# DESIGN OF HIGHWAY ROAD PROJECT BY USING MX ROAD AND HEADS SOFTWARE

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***ABSTRACT:-****The development of highway road system is primary need of any country. The upgrading of highway road network system is also essential traffic on urban and rural highways touches to saturation level over a period of time. The highway road development projects being highly capital intensive involve very high degree of attention by the project authorities as well as by the Consultants engineers and contractor. The HEADS software system for highway engineering projects and design development by highly experienced and MX ROAD is an advanced, string based modelling tool that enables rapid and accurate design of all highway types and facilities.*

Normally the alignment and the pavement composition decide the cost of a highway project and best available tool must be deployed. Today is extremely competitive and sensitive business environment a timely preparation of road construction and reconstruction depends on modern computer based facilities. MX Road and HEADS are the two design software that are most widely used the world over in the road projects.

 **Keywords***:-* MX Road and HEADS software, Highways development

## INTRODUCTION:-

The upgrading of existing road network system is also essential as the traffic on urban and rural highways touches to saturation level over a period of time. The road development projects being highly capital intensive involve very high degree of attention by the project authorities as well as by the consultants, engineers and contractors. Any mistake may result in wastage of millions, which could have been avoided. Normally the alignment and the pavement composition decide the cost of a highway project and for this job the best experienced manpower and the best available tools must be deployed. Today in extremely competitive and sensitive business environment a timely preparation of road construction and reconstruction projects depends on modem computer-based facilities. MX Road and HEADS are the two design software that are most widely used the world over in the road projects. In the present study these design software HEADS and MX Road are compared.

## MX ROAD :-

Developed by Bentley, MX Road is an advanced, string-based modeling tool that enables rapid and accurate design of all road types. With MX Road, we can quickly created sign alternatives to build an ideal road system. Once a final alignment alternative is selected, we can automate much of the design detailing process, saving time and money. As the world's leading company dedicated to providing comprehensive software solutions for the infrastructure lifecycle, Bentley believes in the vital role that infrastructure must play both in sustaining society and in sustaining the environment. Bentley has proven applications that help engineers, architects, contractors, governments, institutions, utilities and owner-operators to design, build and operate more productively, collaborate more globally and deliver infrastructure assets that perform more sustainably.

## HEADS :-

HEADS is a versatile software system for highway engineering and design, developed by highly experienced highway engineering experts at Tech

soft Engineering Services. Acclaimed as premier software, HEADS is widely used in transportation engineering projects. Ever since its introduction the software has been continuously updated to cater to the needs of engineers and consultants who are engaged in planning, design and construction of prestigious highway projects worldwide. The origin of the Company goes back to 1990 when a group of research workers begin work on the software, - HEADS. This team, in 1997, set up an independent company. HEADS software is based on "String" modeling technique. It accepts Topographical Survey data from Total Station, Auto level, GPS, Topo Maps, Aerial Photographs and Satellite Imagery. It offers the facility to use Digitized Topo Maps incase of absence of Topographical Survey data. HEADS has its own CAD engine and is best appreciated for its power, completeness, versatility, fastest processing, simplicity and exchangeability of input and output with other commonly used road engineering software of similar kind and all popular CAD software.

**OBJECTIVES OF STUDY :-**

The study for evolving various design features of a road project has been undertaken using the software MX Road and HEADS.MX Road version XM 2007 and HEADS 2007 have been used in the study. The design features evolved relate to a generalized made up data of a 2 lane NH / SH road project located in a plain terrain. Though the study has been undertaken using above mentioned versions of the software and for the given category of road located in plain terrain, the contents of the study are quite general in nature and can be easily applied using other versions of the software and for other type of roads/ terrain conditions.

**DESIGN METHODOLOGY :-**

**1. Application:-**

MX Road can be used on a wide variety of highway projects, from corridor studies to municipal street schemes, commercial building, plant and manufacturing airports, rail terminals, and drainage, utility and floodplain projects at, its core MX Road V8 XM Edition uses 3D string modeling technology - powerful and concise method of

creating any 3D surface. localised in key markets, MX Road has an interoperable database that allows engineers to create and annotate 3D project models in the most popular CAD platforms and in a Stand-Alone version which has fully functional, high quality CAD tools built in. Digital Terrain Model (DTM) creation and analysis, alignment, road and junction design capability, 2D and 3D drainage design, volume and quantity extraction, 2D and 3D PDF creation, integration with Google Earth and automated production of contract drawings, complete a tool allow MX Road users to feel confident tackling the design of any type of road, largeor small.

**2. Industry :-**

• Civil engineers and designers

• Professional surveyors

• Geotechnical engineers

• Storm drainage and water/sewer system designers

• Civil engineering consultants

**3. Organization Types :-**

• Civil engineering firms

• Municipal engineering organizations

• Surveying companies

• Land and site developers

• Landscape design

• Departments of transportation (DOT)

• National highway organizations

• Design/build companies

**4. Environmental and Other Factors :-**

The environmental factors such as aesthetics, landscaping, air pollution, noise pollution and other local conditions should be given due consideration in the design on road geometries.

Some of the arterial high speed highways and expressways are designed for higher 'speed standards and uninterrupted flow of vehicles by providing grade separated intersections and controlled access.

## 5. Cross Section Elements :-

The features of the cross-section of the pavement influences the life of the pavement as well as the riding comfort and safety. Camber, kerbs, and geometry of various cross-sectional elements are important aspects to be considered in this regard. A typical cross section for a normal two lane two-way rural road and divided rural road is shown in Figure 1.
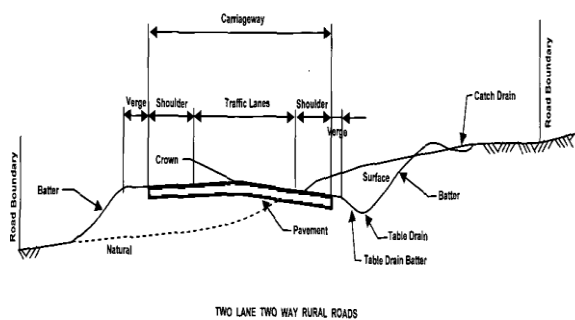
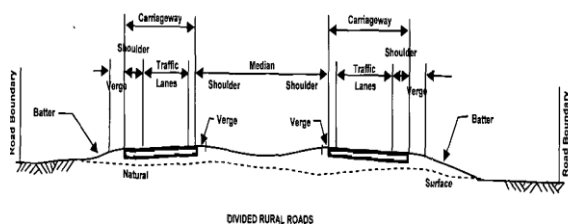

**Fig 1 : Two Line two way Rural Road**



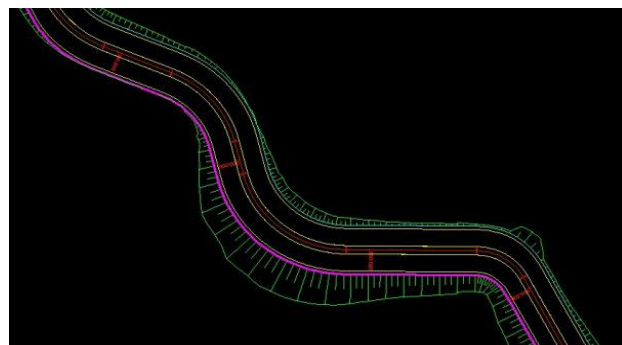**Fig 2 : Horizontal Alignment Viewer**



**Fig 3:Alignment Showing Center Line String Details**
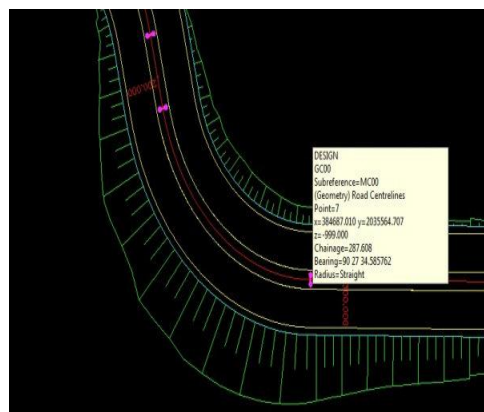


**Fig 4:Scope for future study :-**

1. If a Design Engineer joins the firm in the middle of the project then it is more easy to understand the steps in HEADS as report files are simultaneously generated when a model is run in the default folder of the project whereas in MX no such reports are generated.

2. In HEADS there is very few problems encountered when displaying and working with the data downloaded for this project. However, when exporting data from HEADS to other file formats, the resultant export files sometimes may not be read in MX Road due to different naming convention.

3. Accessing and displaying Survey Data with both the software is found to bestraightforward. Survey data can be saved in any Windows directory and accessed

directly from that location. HEADS offers different data import and export options in most widely used formats in the market whereas in MX Road input options are limited.

4. Only three formats of survey data are analyzed in the study i.e. total station, auto level and GPS data. Other formats like Topo Maps, Aerial Photograph and Satellite Imagery Remote Sensing may be considered for the future study.

5. More complex problems like interchange design, and rotary intersection etc. may be studied to check the capabilities of software in handling complex situations.

6. Other software like Inroads, Auto Civil 3D and other road designing software available in the market may also be incorporated in ftiture study to recommend the most suitable software in the market.

7. Fictitious data used can be tested on the actual data.

## CONCLUSIONS :-

1. Road design models in MX Road and HEADS are very similar. They differ only by their functions and abilities. The use of different software products makes it possible to solve different complex design tasks.

2. Bentley MX Road software is more flexible since it can be operated in Micro-Station/AutoCAD graphical environment or in the environment of Windows operating system without requiring an additional CAD platform whereas HEADS uses its own CAD engine.

3. The key element of a road model in both the software is road geometry which is the basis of the structure of all design models. The more simple and accurate is the design of geometry in CAD system the better is the computerization of the design process, saving in user time and money.

4. Surface Checker is used to check a surface created from surveyed data once it has been

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