



# **ROAD DESIGN FOR BETTER SAFETY**



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# PREVIEW



**INTRODUCTION**

**DESIGN OF ROADS : BETTER SAFETY**

**ROAD SAFETY : HILL ROADS**

**GLOBAL AND FUTURISTICS TRENDS**

**RECOMMENDATIONS**

**CONCLUSION**



# INTRODUCTION



**HILL ROAD MANUAL**

**MORTH.NIC.IN**

**NHAI.GOV.IN**

**SYNTHESIS REPORT : WORKING GROUP ON  
NATIONAL ROAD SAFETY COUNCIL, MORTH**

**VARIOUS ARTICLES IN PRINT MEDIA**



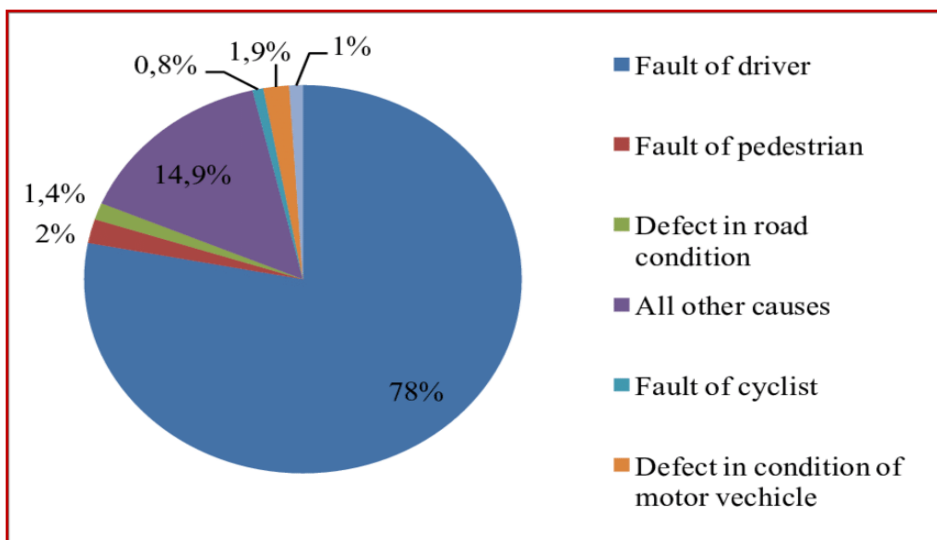
**Ministry of Road  
Transport & Highways**  
Government of India

## **Road Safety**

**"I am shocked to know statistics about road accidents; every minute one accident takes place; every 4 minutes one person dies in road accident."**



# INTRODUCTION



**8% OF WORLD'S FATALITIES**

**NH : 20% TOTAL ROAD ACCIDENTS AND 25% TOTAL FATALITIES**

**DEATH RATE : 10-20 TIMES HIGHER THAN HIC**

**SOCIO-ECONOMIC COST : 3% OF GDP**



**IMPROPER ROAD DESIGN**



**HUMAN ERROR**



**MACHINE ERROR**

**ROAD DESIGNER  
MINIMISE  
ACCIDENTS DUE TO  
HUMAN AND  
MACHINE ERROR**



# DESIGN OF ROADS : BETTER SAFETY





# PLANNING STAGE



**BYPASS FOR CONGESTED AREAS**



**SERVICE ROADS**



**CYCLE TRACKS**



**CROSSING PLACES FOR ANIMALS**



**PASSING PLACES**



**CLIMBING LANE**



**GEOLOGICAL DISTURBANCES**



**LOSS OF FORESTERY**





# **DESIGN STAGE**



## **SELF EXPLAINING AND FORGIVING ROADS**

- **DESIGN SPEED**
- **HORIZONTAL AND VERTICAL GEOMETRY**
- **CROSS SECTIONAL ELEMENTS**
- **DESIGN AT-GRADE AND GRADE SEPARATED JUNCTIONS**

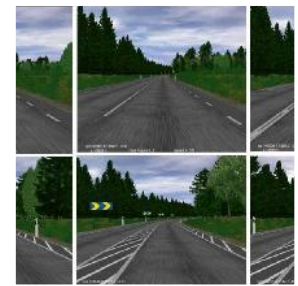
## **SEGREGATION : SLOW AND FAST TRAFFIC**

## **AVOIDANCE OF SHORT CURVES**

## **SET BACK DISTANCE AT HORIZONTAL CURVES**

## **PROPER DRAINAGE SYSTEM**

## **SIGHT DISTANCE AT VERTICAL CURVES**



## **SELF EXPLAINING ROADS**

- **MAIN CAUSE OF ACCIDENT :  
HUMAN BEHAVIOUR**
- **LIMITED EFFECT OF ROAD  
SAFETY AWARENESS**
- **HUMAN ERROR AND DESIGN  
INDUCED ERRORS : MAJOR  
FATALITIES**
- **COMPENSATE THE HUMAN  
ERRORS**
- **ROAD DESIGN : REGULATE  
DRIVING BEHAVIOUR**



## **FORGIVING ROADS**

- **FORVIGIVING THE MISTAKES  
MADE BY DRIVERS**
- **AVOID OR MINIMISE THE HARM  
AND CONSEQUENCES OF  
TRAFFIC ACCIDENTS**
- **ENABLE REGAIN CONTROL OF  
VEHICLE**
- **STOP OR RETURN TO TRAVEL  
LANE WITHOUT INJURY OR  
DAMAGE**





# SELF EXPLAINING AND FORGIVING ROADS







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# **SELF EXPLAINING AND FORGIVING ROADS**





# CONSTRUCTION STAGE



**EFFECTIVE BARRICADING**



**DIVERSION OF TRAFFIC**



**REDUCTION OF NOISE AND DUST**

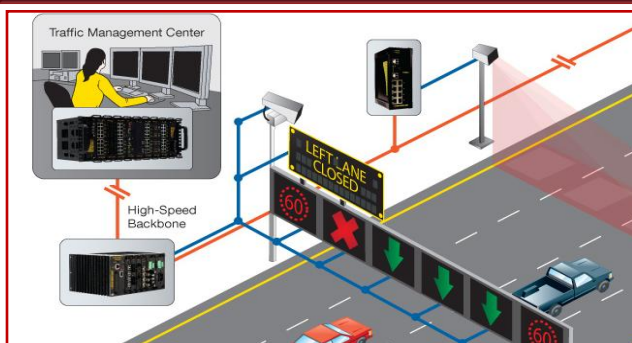


**ROAD SIGNS**



**WARNING BLINKERS**

# MAINT AND OPERATION STAGE



**AUTOMATED TFC MGT SYS**



**REPAIR OF POTHOLES**



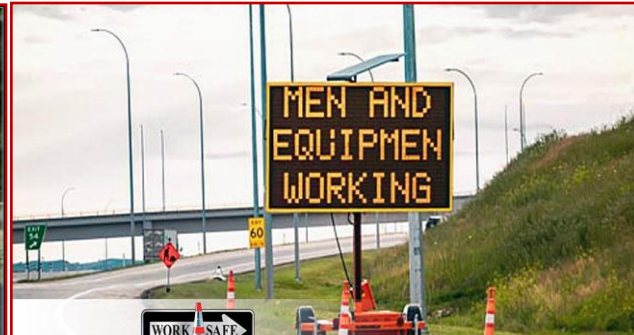
**UPKEEP OF DRAINAGE SYSTEM**



**MISSING ROAD SIGNS**



**CLEARANCE OF FOLIAGE**



**INFORMATION WARNING SYSTEM**



**MEDICAL CARE AT DETT LEVEL**





**SAFETY ON HILL ROADS**

# **CAUSES OF ACCIDENTS AND REMEDIAL MEASURES**



## **CAUSES**

**SHARP CURVES**

**VARYING SPEED DUE TO  
VARYING DEGREE OF  
CURVATURE**

**STEEP GRADIENTS AND  
SUCCESSIVE UP AND DOWN  
GRADES**

**SEVERITY OF CLIMATIC  
CONDITIONS : SLIDES,  
AVALANCHES, POOR  
VISIBILITY ETC**

**LACK OF MAINTENANCE**

## **REMEDIAL MEASURES**

**GEOMETRIC DESIGN**

**DESIGN OF DRAINAGE  
SYSTEM**

**PROVISION OF PARAPET,  
RAILINGS, CRASH  
BARRIERS, SNOW FENCES,  
SNOW GALLERIES AND  
SLOPE PROTECTION**

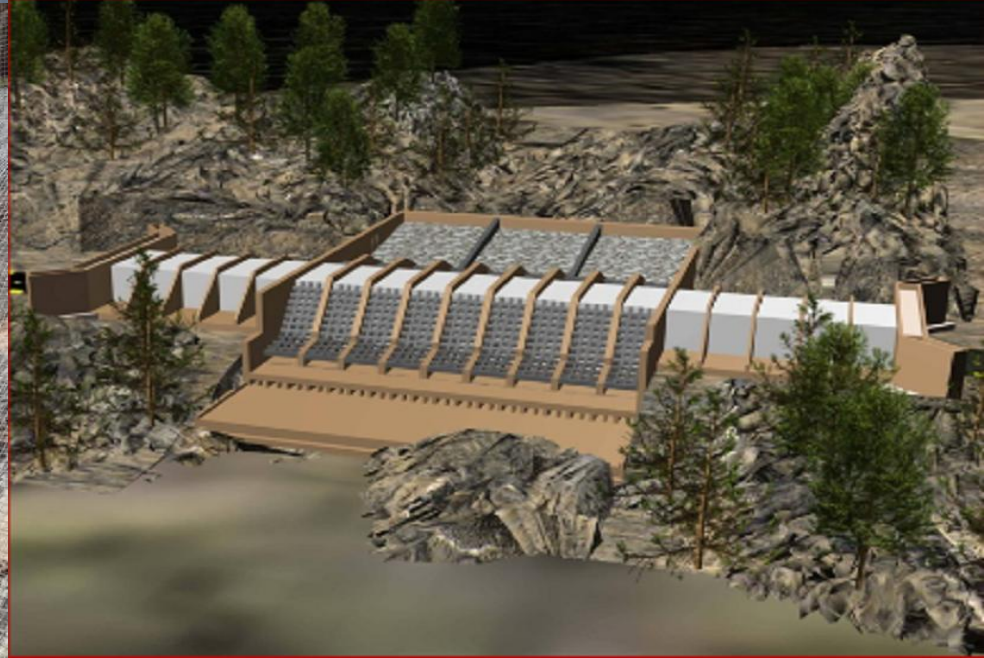
**ROAD FURNITURE : SIGNS,  
SIGNALS, DELINEATORS,  
PAVEMENT MARKINGS**

**PROVISION OF CLIMBING  
LANE**

**PROVISION OF PASSING  
PLACES**



# SAFETY MEASURES







# **GLOBAL TRENDS**



- **ZERO TOLERANCE POLICY ON ACCIDENTS**
- **SWEDEN : SAFETY OVER SPEED**
- **NETHERLAND : SUSTAINABLE SAFETY VISION REDUCED FATALITIES BY 30 PERCENT**
- **EUROPE : SPEED CONTROL, PEDESTRIAN CROSSINGS AND ENFORCEMENT OF SAFETY NORMS. SEPARATION OF VULNERABLE PEOPLE FROM MOTORISED TRAFFIC.**
- **OMAN AND INDIA : SPEED AND MONITORING CAMERAS**
- **CALIFORNIA : MOTORISTS THREE FEET DISTANCE FROM CYCLISTS**
- **PARIS : SPEED LIMIT 30 KMPH**





# **RECOMMENDATIONS**



**ROAD SAFETY : PENULTIMATE**

**CONDUCT SAFETY AUDIT : EVERY FIVE YEARS**

**SET ACHIEVABLE TARGET**

**CONTINUOUS PREPARATION OF ACCIDENT SPOT MAPS**

**ALLOTMENT OF BUDGET FOR ROAD SAFETY JOBS**

**TRAINING OF OFFICERS AND SUBORDINATES ON ROAD SAFETY COVERING 4Es**

- **ENGINEERING**
- **ENFORCEMENT**
- **EDUCATION**
- **EMERGENCY CARE**

**HIGHER COURSES ABROAD**

**PILOT PROJECT BY BRO : SMART ROAD FOR 20 KM STRETCH**

## SMART ROADS

- **ROAD INFRASTRUCTURE INTEGRATED WITH ADVANCED NETWORK AND COMMUNICATION TECHNOLOGIES**
- **MONITOR OWN STATUS, PERFORMANCE, ENVIRONMENT, BEHAVIOUR AND AUTOMATICALLY CALIBERATES, INTEGRATES, MANAGES, DIAGNOSES AND EVALUATES COLLECTED DATA**
- **ADVANTAGES : EXTENDED SERVICE LIFE, INCREASED PERFORMANCE, REDUCE SAFETY RISKS AND IMPROVE SERVICE QUALITY**
- **ENVISION OF *FIVE ZERO TRANSPORTATION* SYSYTEM : ZERO CASUALTIES, ZERO DELAYS, ZERO MAINTENANCE, ZERO EMISSION AND ZERO FAILURE**







# **CONCLUSION**



- ❑ **THE 2030 UN AGENDA FOR SDG RECOGNIZES ROAD SAFETY A MUST FOR HEALTHY LIVES.**
- ❑ **3.92L LIVES LOST IN THREE YEARS DUE TO ROAD ACCIDENTS.**
- ❑ **BRO BEING A PREMIERE CONSTRUCTION AGENCY MUST TAKE LEAD TO DESIGN ROADS WHICH ARE SAFE AND USER FRIENDLY.**
- ❑ **CONCERTED EFFORTS WITH ADEQUATE RESOURCES REQUIRED TO MAKE BRO'S ROAD "SELF EXPLAINED" AND "FORGIVING".**
- ❑ **LET BRO'S ROADS SENSE, THINK AND EXPLAIN.**
- ❑ **LET BRO SHOW THE WAY TO OTHER AGENCIES.**

## TOWARDS ZERO DEATHS

**WHO**

**1.2 Million people**

**will die this year as a result of road crashes**

**More than 3200**

**deaths each day**

**ROAD SAFETY IS NO  
ACCIDENT**

