



Safety during construction

Towards – Safe & orderly Work Zones

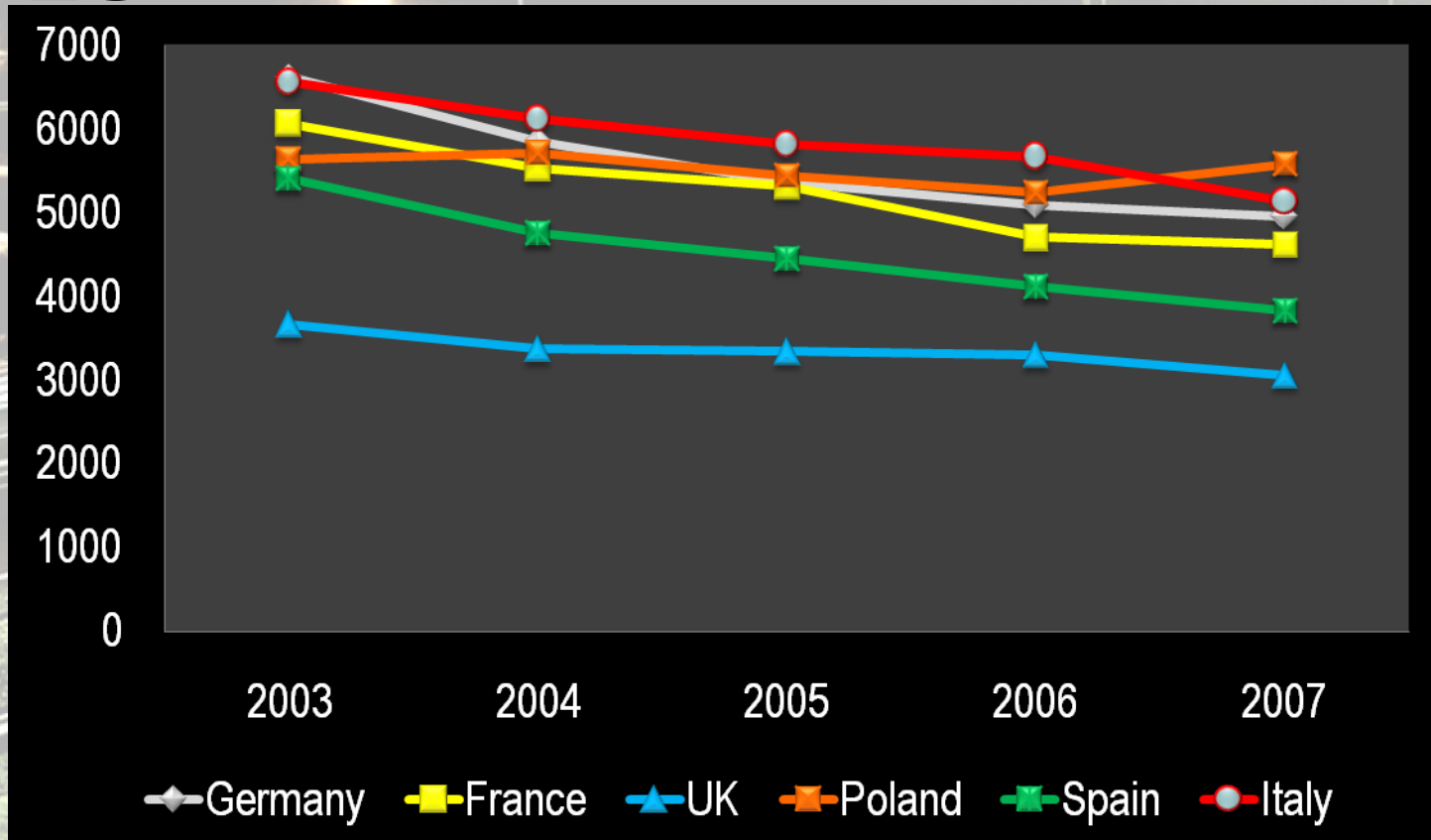




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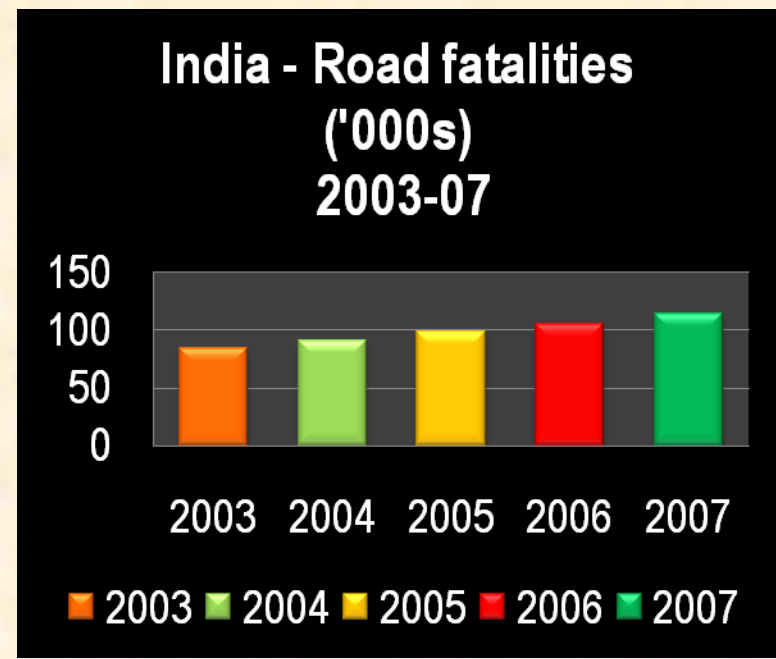
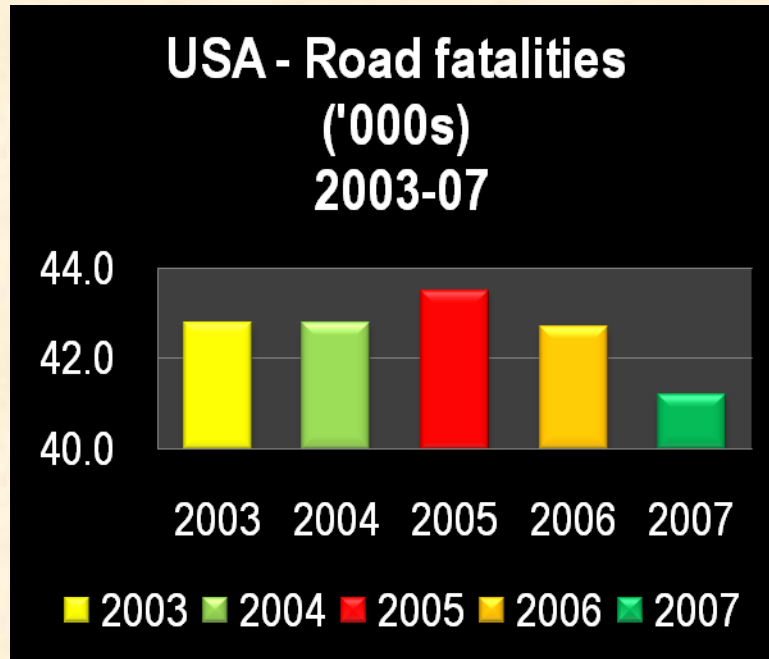
- **Road fatalities – Globally**
- **Work zones – India & International**
- **Work zone safety – Best practices**
 - **Recommendations**

Road fatalities - EU



Fatalities are declining due to proactive initiatives

Road Fatalities – USA Vs. India



Source: National Crime Records Bureau, India Fatality analysis reporting system

As per planning commission India, estimated economic loss of each fatality is about Rs .55 cr

India: Rising fatalities in road accidents is a serious concern

Normal Road Vs Work Zone



Highway road

Clear path makes movement safe and easy



Work zone

Unclear and unpredictable path enhances the risk

High risk of accidents in work zones

Work Zones: India Vs International



India

Clutter
Poor road condition
Minimal warning and guidance



International

Good channelization
Smooth roads
Clear advance warning

Poorly maintained work zones are even more dangerous

Work Zone Fatalities – Globally

Netherlands

16 % of total fatalities are on dutch motorways Of which 39% are in a WZ SWOV (2005)

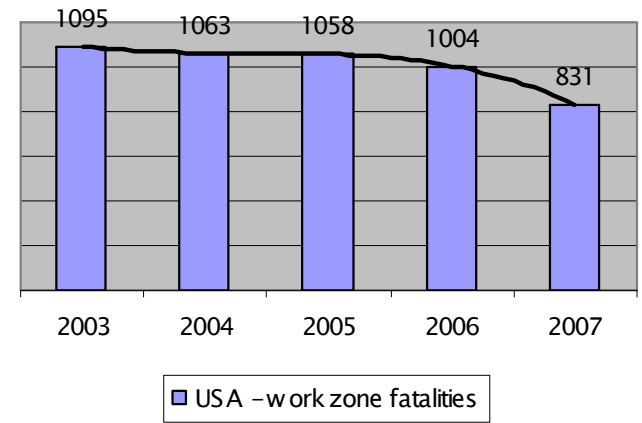
USA

41,000 road fatalities in 2007
Of which 831 (i.e. 2%) fatalities in WZ 3 times higher accident risk

India

Work zones accident statistics are not well documented. With increasing road construction activity in India, high risk of work zone fatalities

USA - Work zone fatalities
2003-07



Special attention required for work zone safety

Causes for Work Zone Accidents

Factors responsible for accidents:

Driver (Age)

Vehicle (type, condition, speed)

Road condition (Paved, mud)

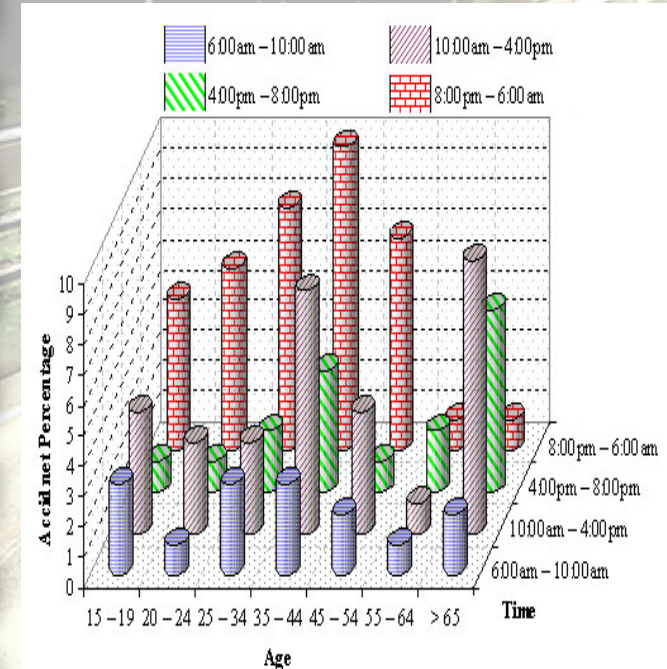
Time (Day, Week, Year)

Location (Highway/City road, Curve, Intersection)

Environment (Light and weather condition)

Traffic control devices

Driver error



Work zone crashes
- cause analysis

Lets focus on controllable factors

Work Zone Safety – International Best Practices



Engineering

Education

Enforcement

Data collection



Every piece is critical in the long term

Engineering Standards & Benchmarks



International Standards

USA: MUTCD 2003

"Manual on Uniform Traffic Control Devices"

Singapore: Code of Practice

"Traffic control in Work Zone"

India

Indian standards: IRC-SP-55: 2001 Code "Guidelines on Safety in Road Construction Zones"

India has good work zone standards. These are further being revised

Improved traffic control is the most direct method to reduce work zone fatalities

- Yong Bai, K-Tran, Kansas, USA

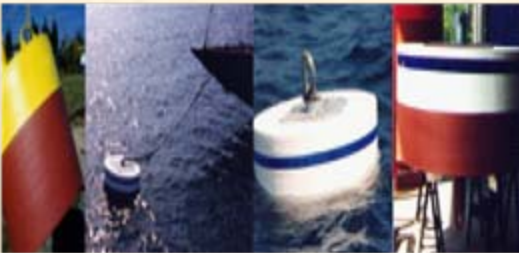


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Signs

Traffic Control



Effective traffic control devices



Command attention and respect
Ex: Drums

Higher size and visible area for more impact

Effective traffic control devices



Provide positive guidance 24/7 and in all weather conditions

Higher retroreflectivity for visibility during nights

Effective Traffic Control Devices



Conspicuous and easier to distinguish

Ex: **Fluorescent Orange** (USA, Singapore, etc)

Ex: Fluorescent yellow (Germany, Belgium, Norway, etc)

Fluorescent color for work zone signs and devices

Effective Traffic Control Devices

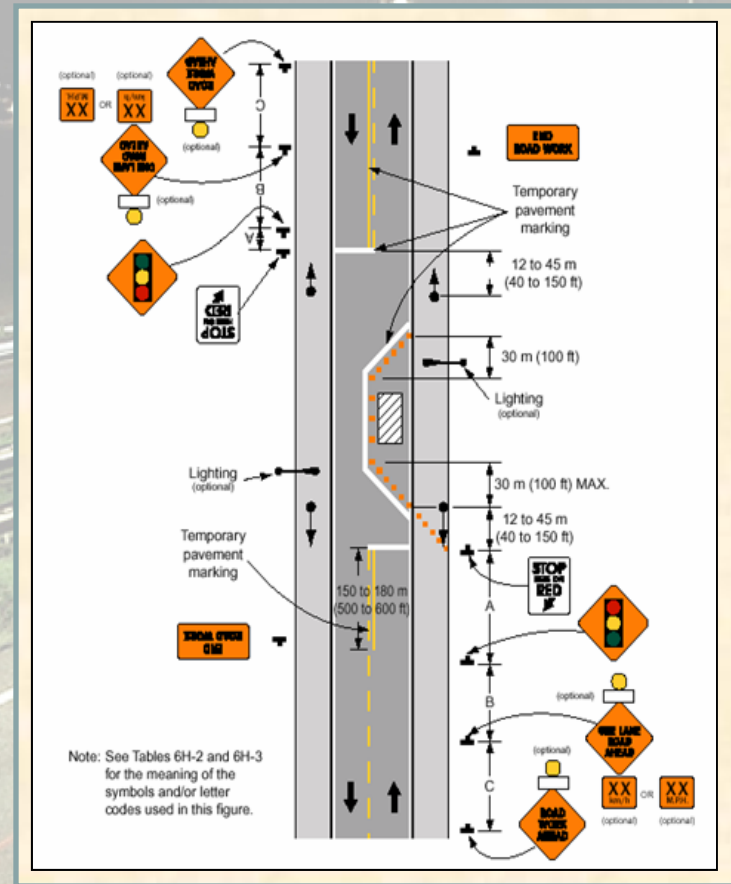
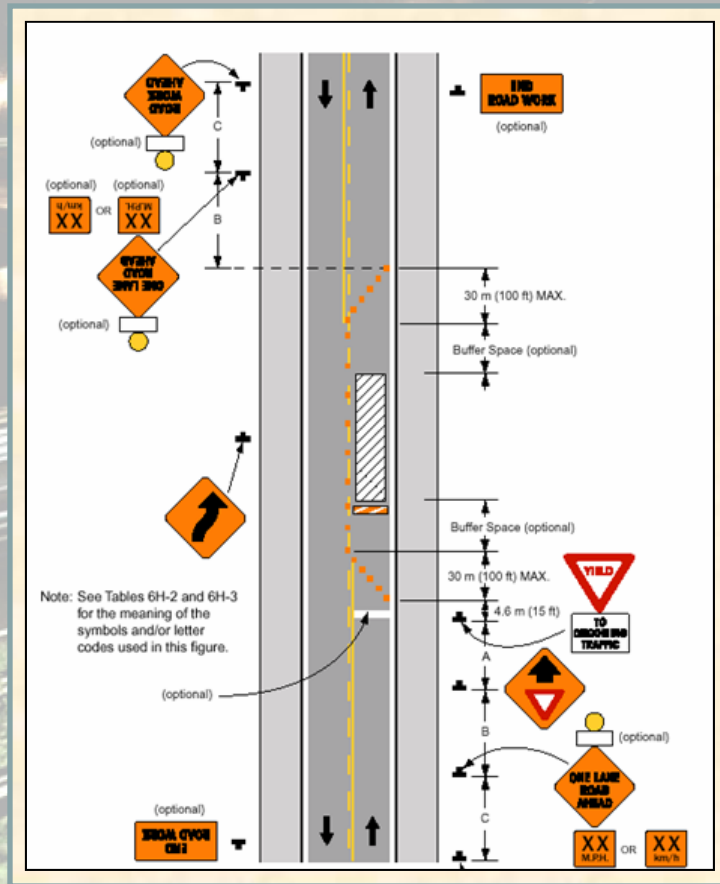


Roll Up Signs

Light weight and portable

Reusable and command attention

Effective Traffic Control Plan



Easy-to-use layouts for safety and traffic control in standards, specifications

Detailed safety maps and layouts

Effective Traffic Control Plan



“Gate Effect” = announce the upcoming changes in road situation
- ARROWS study, EU
Provides more channelization path
Allows adequate time to respond and adapt

Long and clear advanced warning

Education



Educating all stakeholders is essential

Data Collection

- Systematic collection of data on road accidents, injuries and fatalities
 - Ex: *FARS database, USA*
- A uniform and detailed data collection format for road accidents
 - Ex: *Kansas State – Crash data collection format*
- One stop web-based clearinghouse for all work zone related information
 - Ex: www.workzonesafety.org
- Circulate best practices among all stakeholders
 - Ex: *FHWA [best practices guidebook](#)*



Data collection -
links

Clear data helps identify precise solutions

Education

- **Regional work zone conferences**
 - Ex: US Federal Highways – Regional conferences to improve awareness
- **Contractor and traffic police education and training**
 - Ex: Virginia – Training for contractor and enforcement authorities
 - Ex: Arizona – Traffic management workgroups
- **Public information campaigns**
 - Ex: Texas – “Give us a Break” campaign
 - Ex: Virginia – “Work zone safety week” program
- **‘Safety culture’**
 - Work on the development of a “safety culture”
 - Ex: Europe and Australia – dramatic deduction in road accidents



Education-links

Enforcement

- **Performance goals**
 - Benchmarks and performance goals for reduction in WZ fatalities and injuries
 - Ex: Indiana – performance goals for WZ
- **Contractual requirement**
 - Detailed work zone safety and traffic control requirements in specification
 - Ex: New Jersey – tender specification
- **Implementation and quality control**
 - Regular safety audits
 - Ex: New York – statewide work zone inspection program
 - Ex: Scotland – safety audits by independent agencies
 - Dedicated police teams assigned to construction projects
 - Ex: Maryland
 - Contests and Awards
 - Ex: Minnesota – work zone safety award program for contractors



Enforcement - links

Enforcement is the key issue

Recommendations Summary

Engineering

- Longer advanced working zones
- Upgrade minimum reflectivity requirement for devices and signs
- Uniform conspicuous color for work zones devices and signs – fluorescent orange
- Devices which command respect like drums for channelization

Education

- Awareness improvement programs for local road and traffic authorities, contractors

Enforcement

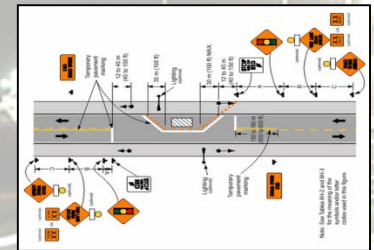
- Detailed safety plans made contractually binding
- Regular work zone safety audits to be made part of standards

Data Collection

- Centralized data collection and information dissemination

Legal & Institutional

- Commitment towards road and work zone safety
- A lead agency for coordination and better management





Wz1-Lift

Thank you