

Design of Pavement by SuperCivilCD Software (Road)

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Abstract: A reiterative procedure to design the flexible and rigid pavement by using the software "Supercivilcd" (ROAD) is done. We carried the design for two cases, ie. two variant solutions for flexible and rigid pavement as per IRC provision. This paper highlight the following parameters of rigid pavement design relative stiffness, temperature stress, expected pavement life, length bar, spacing of bar and for following parameter for flexile pavement design total thickness, expectd traffic growth rate, initial traffic in year.

Keywords: Pavement, software, design, flexible and rigid

1. Introduction

1.1 Pavements

Pavement, in civilian engineering, is authentic as a multi band arrangement that distributes the vehicular amount over a ample breadth. OR Highway pavement is anatomy consisting of superimposed layer whose primary action is to deliver the activated car amount to the subgrade OR It is well define as anatomy which abstracted the tyre of cars from the basal foundation. There are two types of pavement rigid pavement and flexible pavement.

- a) **Rigid pavement:** Rigid pavement composed of a PCC apparent course. Such pavements are essentially "stiffer" than flexible pavements due to the top modulus of elasticity of the PCC material. Further, these pavements can accept reinforcing steel, which is about acclimated to reduce joints. The architecture of rigid pavement is based on accouterment a structural adhesive accurate slab of acceptable backbone to resists the endless from traffic. The rigid pavement has acerbity and top modulus to deliver the amount over a almost advanced breadth of soil.
- b) **Flexible pavement:** Flexible pavements are those which are alike with bituminous (or asphalt) materials. These can be either in the form of pavement apparent treatments such as a bituminous apparent analysis (BST) about begin on lower aggregate roads) or, HMA apparent courses (generally used on higher volume road). These types of pavements are alleged "flexible" back the absolute pavement anatomy "bends" or "deflects" due to cartage loads. A flexible pavement structure is about composed of several layers of abstracts which can board this "flexing". The architecture of flexible pavement is based on the assumption that for a amount of any magnitude, the acuteness of a amount diminishes as the amount is transmitted downwards from the apparent by advantage of overextension over an more beyond area, by carrying it deep enough into the arena through alternating layers of diminutive material.

1.2 Software

Software's are actual accessible for our day to day work. They accomplish our activity easier and comfortable. Also, the plan becomes added efficient. They advance our

productivity; makes designing, planning, and assay of huge projects easier with the use of minimum time and resources. Here "SuperCivil CD" (ROAD) software are used for the design purpose. SuperCivilCD is a West Australian ancient accession committed to access all aspects of our noncombatant works operation. From the ancient point of associate until accomplishment you will associate our safety, above of workmanship, cleanliness, adeptness and professionalism. Super Civilian CD is a different civil, structural and architectural engineering handbook-cum-architecture software on CD-ROM is absolutely like a mini album of civilian engineering. It has been aimed at accouterment varieties of advice and accoutrement for the architecture industry in a individual CD. It is acutely benign and advantageous to professionals including Architects, Builders, Contractors, Structural Engineers, Consultants, Designers / Draughtsmen, Project Managers, Estimators / Tenders, civilian engineers, and students.

SuperCivilCD software consists of various kind of software are:-RC DESIGN PACKAGE, STEEL DESIGN PACKAGE, CONSTRUCTION PACKAGE, BILLING PACKAGE, ROAD PACKAGE, VALUATION, HVAC & ELECTRIC PACKAGE. The advantages are the software is self learning product., easy to use and learn, simple and user friendly, does not required guidance or computer training.

2. Software Analysis

1. Design of Rigid Pavement as Per IRC: 58-2002

Inputs:

TRAFFIC (COMMERCIAL VEHICLE PER DAY SUM OF BOTH DIRECTION) - 3000
 EXPECTED GROWTH RATE PER ANNUM OF TRAFFIC (%) – 7.5
 EXPECTED DESIGN LIFE OF PAVEMENT (YEARS) - 20
 MODULUS OF SUB GRADE REACTION - 8
 SELECT CONCRETE GRADE – M35
 MODULUS OF RUPTURE (FLEXURAL STRENGTH) KG/CM² - 45
 TEMPERATURE DIFFENTIALS IN ROAD (deg.c)- 21.0
 LOAD SAFETY FACTOR – 1.2
 ASSUMED THICKNESS OF PAVEMENT (MM) - 320

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mm

Outputs:

MODULUS OF SUB GRADE REACTION [KG/CM³] = 8
 INITIAL TRAFFIC [CV/DAY] = 3000
 GROWTH RATE OF TRAFFIC [%] = 7.5
 EXPECTED PAVEMENT LIFE [YEARS] = 20
 DESIGNED TRAFFIC [CV/DAY] = 11854657
 CONCRETE GRADE = M 35
 TEMPERATURE DIFFERENTIAL deg C = 21
 LOAD SAFETY FACTOR = 1.2
 98 % WHEEL LOAD [KG] = 7370
 SLAB WIDTH [M] = 3.5
 CONTRACTION JOINT SPACING [M] = 4.5
 MAXIMUM TYRE PRESSURE [KG/CM²] = 8
 TOTAL THICKNESS OF PAVEMENT REQUIRED [CM] = 32
 RADIUS OF RELATIVE STIFFNESS [CM] = 101.16
 C / C BETWEEN TYRES [CM] = 31
 FATIGUE LIFE CONSUMED RATIO = 0.55
 MAX. EDGE STRESS DUE TO WHEEL LOAD [KG/CM²] = 24.58
 TEMPERATURE STRESS [KG/CM²] = 17.64
 TOTAL EDGE STRESS [KG/CM²] = 42.22
 CORNER STRESS [KG/CM²] = 15.25
 PERMISSIBLE FLEXURAL STRESS [KG/CM²] = 45
 PERMISSIBLE BEARING STRESS [KG/CM²] = 255.74
 RELATIVE STIFFNESS OF EMBEDDED BAR = 0.23
 CAPACITY OF SINGLE DOWEL BAR [KG] = 1255.2
 WORKING STRESS IN TOR STEEL [KG/CM²] = 2000
 BOND STRESS IN CONCRETE [KG/CM²] = 24.6
 SPACING OF DOWEL BARS [MM] = dia 32 @ 337 C/C
 LENGTH OF DOWEL BARS [MM] = 500
 SPACING OF TIE BARS [MM] {IF REQUIRED} = dia 12 @ 563 C/C
 LENGTH OF TIE BARS [MM] {IF REQUIRED} = 638
 SPACING OF LONGITUDINAL NOMINAL BARS [MM] = dia 12 @ 960 C/C - If Reqd.
 SPACING OF TRANSVERSE NOMINAL BARS [MM] = dia 12 @ 960 C/C - If Reqd.

2. DESIGN OF FLEXIBLE PAVEMENT AS PER IRC: 37-2001**Inputs:**

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

Outputs:

Initial 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

Total 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

3. Result

It is well observed while doing with the software the output results are knowingly calculated of different designed Pavements as follow:

DESIGN OF RIGID PAVEMENT AS PER IRC: 58-2002

- 1) TRAFFIC (COMMERCIAL VEHICLE PER DAY SUM OF BOTH DIRECTION) - 3000
- 2) EXPECTED GROWTH RATE PER ANNUM OF TRAFFIC (%) – 7.5
- 3) EXPECTED DESIGN LIFE OF PAVEMENT (YEARS) - 20
- 4) MODULUS OF SUB GRADE REACTION - 8
- 5) SELECT CONCRETE GRADE – M35
- 6) MODULUS OF RUPTURE (FLEXURAL STRENGTH) KG/CM² - 45
- 7) TEMPERATURE DIFFERENTIALS IN ROAD (deg.c)- 21.0
- 8) LOAD SAFETY FACTOR – 1.2
- 9) ASSUMED THICKNESS OF PAVEMENT (MM) - 320 mm

And the result of this input is :-MODULUS OF SUB GRADE REACTION [KG/CM³] = 8 INITIAL TRAFFIC [CV/DAY] = 3000 ,GROWTH RATE OF TRAFFIC [%] = 7.5, EXPECTED PAVEMENT LIFE [YEARS] = 20, DESIGNED TRAFFIC [- CV/DAY] = 11854657, CONCRETE GRADE = M35 TEMPERATURE DIFFERENTIAL deg C = 21

DESIGN OF FLEXIBLE PAVEMENT AS PER IRC: 37-2001

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

And the result of this input is:-Initial 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,Total Thickness in MM = 660.

4. Conclusion

It is well concluded after using software for analysis and design of rigid pavements and flexible pavement by both the method IRC. The software is very versatile and very convenient to use for designing of pavements various input

parameter can be change number of time and within very sort interval of time. we can get the desire output so in this way we can optimise our design in hand calculation it is not possible because it take lot of time to get output after changing input parameter here the software program is already there we can change the input 100 of time and can get N number of design for various parameters. secondly by hand calculation we can use any of the method here number of method are there we have to shift to the method and according to the method we can get the design like AASTHO , IRC etc so we can also compare the design output by various method and we can very well optimise the design . This software not only gives us design but also optimise our design which can be very much useful in the industry.

References

- [1] Rafi Ullah Khan, Muhammad Imran Khan and Afed Ullah Khan, www.researchgate.net/publication/275154579.
- [2] Garg, Sanjay, "Perpetual Flexible Pavements: Pavements of Future", Journal of the Indian Road Congress, Indian Roads Congress, Vol.73-1, 2012.
- [3] Srikanth M.R., IJERT, ISSN:2278-0181, Vol. 4, Issue 9.
- [4] Magdi M. E. Zumrawi, American Journal of Construction and Building Materials 2017; 1(1): 1-11 <http://www.sciencepublishinggroup.com/j/ajcbm> doi: 10.11648/j.ajcbm.20170101.11.
- [5] Bhavesh Joshi, Dr. R.P Arora, International Journal of Civil Engineering and Technology (IJCIET) Volume 6, Issue 11, Nov 2015, pp. 39-44, Article ID: IJCIET_06_11_005.