOFTWARE

Since the procedure carrying out of designing of FLEXIBLE PAVEMENT of VADODARA BHARUCH HIGHWAY on practical basis is different than input the values on a particular software and providing the result accordingly since I have worked on the basic principles of the highway design i.e. Horizontal Alignment, Vertical Alignment, Creating Cross Sections, Super Elevation.

4.1 STUDY AREA LOCATION

The Delhi Mumbai Green Field Expressway connects from Delhi to Mumbai and its major parts of national highway connect with this expressway so the under this expressway I have worked on the VADODARA BHARUCH HIGHWAY, it is a 79km highway in the state of Gujrat the project is under NHDP (phase 5)

Fig Shows the route of Vadodara Bharuch Highway connecting NH8

The work is finished on the product with the assistance of various components this segment of guide was finished after the IRC37:2018

4.2 TROPHICAL SURVEY DATA

The geographical study was led in a width of 200m either side of the proposed arrangement to catch the ground levels and every one of the current actual highlights like rail, street, waterways, channels,

houses and so forth The primary control focuses for the geological review were fixed utilizing Global Positioning System (GPS).

Twin Pillars of size 15cmx15cmx45cm were fixed along the proposed ROW at a time frame and GPS perceptions were recorded. To conceal the holes between two back to back pair of GPS control Points, brief control focuses were fixed utilizing stakes/nails at a time frame to 200m.

The X and Y network directions of these Bench Marks columns were fixed by Total Station cross and the levels were fixed with the assistance of evening out. The heights (Z worth) of the multitude of GPS control columns were set up via doing differential evening out starting with one GTS Benchmark then onto the next GTS Benchmark. In view of the GPS and Traverse control focuses, the Easting (X), Northing (Y) and MSL Height (Z) directions of exceedingly significant artificial and regular geographical highlights along the arrangement inside a hallway of 200m on one or the other side of arrangement were recorded utilizing Total Stations having programmed information recording gadgets with fitting element codes.

So as indicated by plan of adaptable asphalt

Data sources:

TRAFFIC (COMMERCIAL VEHICLE PER DAY SUM OF BOTH DIRECTION) - 400 EXPECTED GROWTH RATE PER ANNUM OF TRAFFIC (%) – 7.5 EXPECTED DESIGN LIFE OF PAVEMENT (YEARS) - 15 SELECT NATURE OF ROAD – 2-LANE SINGLE CARRIAGE C B R OF SUBGRADE [%] – 4 VEHICLE DAMAGE FACTOR – 2.5

Yields:

Starting Traffic in Completion Year (cv/day) = 400 Designed Life in Years = 15 Expected Traffic Growth Rate in % = 7.5 CBR of Sub Grade in % = 4 Standard Axles in Msa = 7 Lane Distributor Factor = 0.75

Complete Thickness in MM = 660 Thickness of Wearing Course in MM = 40 BC Thickness of Binder Course in MM = 80 DBM Thickness of Granular Base in MM = 250 Thickness of Granular Sub Base in MM = 290.

5.1 HORIZONTAL ALIGNMENT

The operational attributes of a street are straightforwardly influenced by the level arrangement.

Roadways will be planned by their expected presented speed as gone against on a self-assertive plan speed.

The geography of the land navigated impacts the arrangement of streets and roads. Varieties in geography are by and large isolated into three arrangements as indicated by territory:

- Level - Highway sight distances, as administered by level and vertical limitations, are by and large long or can be made so without development trouble of significant cost.

- Rolling - Natural slants reliably transcend and fall underneath the street or road level, and periodic steep inclines offer some limitation to the typical flat and vertical arrangement.

- Mountainous - Longitudinal and cross over changes in the rise of the ground concerning the street or road are unexpected, with sidelining and side unearthing much of the time expected to get satisfactory flat and vertical arrangement.

These groupings relate to the overall character of a particular street passageway. Streets in valleys, passes, or hilly regions that have every one of the attributes of streets or roads crossing level or moving landscape ought to be delegated level or rolling.

The flat arrangement configuration begins with by making new record and giving the model name in which level arrangement is to be put. For this surface checked model string is named as Plan for instance and this string model is chosen for setting the arrangement. The level arrangement configuration is done according to IRC 37 : 2018.

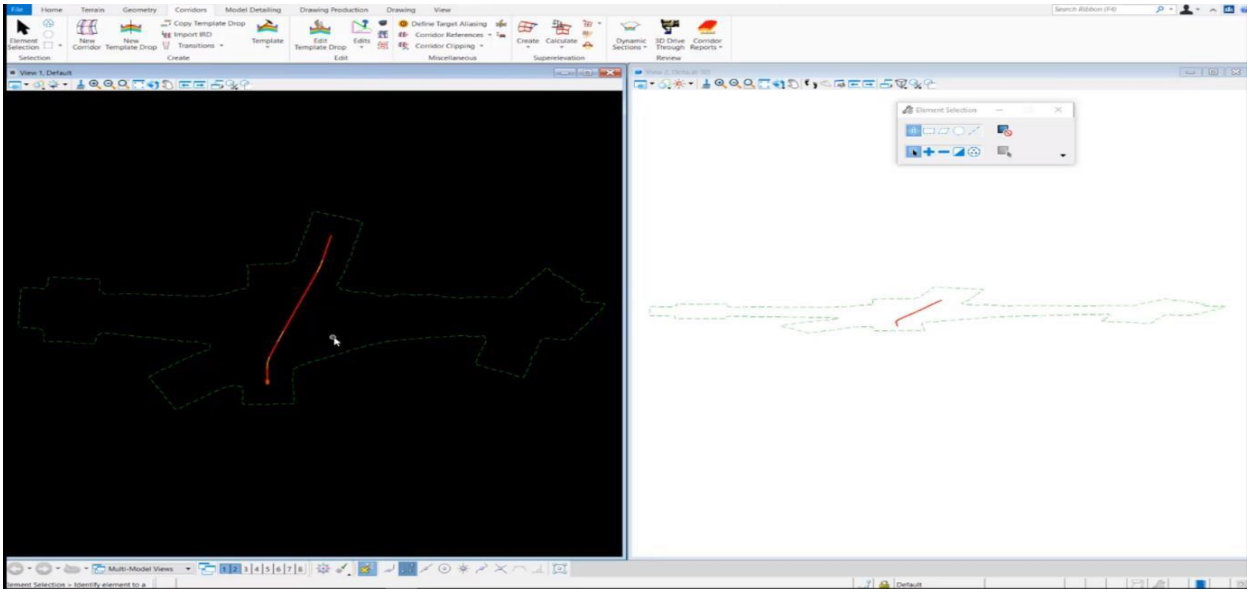


Fig Shows The development of corridors along the horizontal section of Road

In the Above Screenshot the work here was making corridors as for the making an even arrangement to the way the information gathered for the accompanying has been taken from the NHAI Guidelines

Design Speed

Terrain classification	Cross s
Plain	0
Rolling	1(
Mountainous	2!
Steep	>

Type	Plain	Rolling	Hilly	Steep
NS&SH	100-80	80-65	50-40	40-30
MDR	80-65	65-50	40-30	30-20
ODR	65-50	50-40	30-25	25-20
VR	50-40	40-35	25-20	25-20

Horizontal curve

$$P = \frac{Wv^2}{gR}$$

The presence of flat bend bestows divergent power which is a receptive power acting outward on a vehicle arranging it. Radiating power relies upon speed and span of the flat bend and is checked

partially by cross over rubbing between the tire and asphalt surface. On a bended street, this power will in general reason the vehicle to overwhelm or to slide outward from the focal point of street arch. For appropriate plan of the bend, a comprehension of the powers following up on a vehicle taking an even bend is important. Different powers following up on the vehicle are outlined in the figure14:1.

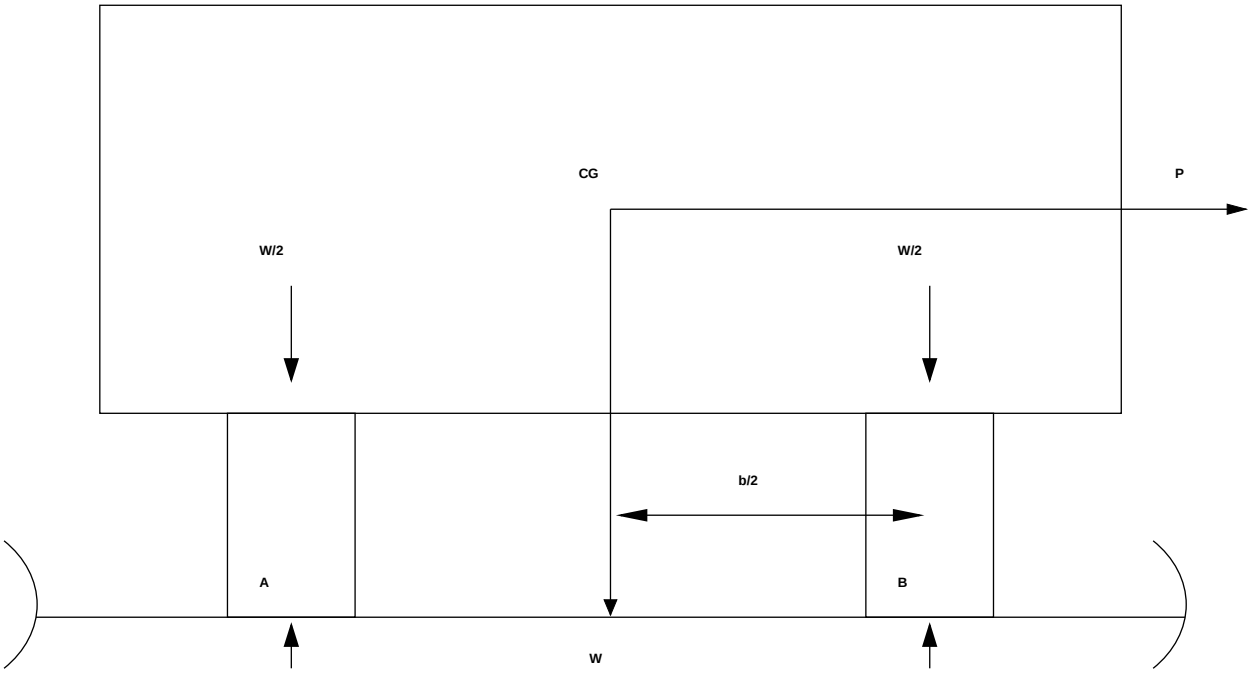


Fig shows Horizontal curve in a 2D plan

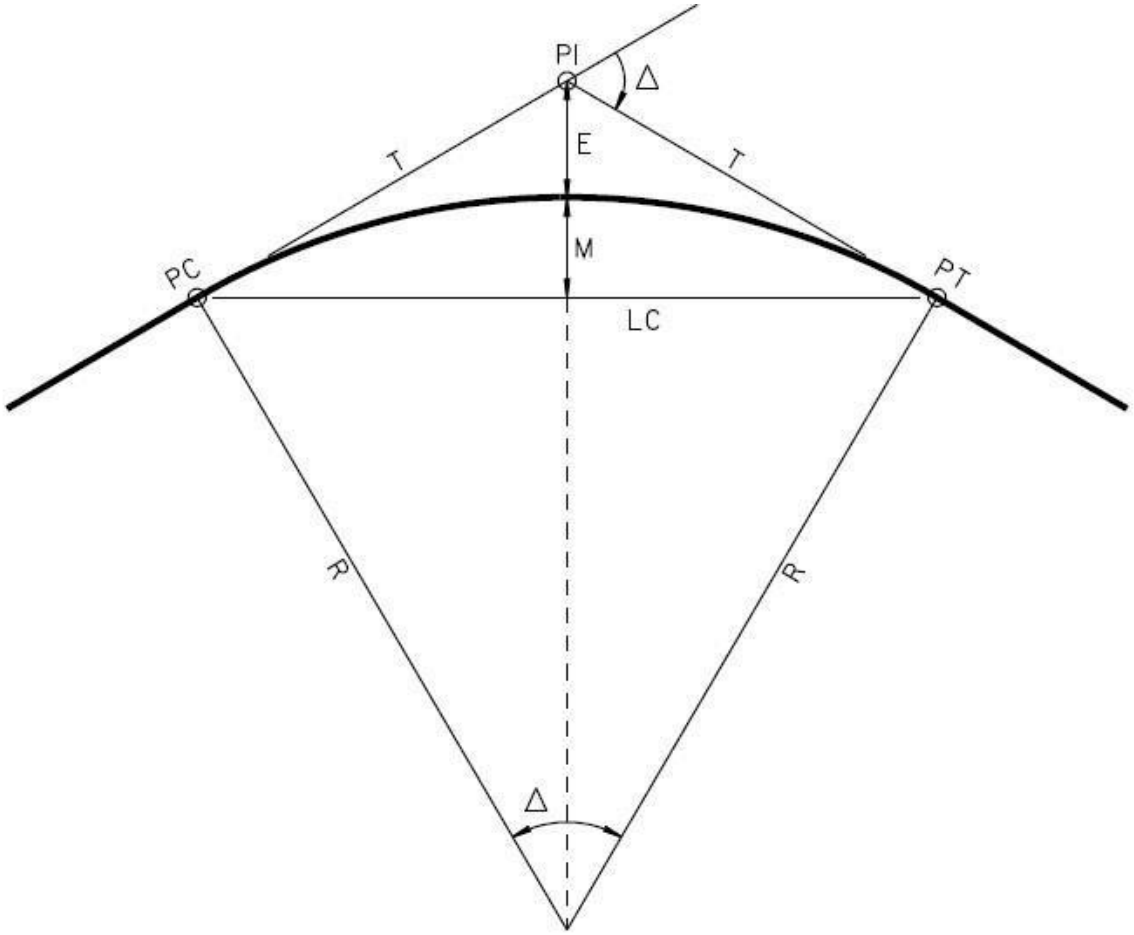


Fig showing vertical gradient for super elevation

R = Radius

PC = Point of Curvature (point at which the curve begins)

PT = Point of Tangent (point at which the curve ends)

PI = Point of Intersection (point at which the two tangents intersect)

T = Tangent Length (distance from PC to PI or PI to PT)

LC = Long Chord Length (straight line between PC and PT)

L = Curve Length (distance from PC to PT measured along the curve)

M = Middle Ordinate (distance from midpoint of LC to midpoint of the curve)

E = External Distance (distance from vertex to curve)

Δ= Deflection Angle (change in direction of two tangents)

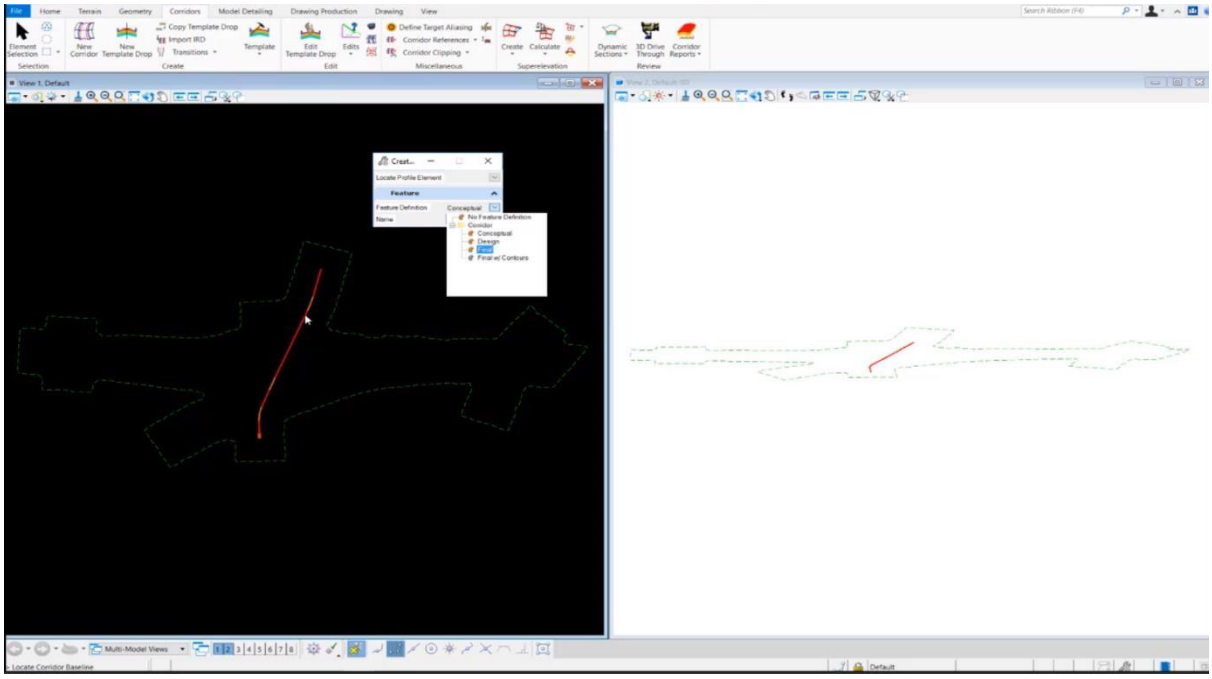


Fig Shows the difference in the corridor table alignment along Horizontal Axis done

The input values are given to determine the length old national highway of 4 lanes and comparison of new data evaluation with six lane road

The red bar Shows that the alignment according to the boundary walls created are not justified to the corridors created on a small base platform the horizontal curves also gives specific data for super elevation

Horizontal Alignment Design

(a)Super Elevation = Max. 9%

(b)Radius of Horizontal Curve

- Ruling Minimum Radius = 360m
- Absolute Minimum Radius = 230m

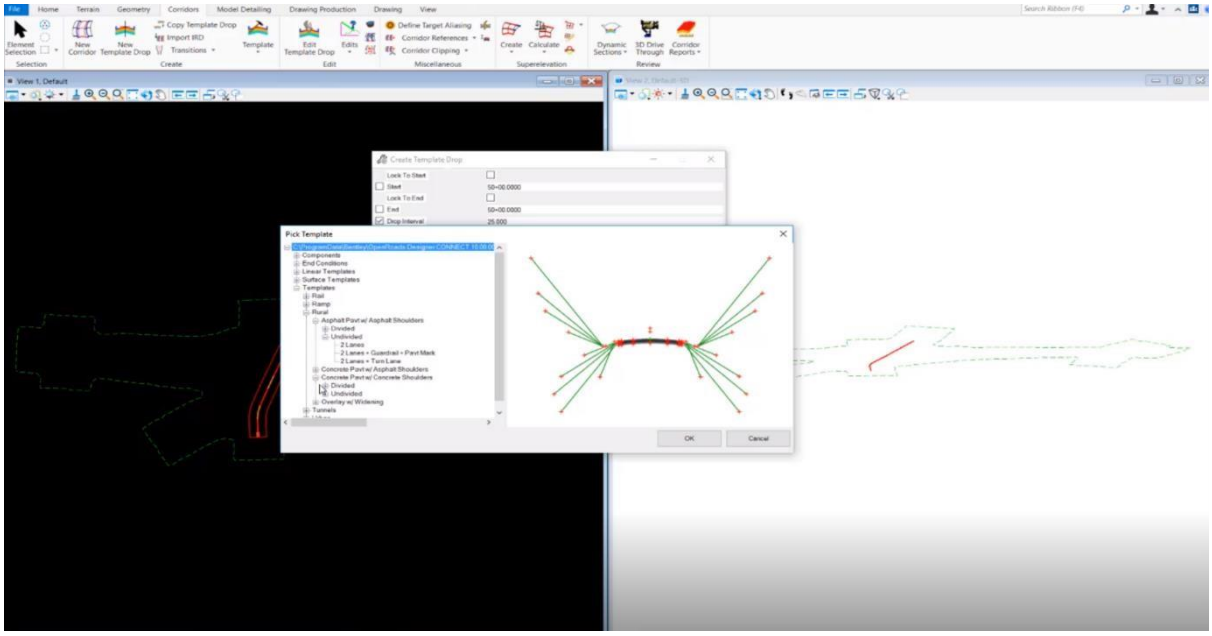


Fig Shows the elevation curve required to give the arc radius of the horizontal alignment

In the above screen shot the values of corridors taken by the IRC guidelines in creating the 2D creation of highway

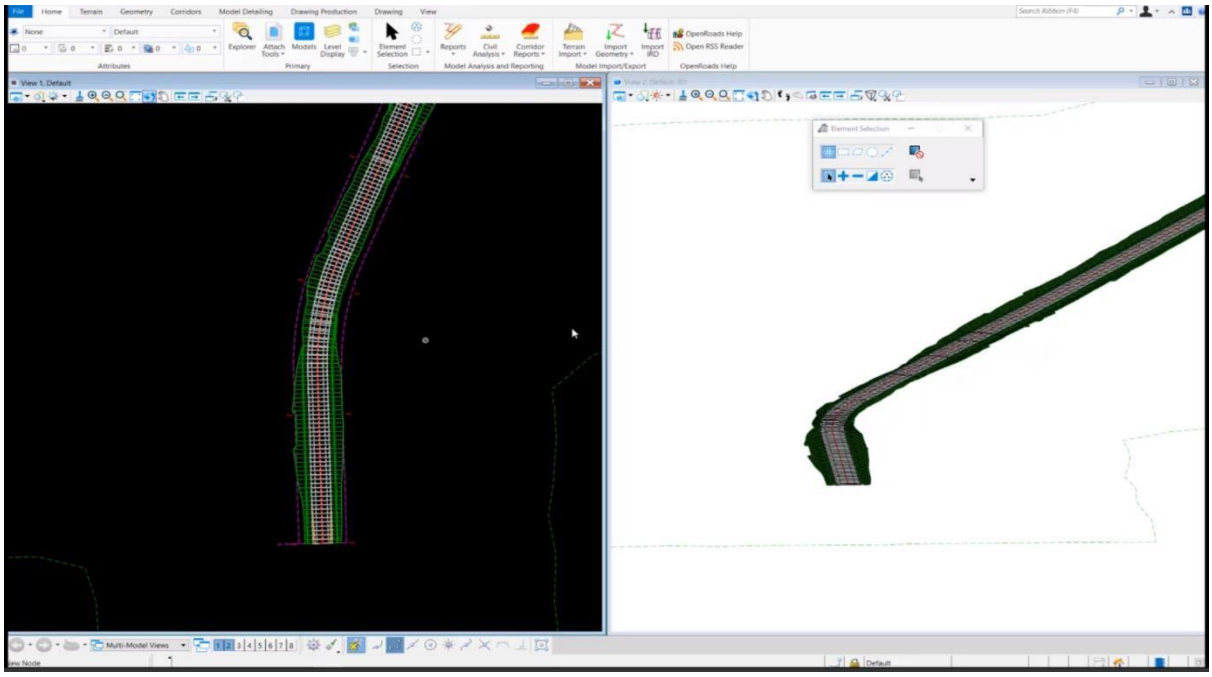


Fig shows 2D and 3D demonstration of Horizontal Alignment

So after analysing the input values the final horizontal alignment of a 3D view of the highway is above on the left side it shows the errors in the plotting of corridors rectifying the errors in creating new corridors for the horizontal alignment

5.2 VERTICAL ALIGNMENT

The upward arrangement of a street comprises of gradients (straight lines in an upward plane) and vertical bends. The upward arrangement is typically drawn as a profile, which is a diagram with height as upward pivot and the even distance along the middle line of the street as the level hub. Similarly, as a round bend is utilized to associate even straight stretches of street, vertical bends interface two inclinations. At the point when these two bends meet, they structure either curved or sunken. The previous is known as a culmination bend, while the last is known as a valley bend. This part covers a conversation on inclination and culmination bends.

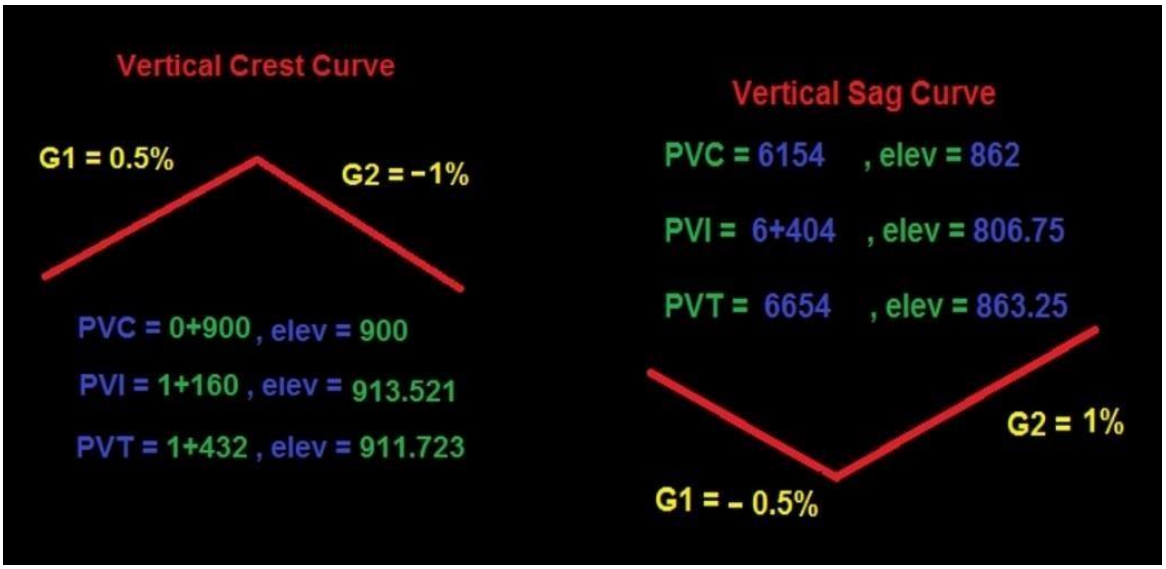


Fig shows the difference in the level of gradient along vertical axis

Gradient

Inclination is the pace of rise or fall along the length of the street as for the even. While adjusting a parkway, the angle is chosen for planning the upward bend. Prior to concluding the slopes, the development cost, vehicular activity cost and the functional issues in the site additionally must be thought of. Typically steep inclinations are kept away from beyond what many would consider possible in view of the trouble to climb and expansion in the development cost. More about slopes are examined underneath.

Effect of gradient

The impact of long steep slope on the vehicular speed is impressive. This is especially significant in streets where the extent of weighty vehicles is critical. Because of prohibitive sight distance at uphill angles the speed of traffic is frequently constrained by these substantial vehicles. Subsequently, not just the working expenses of the vehicles are expanded, yet additionally limit of the streets should be decreased. Further, because of high differential speed among hefty and light vehicles, and among uphill and downhill slopes, mishaps have large amounts of angles.

Effect of gradient

The impact of long steep angle on the vehicular speed is extensive. This is especially significant in streets where the extent of hefty vehicles is critical. Because of prohibitive sight distance at uphill slopes the speed of traffic is regularly constrained by these hefty vehicles. Therefore, not just the working expenses of the vehicles are expanded, yet in addition limit of the streets should be decreased. Further, because of high differential speed among substantial and light vehicles, and among uphill and downhill slopes, mishaps have large amounts of angles.

Representation of gradient

The positive slope or the rising angle is signified as +n and the negative inclination as −n. The deviation point N is: when two evaluations meet, the point which estimates the shift in course and is given by the arithmetical contrast between the two evaluations (n1 −o(−n02)) = n1 + n2 = α1 + α2. Model: 1 of every 30 = 3.33% ≈ 2o is a precarious angle, while 1 out of 50 = 2% ≈ 1 10 is a compliment inclination. The inclination portrayal is delineated in the figure 17:1.

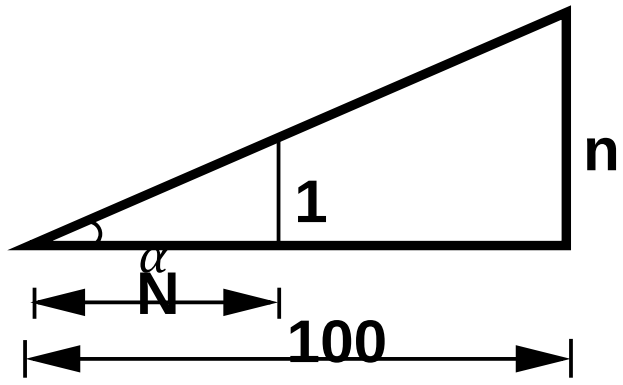


Fig shows the elevation of gradient value

Terrain	Ruling	Limitings	Exceptional
Plain/Rolling	3.3	5.0	6.7

Hilly	5.0	6.0	7.0
Steep	6.0	7.0	8.0

Design Consideration

In deciding the sort and length of the upward bend, the plan contemplations are solace and security of the driver, and the presence of the profile arrangement. Among these, sight distance necessities for the wellbeing is generally significant on highest point bends. The halting sight distance or supreme least sight distance ought to be given on these bends and where surpassing isn't precluded, overwhelming sight distance or moderate sight distance ought to be given beyond what many would consider possible. At the point when a quick vehicle goes along a culmination bend, there is less uneasiness to the travelers. This is on the grounds that the radial power will be acting upwards while the vehicle arranges a culmination bend which is against the gravity and consequently a piece of the tire pressure is alleviated. Additionally if the bend is given satisfactory sight distance, the length would be adequate to facilitate the stun because of progress in angle. Round culmination bends are indistinguishable since the sweep stays same all through and henceforth the sight distance. Starting here of view, progress bends are not alluring since it has shifting span thus the sight distance will likewise fluctuate. The deviation point gave on culmination bends to roadways are huge, thus the a straightforward parabola is practically consistent to a roundabout curve, between a similar digression focuses. Explanatory bends is simple for calculation and furthermore it had been discovered that it gives great riding solace to the drivers. It is additionally simple for field execution. Because of every one of these reasons, a straightforward allegorical bend is liked as culmination bend.

Various kinds of slopes and IRC suggestions for their most extreme and least cutoff were talked about. At points of blend of level bend and inclination, grade pay must be given. Because of changes in level in the upward arrangement of the roadway, vertical bends become fundamental. Culmination bend, which is a sort of vertical bend was examined in detail in the part. One of the use of highest point bends that can be seen as a rule in the metropolitan zones are the place where flyovers come.

Vertical Alignment Design

(a) Gradient for Plain Terrain

Ruling Gradient = 3.3%
Limiting Gradient = 5%

(b) Minimum Gradient for drains = 0.2% to 0.5%
(c) Minimum Length of Vertical Curve for design speed of 100 kmph = 60m

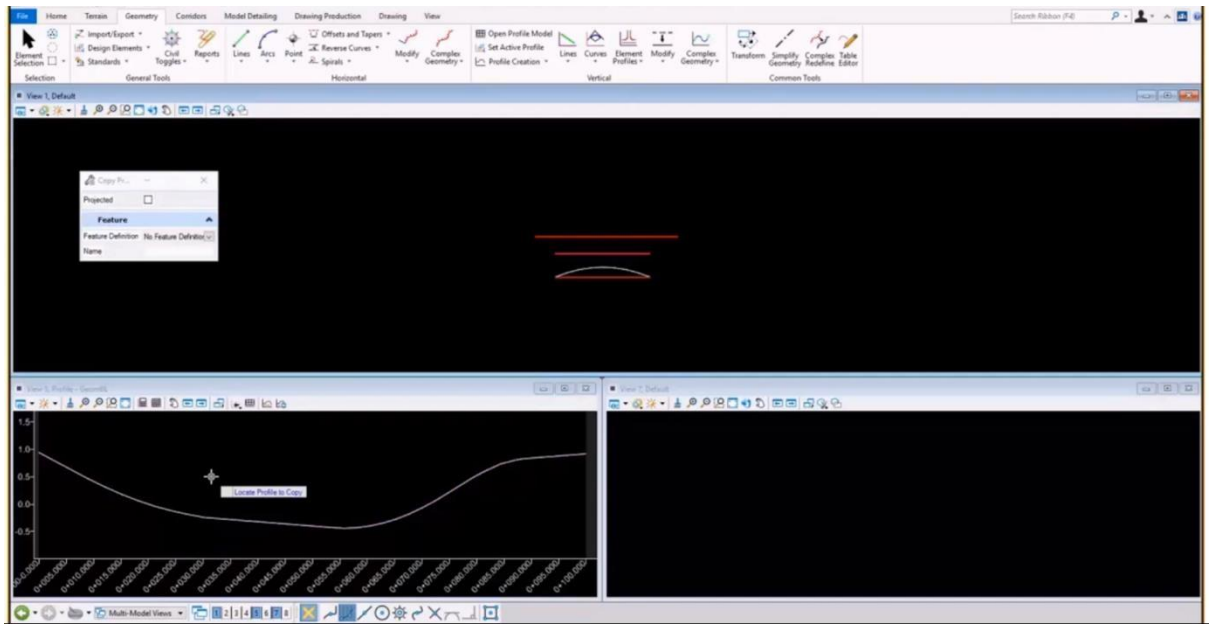


Fig shows the process of creating a vertical profile of the gradient provided

- Before chipping away at a Vertical plan, it is ideal to assign the Active Terrain Model. The Set Active Terrain Model instrument can be found on the Tasks menu in either General Geometry or in the Terrain Model menus. To set the landscape to dynamic when utilizing the Context Sensitive menu, first select the Terrain with the Element Selection apparatus, at that point drift over the Terrain to call the Context Sensitive menu. Select the Set As Active Terrain Model fasten and afterward follow the Heads-Up brief. Setting the Terrain Model as Active empowers the current ground to naturally show up in the Profile Model.

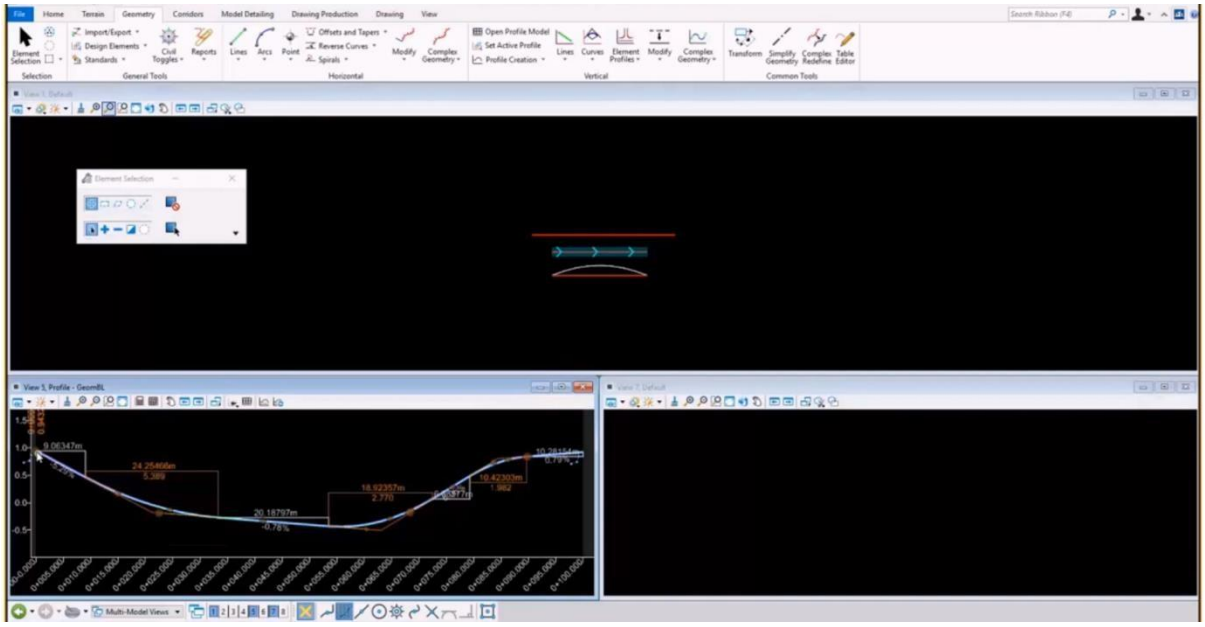


Fig Shows the Interval Between each section of the vertical alignment

- To start a Vertical plan, select the Open Profile Model catch from the Vertical Geometry Tasks menu. The Open Profile Model catch can likewise be found on the Context Sensitive menu. In any case, follow the Heads-Up brief to Select and afterward Click in an Open View.

- When utilizing the Profile Complex By VPI order, the Vertical Curve Length can be changed on the Heads-Up brief before setting the following VPI. In the event that the bend doesn't show while setting the following VPI, the current bend is likely covering the past bend.

- Use the instruments found on the Vertical Geometry Tasks menu to make a Profile. The Vertical Geometry Tasks work basically the same as the Horizontal Geometry Tasks. It is prescribed to give a Save Settings and a Save before beginning a profile just as when you are done planning.

- When completed the process of planning, set the ideal profile to be the Active Profile. This progression is essential since more than one profile may exist in a solitary profile model. Consequently it is obligatory to assign which is the expected profile for the Horizontal Geometry. The Set (As) Active Profile device is discovered either on the Vertical Geometry Tasks menu or on the Context Sensitive menu. Subsequently, Save the DGN if not set to consequently do as such.

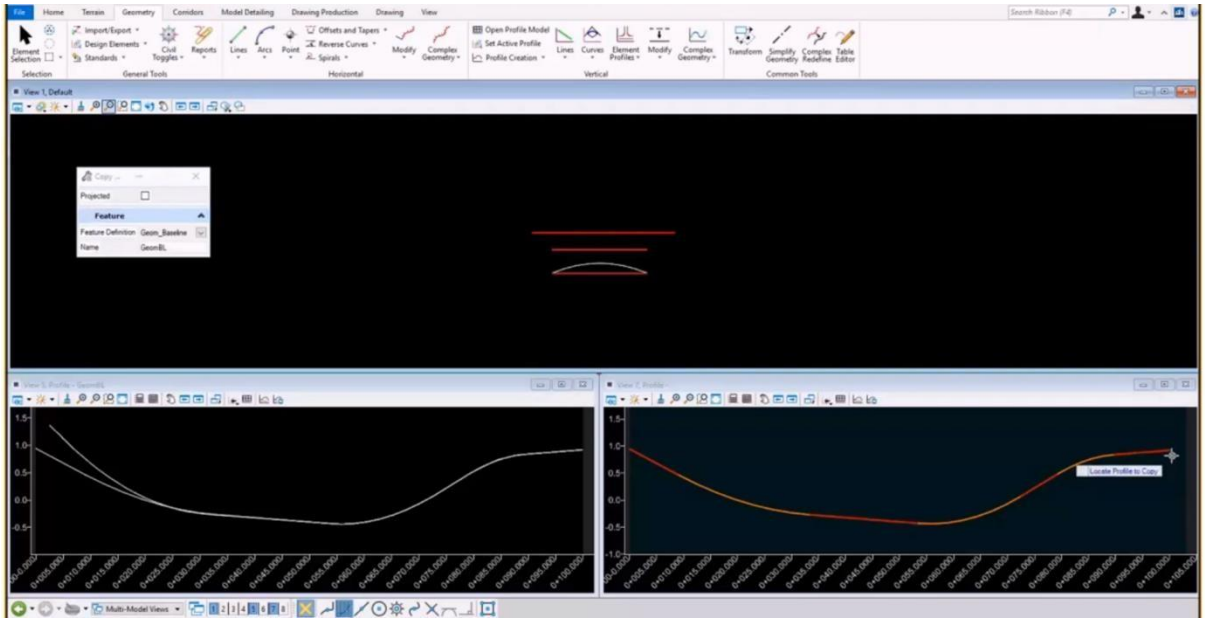


Fig Shows 2D depiction of the vertical alignment created

Profiles should look equivalent to the Horizontal highlights that they address. On the off chance that your profile doesn't appear as though it's Horizontal partner, select the profile with the Element Selection apparatus. Then, open Element Information and extend the General class. Change the Template alternative to coordinate with the Feature Definition relegated to the Horizontal part of the arrangement.

5.3 CREATING CROSS SECTION

1. Open the file Corridor_Rt97_Extension.dgn from the Module 7 (Cross Sections) folder.

2. Select the Open Roads Modelling workflow from the pick list in the upper left corner

. 3. Create cross section named boundaries along Rt97 Extension alignment. The named boundaries define the location, width and height of the cross sections.

a. Click in View 1 (2D view) to set it as the active model.
b. Select Drawing Production > Named Boundaries > Named Boundary > Place Named Boundary. c. Select Civil Cross Section mode.
d. Set the Drawing Seed to A1_XS. The drawing seed sets the seed files and default values for the values on the dialog except the start and stop locations.
e. Graphically select the centreline geometry for Route97 Extension in the 2D view.
f. Change the following parameters from their defaults. Interval = 100 Bottom Clearance = 2.0 (The extra bottom clearance is to allow the drainage pipes to appear on the cross sections) Keep the default values set by the Drawing Seed for the other parameters.
g. Disable the Include Control Points option. When enabled, cross sections are added at horizontal control points such as PC and PT.

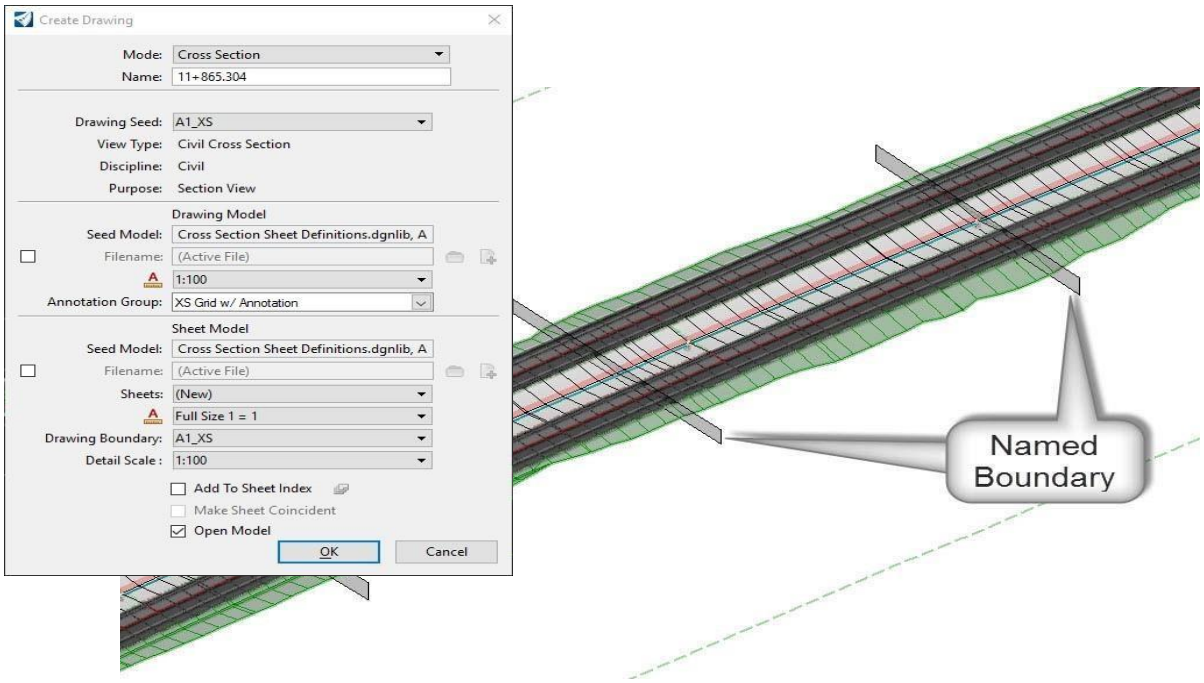
h. Enable the Create Drawing option. When enabled, the process to create the cross section sheets is automatically started after the named boundaries are created. When disabled, the named boundaries are created but the sheets are not created

i. Enable the Show Dialog option.

When enabled, a dialog with additional parameters set by the Drawing Seed is shown.

j. Define the start and stop locations.

- ✓ *Start Location* = Click to lock to the beginning of the alignment



- ✓ *Stop Location* = 21+500

Fig shows the cross section to be created by sample imaging of the NH

Data point in the 2d view to accept the starting station of the named boundaries.

NOTE: If the Start Location was not defined and locked in the dialog it is selected graphically at this step.

k. Data point a second time in the 2d view to accept and create the named boundaries.

NOTE: If the Stop Location was not defined and locked in the dialog it is selected graphically at this step.

Creating the named boundaries will take a short time. Once complete the Create Drawing dialog appears and the named boundaries are visible in the 3D view.

2. Click OK on the *Create Drawing* dialog to create the cross-section sheets.

The Create Drawing dialog provides an opportunity to adjustments the parameters being used. However, in a typical workflow these parameters do not need to be changed because the default values are all set by the Drawing Seed selected when creating the named boundaries in the previous steps

Creating the cross sections sheets will take a minute or so for this 9.8 kilometre or 6.1 mile long stretch of roadway. A progress bar is provided at the bottom of the screen. Once complete, a cross section sheet appears.

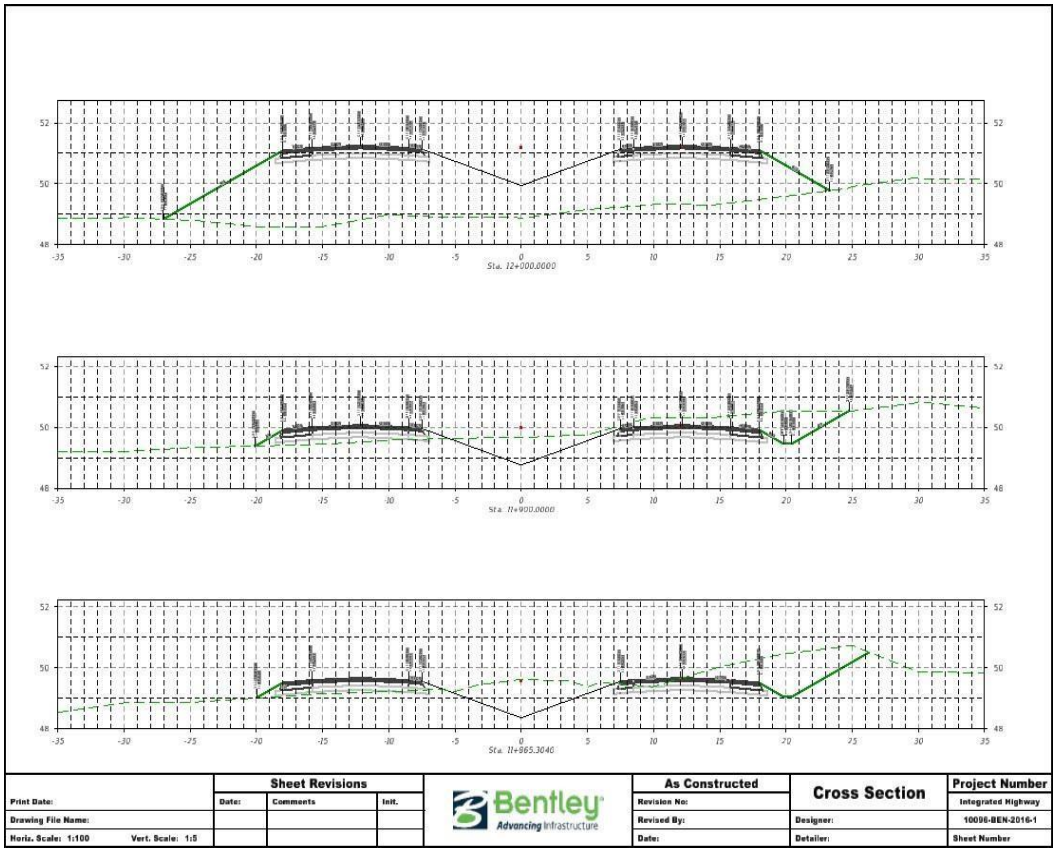
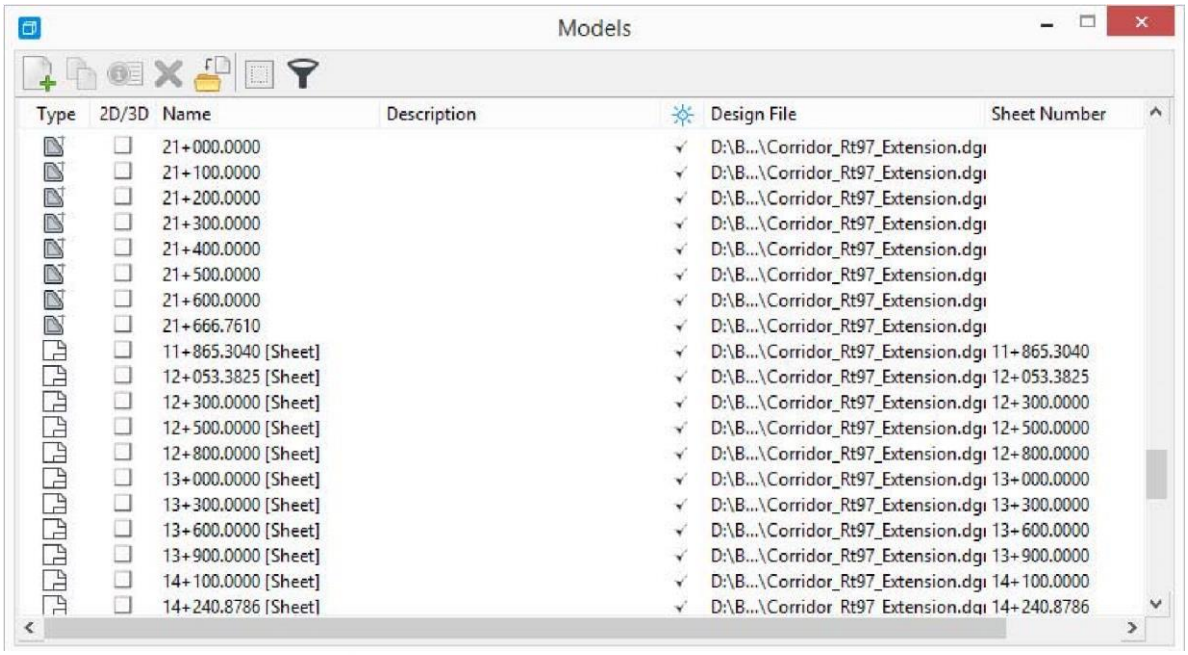
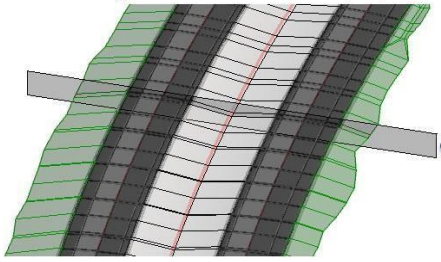


Fig Shows Different CBR levels to be used while creating 2 lane cross section

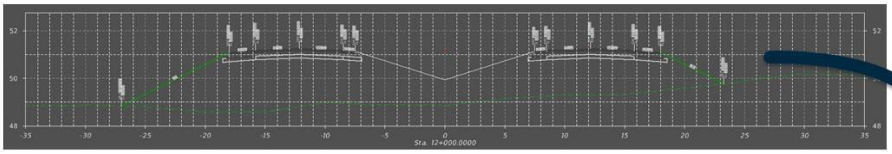
Each cross section is a live reference to a drawing model which in turn is a live reference to the 3D design model. The drawing model is where annotations are added to the cross sections. All graphics that appear in the 3D model are automatically shown on the cross section. In addition, since these are live references, any changes to the 3D model are automatically updated on the cross sections.



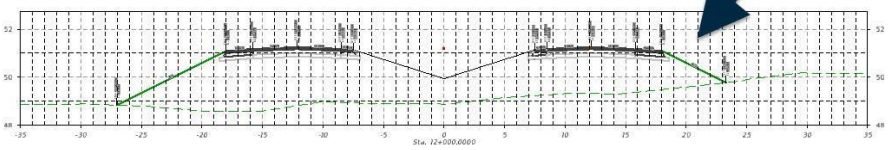
3D Design Model - Named Boundary Layouts



Drawing Model - Reference of 3D Design Model clipped to Named Boundary



Sheet Model - Reference of Drawing Model Laid Out on Sheets



Fid shows different type of cross section models to be used

5. Review Cross Section sheets.

   a. Select *Home > Primary* >Models.

= Drawing Model

= Sheet Model

b. Double click on one of the sheet models.

TIP - Since the cross-section sheets were added to the sheet index when they were created, the sheets can also be navigated using the Sheet Index tab in the Explorer.

6. Set the 17+400.000 [Sheet] view active and observe the drainage network pipes are included on the cross sections.

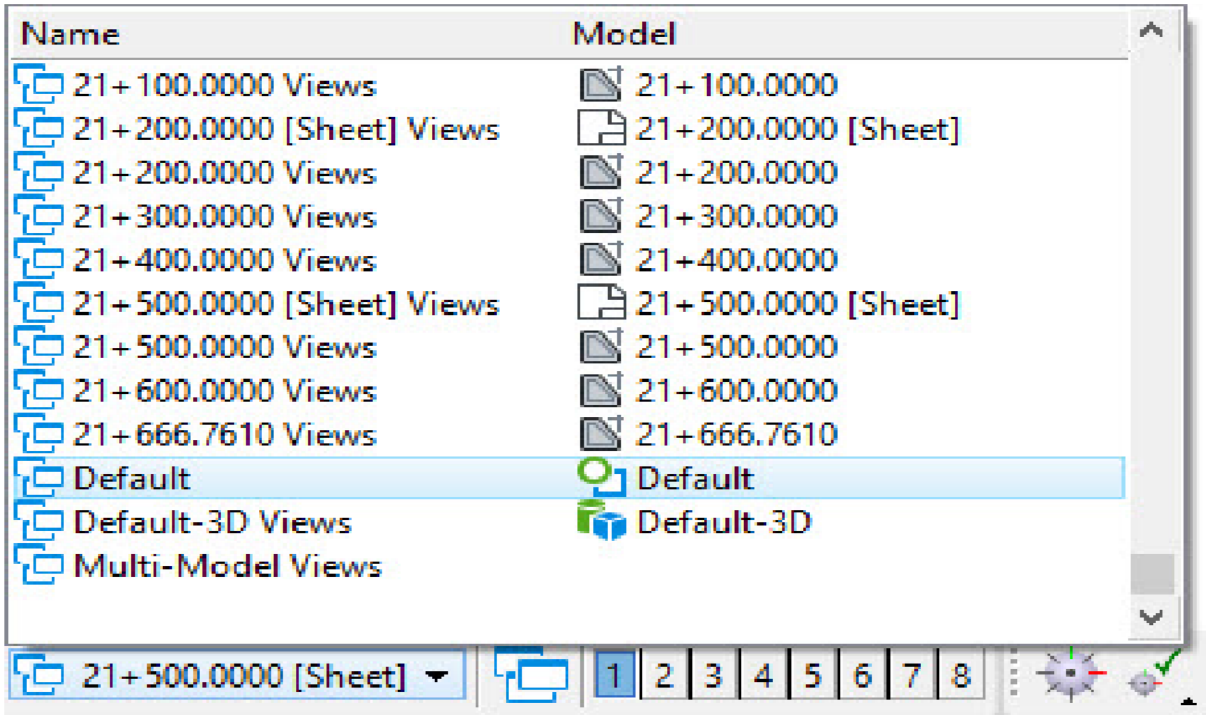


Fig shows different profiles to create curves

Return to design model.

You can select the design model from the Models dialog, however only the selected Default or Default-3D model will be shown, not the multiple model view of both the 2D and 3D models. There is a better way by selecting a view group.

a. Select Multi-Model Views from the *View Group* list in the lower left corner of the screen.

OUTPUT

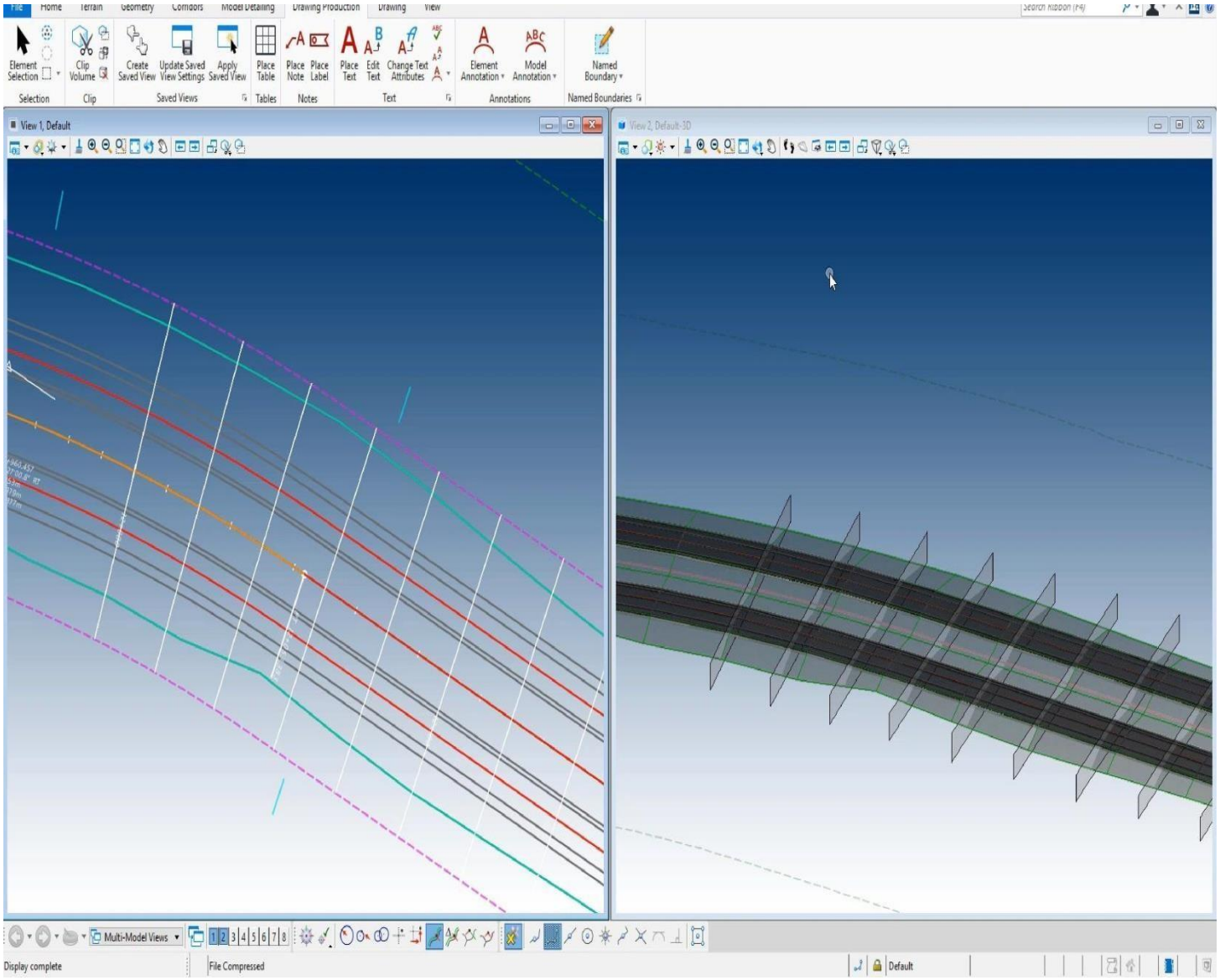


Fig Shows

SUPER ELEVATION OF A TWO-LANE CROSS SECTION

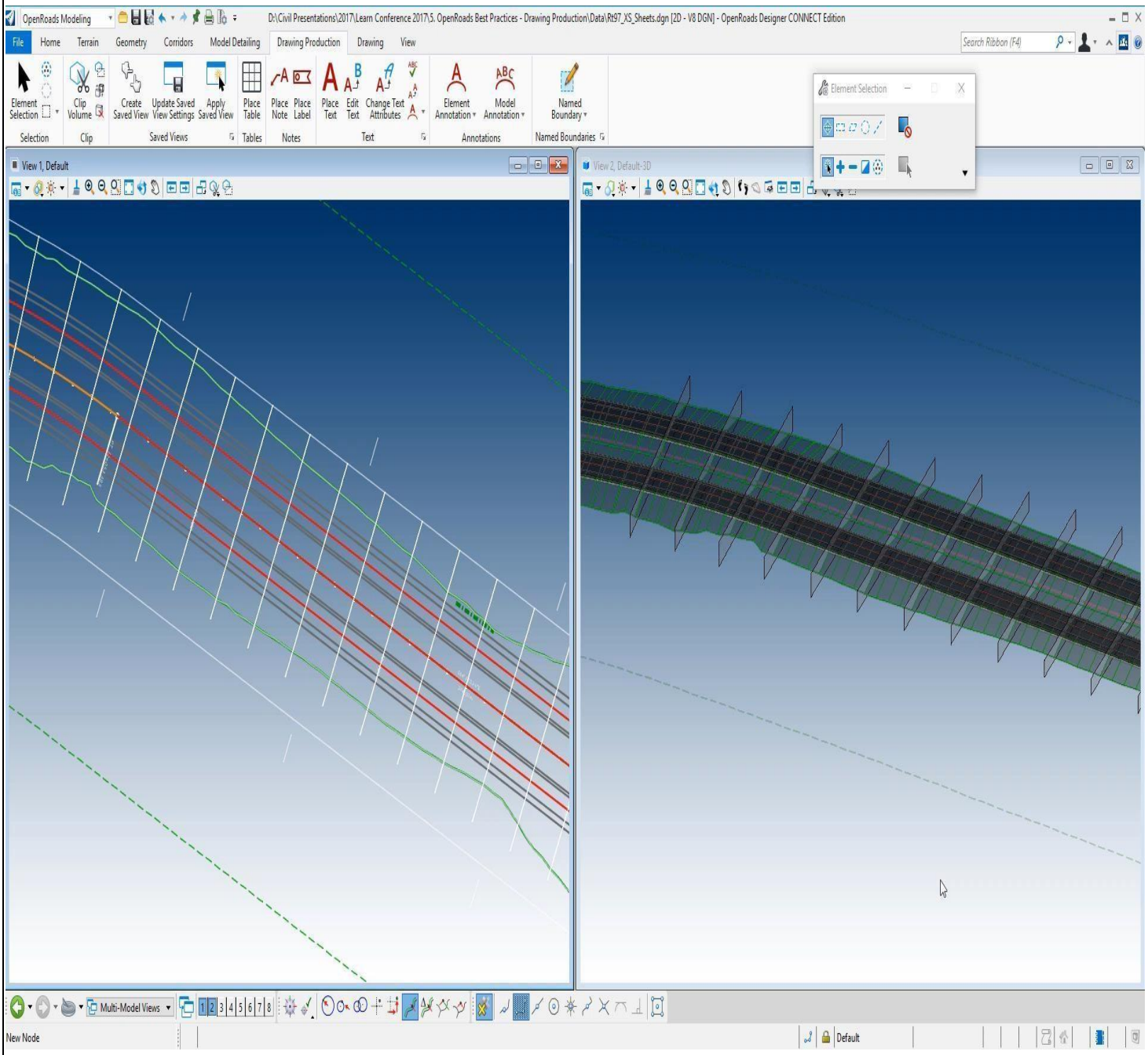


Fig Shows

SUPER ELEVATION WITH CORRIDORS TWO LANE CROSS SECTION

5.4 SUPER ELEVATION

Set Superelevation Flags in Template

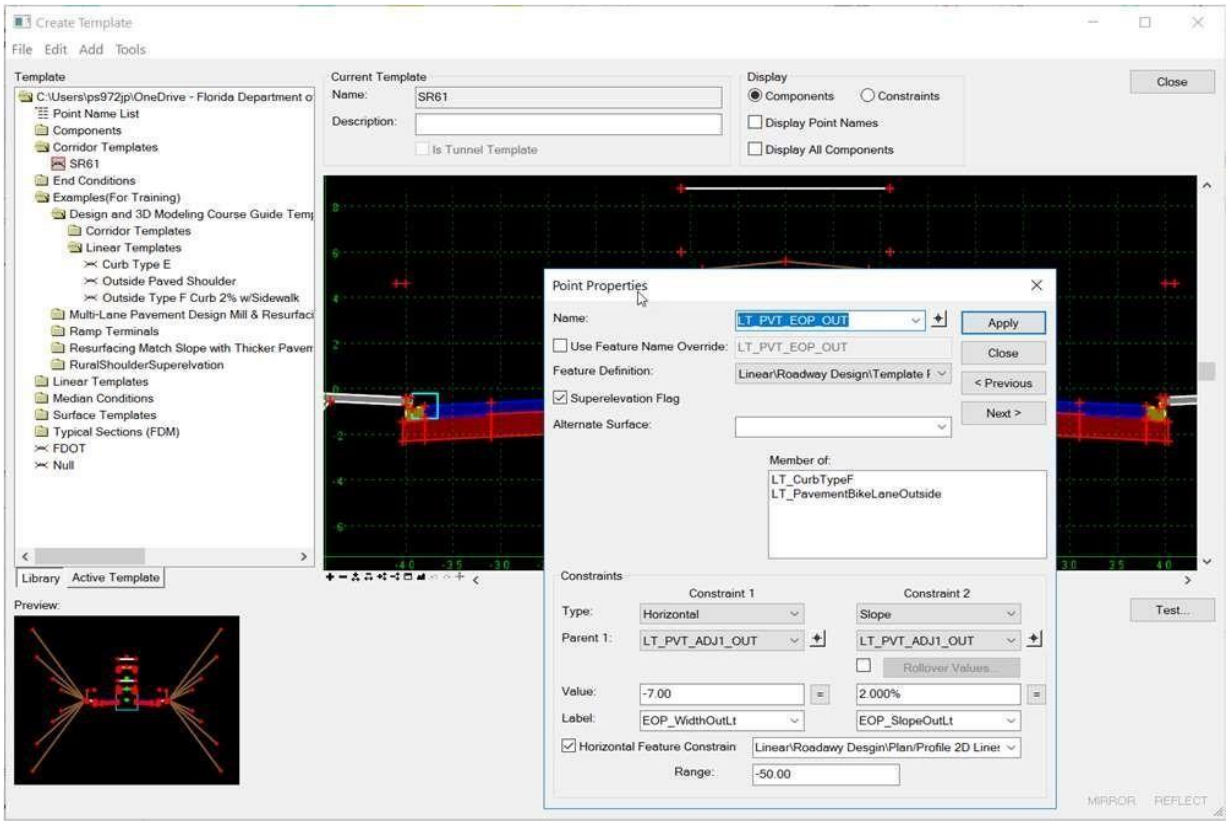


Fig shows creating of template of the Superelevation Curves and prfile

You can optionally open the superelevation editor when complete. The editor is the same as it was in SS4, so I'm not going to go over that part. But you can create a superelevation report to export the superelevation to a .csv file, then import it through the editor. This allows you to make corrections or calculations in Excel if you want to double check that the numbers meet the standards.

Select the Superelevation section and then the corridor, Verify the points in the dialog, and it should process when you click OK.

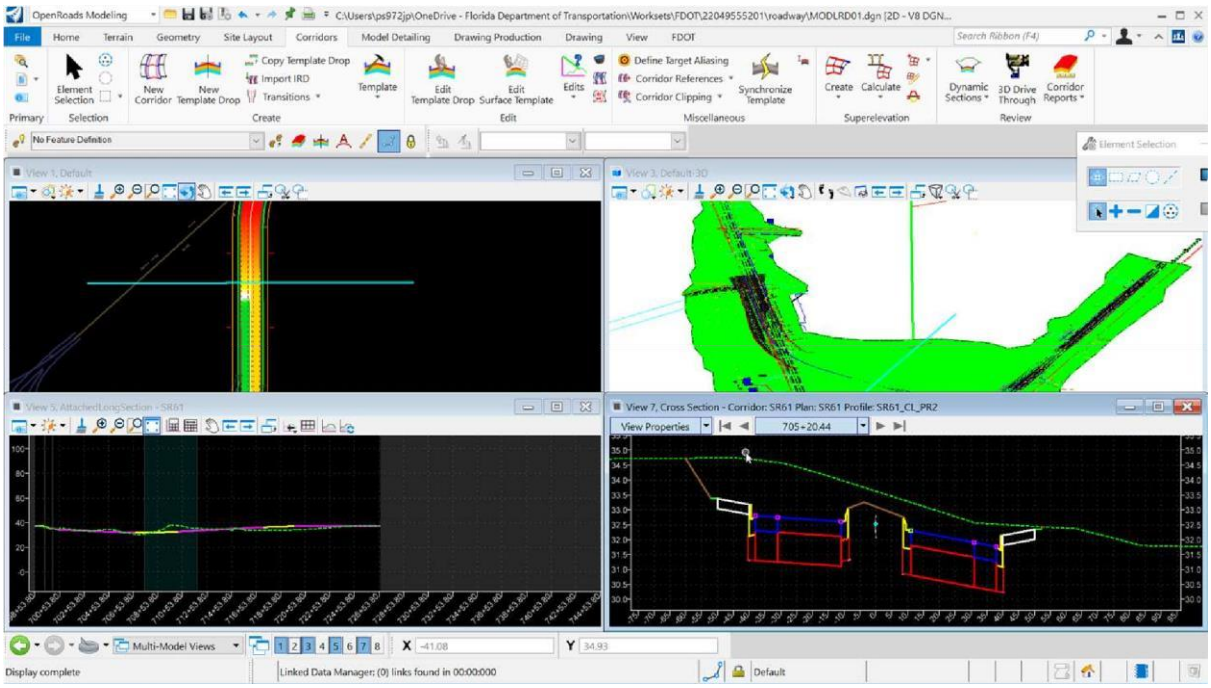
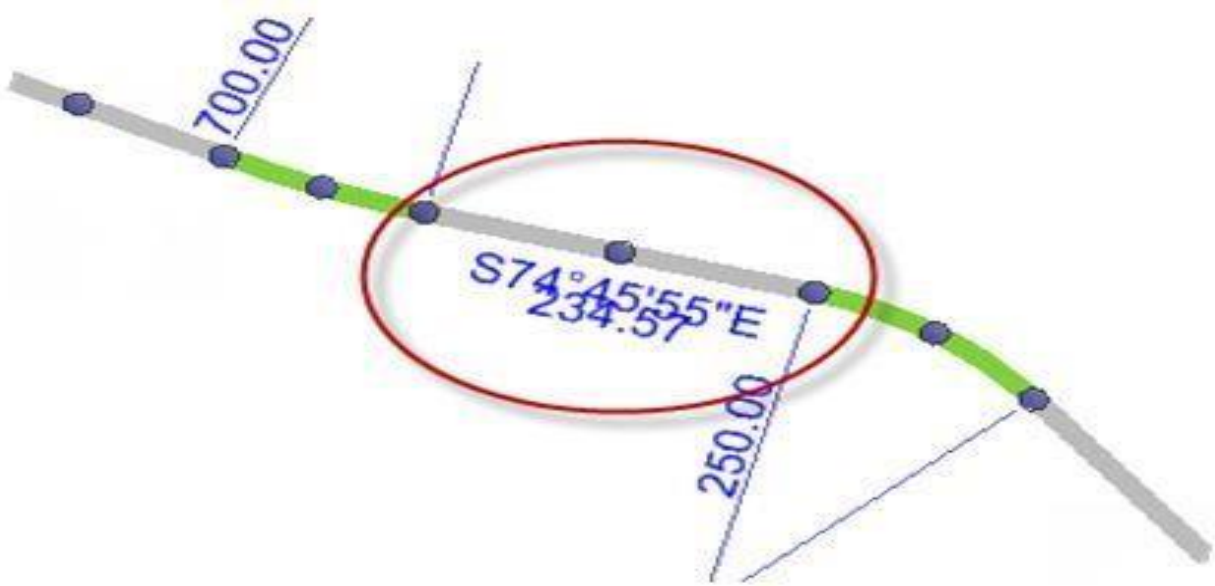


Fig shows VERTICAL SUPER ELEVATION OF (NH-8) in 2D and 3D

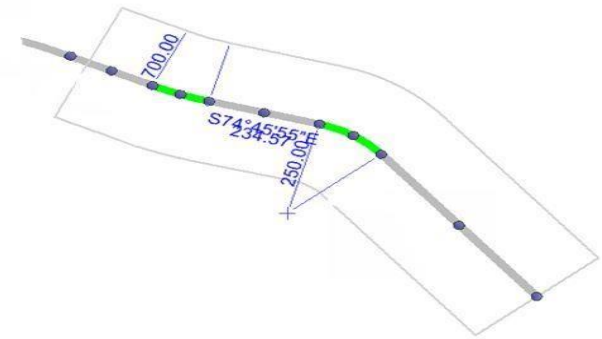
Determination of Sections

The overall guideline is to make another part on the off chance that you are utilizing rules-based computations and the through path setup, speed, or turn/pivot strategy changes. In an essential guidelines-based venture where the through path asphalt arrangement is predictable (i.e., every one of the 2-path provincial with a couple of turn paths), a solitary area might be utilized. Be that as it may, if there are critical changes to the street, i.e., changing from 2-path country to 4-path partitioned, separate segments ought to be made. The progressions ought to be founded on the through paths, as assistant paths, for example, turn paths, incline doors and exits and truck climbing paths are taken care of freely. In any case, the assistant paths should be drawn inside a solitary segment.

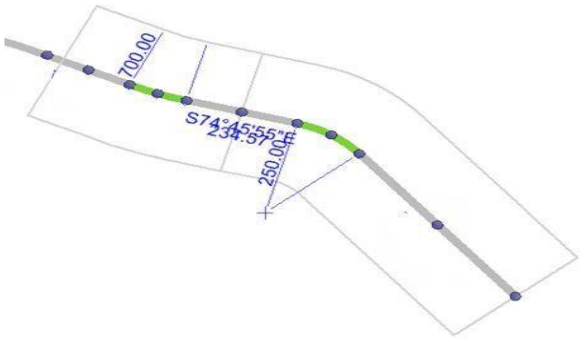
On the off chance that you are bringing in superelevation from a CSV record, one area can be utilized for a whole arrangement. The upside of bend sets for each bend versus one huge segment is the capacity to reprocess rules for a solitary bend set or two. Since rules are not utilized in an imported venture, separate bend puts fill no helpful need beside more limited, piecemeal reports and greater granularity in the proof-reader.



illustrate the impact of the Minimum Tangent Between Curves.



One curve set created (Min. Tangent Distance = 235



Two curve sets created (Min. Tangent Distance = 225

CHATER 6 ESTIMATION AND COST

6.1 OVERVIEW

For all development works or designing cycles the necessity in advance is to think about the likely expense of development which is known as the assessed cost. On the off chance that the spending plan accessible for the task is lesser when contrasted with the assessed cost endeavours are made to decrease such expense through diminishing the work or by

changing certain determination. The necessity for setting up a gauge is by computing amounts through mensuration strategies and afterward assessing the expense.

Advantages of Flexible Pavements:

- Cost of laying: Cost of laying asphalt is less as compared to concrete
- Recyclable and reusable: Asphalt can be melt and reused again and again
- Maintenance and Repair: Small portion of asphalt can be repaired and relayed easily
- Safety: Flexible pavements provide more resistance and grip to the wheels of the vehicles.

Disadvantages of Flexible Pavements:

- Less Durable: Rains, Heat and Snow have damaging effects on the asphalt road and thus they require frequent repairs and maintenance. Generation of Pollution: Greenhouse gases and toxic gases are produced when asphalt is melted.

Design and construction cost per km of flexible pavements of Vadodara Bharuch Highway: There are two parameters based on which the flexible pavements are designed i.e. the CBR value of the existing subgrade and the number of vehicles passing per day during design life.

A typical pavement composition based upon SP: 20-2001 and it's cost for rural road with CBR value of 4 and traffic 75 cvpd is given below

GSB 250mm (Full width) @Rs 600	= Rs 300 per m2
WBM 225 mm @Rs 800	= Rs 180 per m2
PC 20 mm L.S	= Rs 90 per m2
Including prime coat and track coat	
Total	= Rs 570 per m2

The cost will be about 21 lakh per km for 3.75 m wide pavement.

Maintenance Cost:

10th, 20th years after construction, one layer of 75 mm of WBM is laid.

20 mm PC once in 5 years is to be provided as per NRRDA guidelines.
As per NRRDA norms, cost of repairs is taken as Rs14000 per Year.

Bharuch-Vadodara stretch was assigned to Ideal Road Builders for a negative grant of Rs 5.04 billion. The project involves six-laning of the high-traffic density of 65 km four-lane corridor. The total project cost including the negative grant component is Rs 14.09 billion and the cost has been funded through a loan of Rs 12.11 billion and equity of Rs 1.98 billion. Further the company has spent Rs 7.65 billion including negative grant.

Cost (Rs. Lakh) per km	Flexible(BT)	Rigid (Concrete)
Construction cost	21	27
Routine maintenance cost per year	0.14(Average)	0.1 (Average)
Renewal (5 years)	3.5	-
Strengthening (10 years)	6.5	-

6.2 Life cycle cost analysis:

Period of analysis-20 years

Discount rate- 10%

Inflation rate-5%

6.3 Cost estimate:

1. Initial cost of flexible pavement = 82 lakh per km
2. Initial cost of rigid pavement = 27 lakh per km
3. Initial cost of rigid pavement

(Using 30% fly ash as cement replacement) = 25.25 lakh per km

4. Annual maintenance of flexible pavement = 0.14 lakh per km
5. Removal of wearing course of flexible pavement

Every 5 years-5th, 15thyr. After completion = 90*3.75*0.1000

= Rs337500 say Rs3.50lakh

6. Strengthening with WBM every 10th year-10th ,20th year

WBM 100mm = 0.10*3.75*1000*800 = Rs3 lakh

PC 20mm = 90*3.75*1000 = Rs337500

Total cost = Rs 637500 say Rs6.50 lakhs

6.4 Economic Analysis:

For the flexible and rigid pavement, the economic analysis over an analysis period of 20 years based on net present value of total construction and maintenance cost are provided annexure 1

Summary of initial and life cycle cost

6.5 Cycle Cost

Analysis

(Concrete roads analysis according to NHAI)

Data assumption:

Period of analysis-20 years

Discount rate- 10%

Inflation rate-5%

Sr No	Pavement Type	Initial cost	Maintenance Cost
1	Flexible/Bituminous	21	33.6
2	Rigid/Concrete	27	28.3
3	Rigid/Concrete with 30% fly ash	25.25	26.5

SUMMARY OF REPORT

Study shows that comparison between Flexible of NH from Open road software tools and the provided data already provided by NHAI. Pavements design by using materials at different location gives us the costing of the initial cost of flexible pavement as 28% higher than the initial cost of flexible pavement design by open road software. Thus, the pavements are high on initial costs but these costs get balanced during the entire life since more durability and serviceability is provided by the pavements.

Through the Life cycle costing it is found that the maintenance cost of pavement is 19% less as compared to designing through horizontal corridors of the flexible pavement. So, even if the initial costs of pavements are high, maintenance costs are considerably low with long life span.

The maintenance cost of flexible pavement was 5.3 lakh less and in case of Fly ash mixed it was 7.1 lakh

The study also provides the information that the initial cost of flexible pavement is 6 lakh per km without using Fly ash and 4.25 lakh using Fly Ash. Thus, if 30% Fly Ash is used in place of cement and LCC is applied, the results shows a reduction of almost 1.75 lakh in the cost of the pavement

This study also give insight on the application of the flexible pavements in regions where the subgrade soil has low CBR values such as waterlogged areas or heavy rainfall areas. So from the whole study it may be concluded that 20% - 25% of the design of flexible pavement on open road is less in cost effective and maintainance.

OVERALL VALUE AND EVALUATION OF HIGHWAY

In the finish of this task, it's demonstrated that the planned roadway has a satisfactory, precise, and conservative framework dependent on the proposed information. Through this highway configuration project, tedious travel, street span, and mishap will be diminished. The development of the corridors and super elevation have will be finished by the authority division for the government streets framework (NHAI). The unwavering quality of the planned roadway was 94%. Alluding to the IRC37:2018 standard and contrasting our information with the best quality framework, this planned task met the planning necessities and satisfied the objectives and targets of this undertaking.

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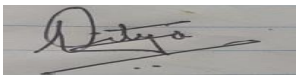

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