# Construction Safety and Health:

## Origin in Europe, Advancement in North America, Adoption in India

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Swedish Work Environment Authority (Ret)
**Krishna N. Sen**
Larsen and Tubro, India

# Join the ICOH Scientific Committee on Construction

**www.ohici.nl**

# Key Questions

- Why have societies allowed the high risks in construction?
- Why has there been so little interest in COSH in the occupational safety and health community?
- What have we been doing about it?

# Outline

1. Setting the Context
2. Why Construction is Different (from 1100)
3. Origin of Modern COSH (from 1780)
4. Origin of Science-based COSH (from 1968)
5. Advancement of COSH in North America
6. Recent Developments in India
7. Concluding Comments

# PART 1: SETTING THE CONTEXT

# Why Construction is Important

- To GNP: 7-10%
- To Employment: 7-12%
- To Safety and Health: ***20-30% of all fatalities, injuries and probably illnesses***

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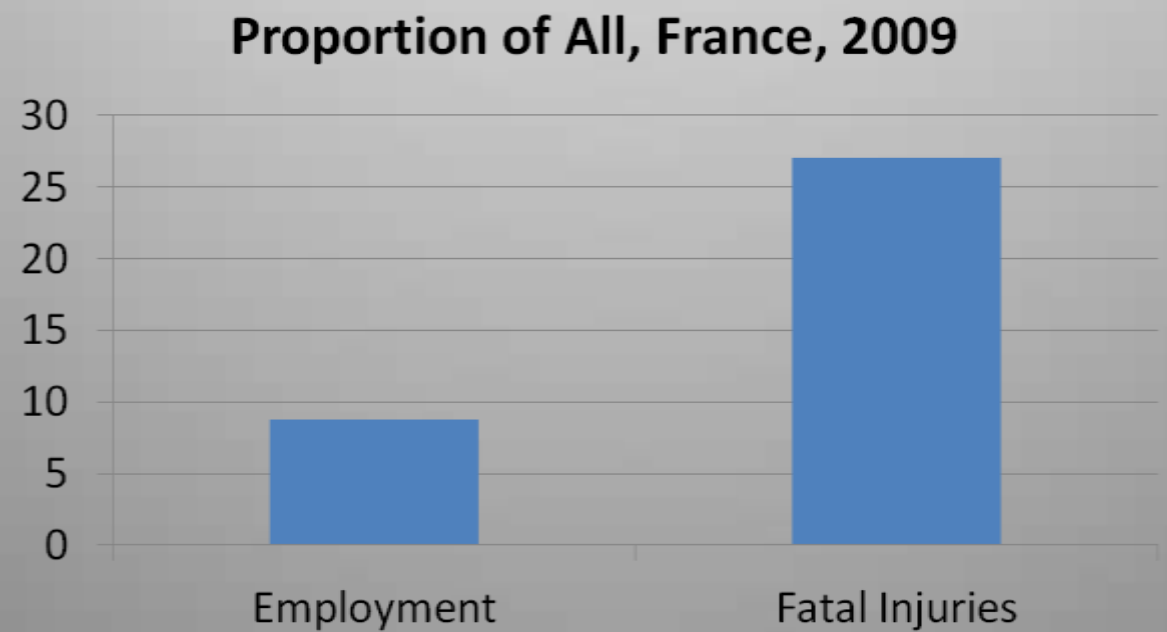
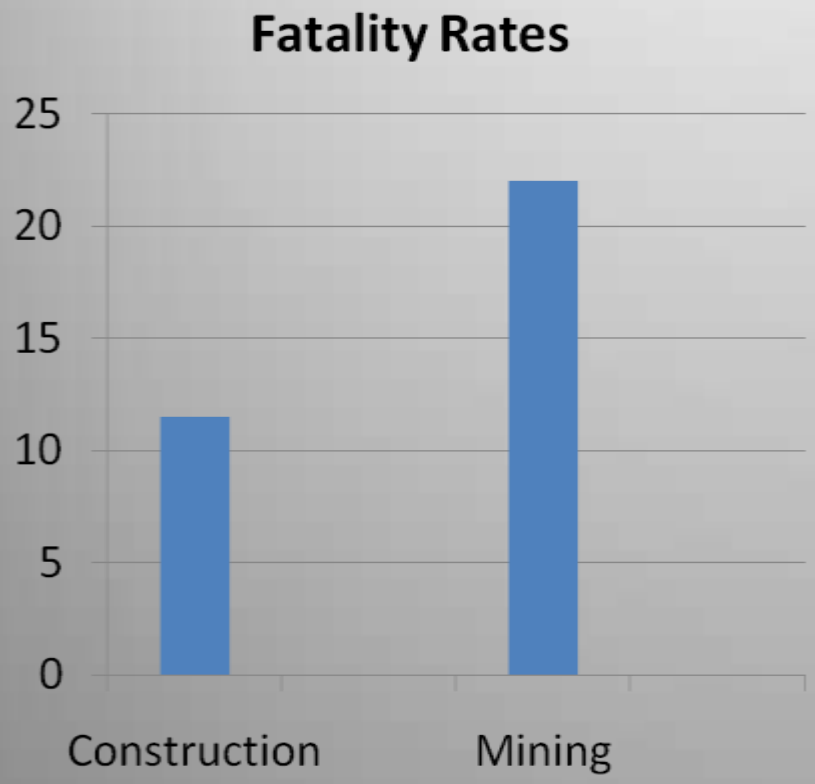



Thanks to OPPBTP

# Relative and Absolute Risk: Construction and Mining, USA, 2007



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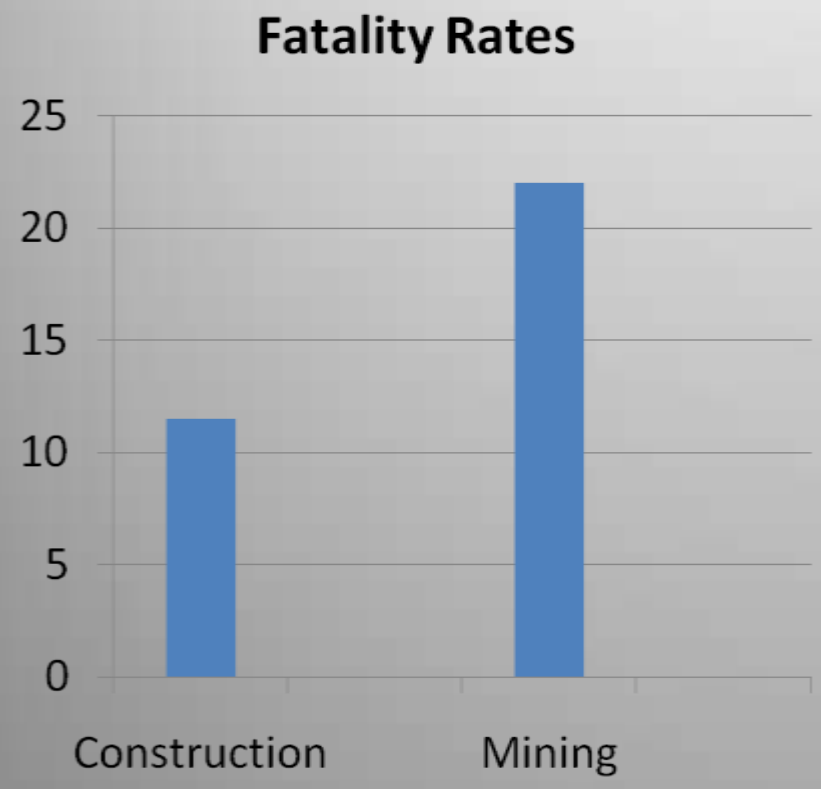
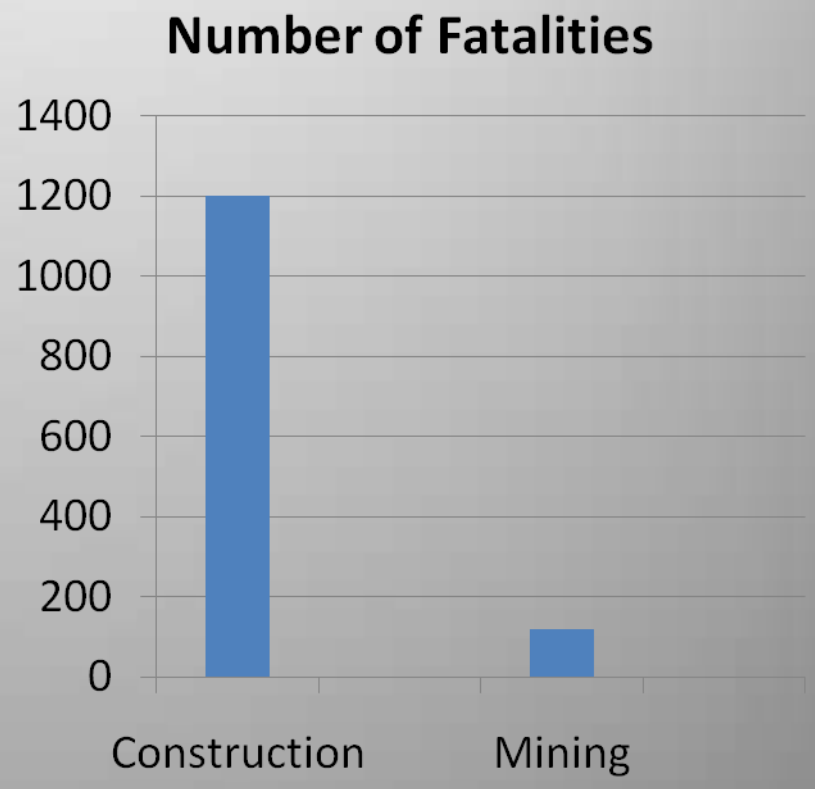
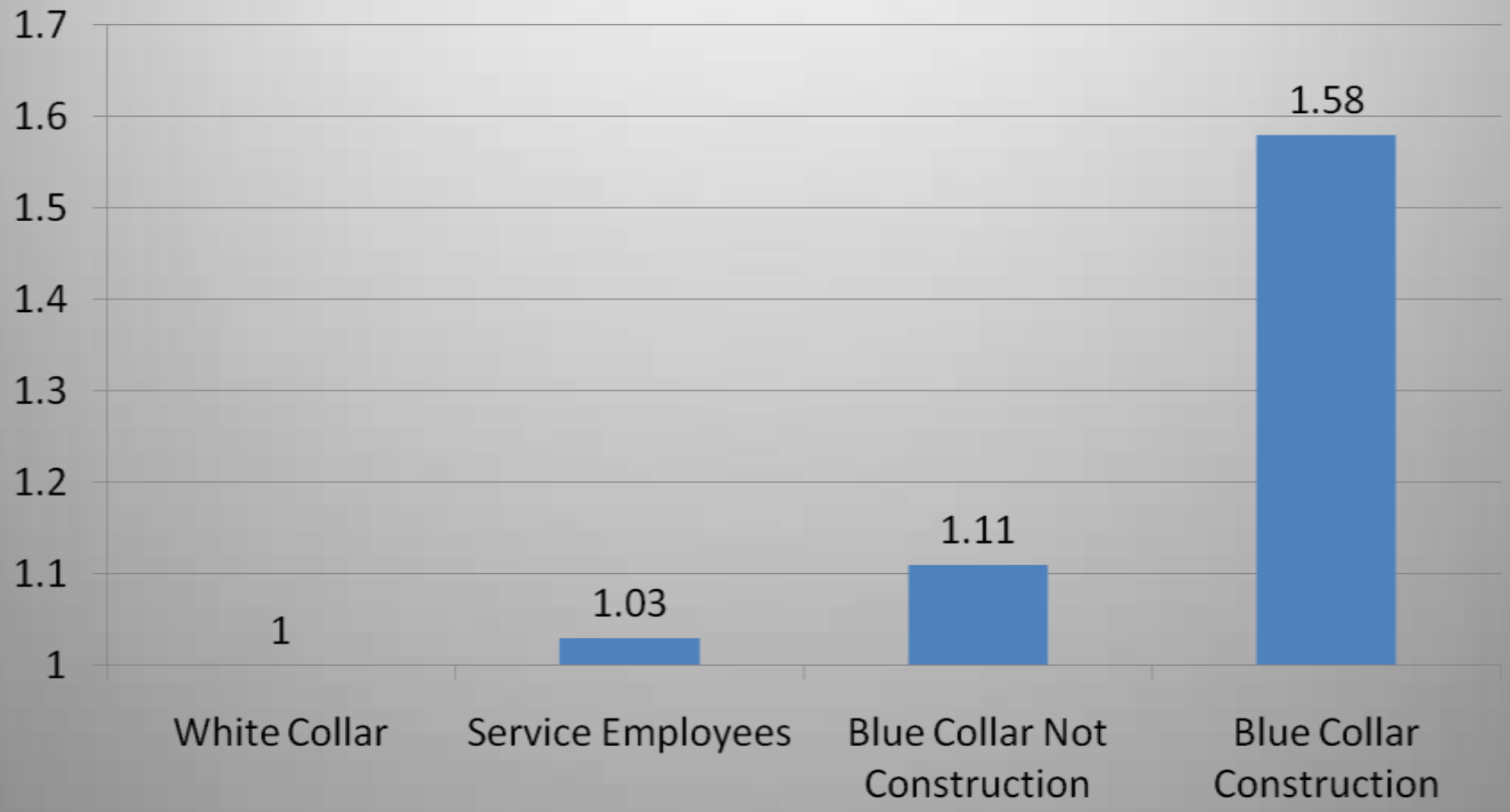


# Probabilities of Occupational Death, Injury or Illness over 40-year Working Life, Construction Industry, USA

| Condition | Probability |
|---|---|
| Traumatic Death | 0.5% |
| One or More Serious Injuries | 80% |
| Hearing Loss | 70% |
| X-ray Evidence of Lung Damage | 20% |
| COPD | 30% |

# Probability of Chronic Back Pain, US




Data source: Health Retirement Study 1992-2006

# Why Should We Care

In the USA

In the 40+ years
that I have worked in safety and health

Over **50,000** construction workers

have been killed on the job

# PART 2: WHY CONSTRUCTION IS DIFFERENT

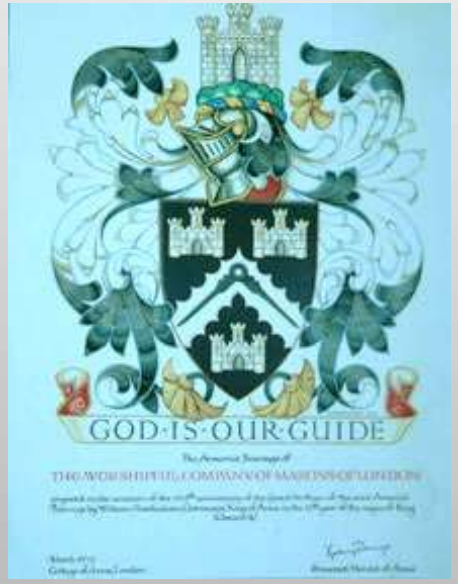
# Grand Place Brussels

# The Guilds

- **Ancient trades**
  - Pile drivers
  - Carpenters & joiners
  - Brick & stone masons
  - Blacksmiths and forgers
  - Plumbers
  - Teamsters
  - Roofers
  - Tile setters
  - Lathers and plasterers
  - Painters
  - Glaciers

# London Guilds

Joiners & Ceilers, 1253




Stonemasons, 1356


Plumbers, 1365


Blacksmiths, 1421

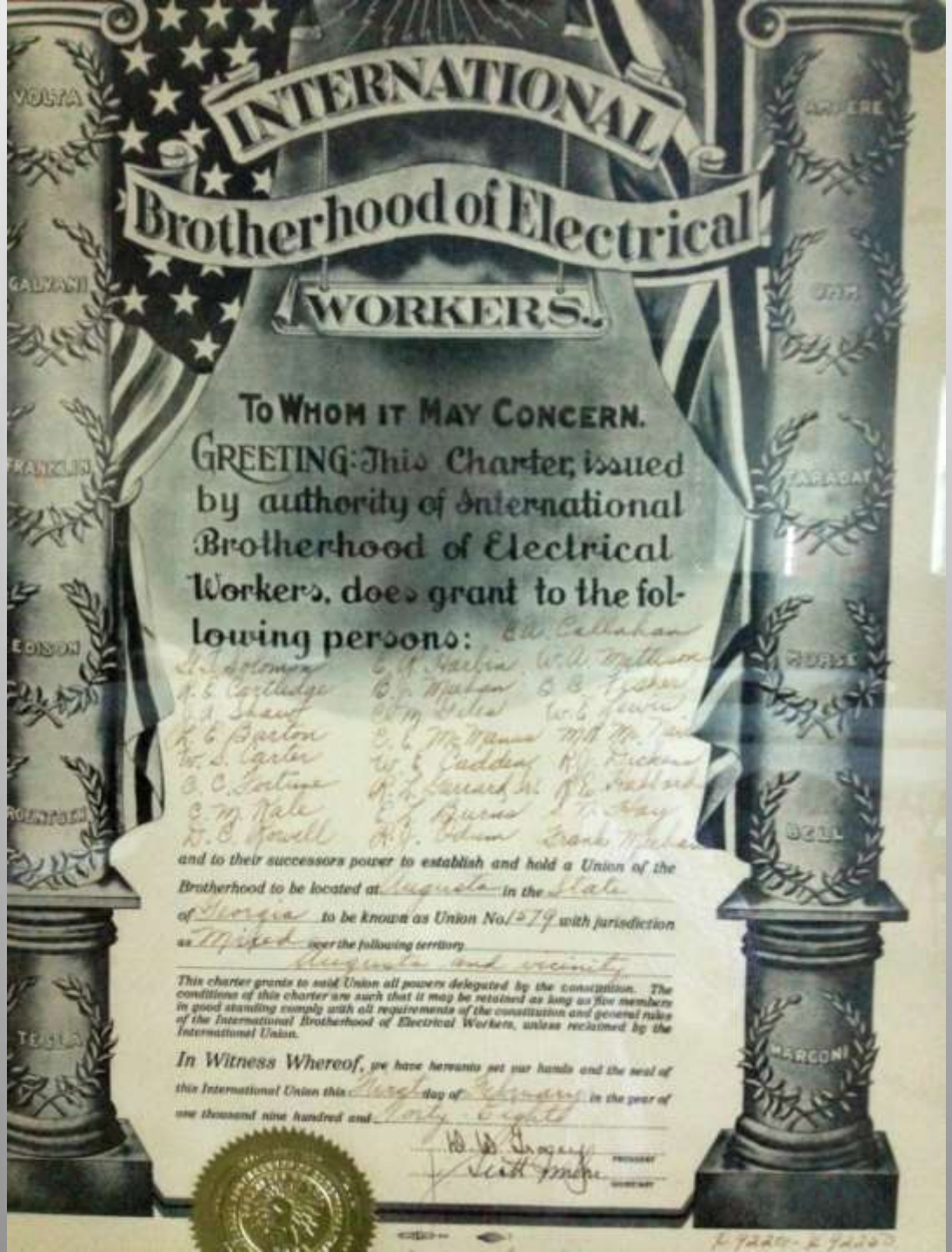
# Washington National Cathedral, Construction Period: 1907-1990

# Stonecarvers Guild, USA, 2011

# Today's Trades

- **Ancient trades**
  - Pile drivers
  - Carpenters & joiners
  - Brick & stone masons
  - Blacksmiths and forgers
  - Plumbers
  - Teamsters
  - Roofers
  - Tile setters
  - Lathers and plasterers
  - Painters
  - Glaciers
- **Modern trades**
  - Sheet metal workers
  - Insulators
  - Boilermakers
  - Pipe and sprinkler fitters
  - Electricians
  - Machinists
  - Operating Engineers
  - Millwrights


INTERNATIONAL
Brotherhood of Electrical




**TO WHOM IT MAY CONCERN.**

GREETING: This Charter, issued by authority of International Brotherhood of Electrical Workers, does grant to the following persons:

and to their successors power to establish and hold a Union of the Brotherhood to be located at Augusta in the State of Georgia to be known as Union No. 379 with jurisdiction as Mixed over the following territory

Augusta and vicinity

This charter grants to said Union all powers delegated by the constitution. The conditions of this charter are such that it may be retained as long as five members in good standing comply with all requirements of the constitution and general rules of the International Brotherhood of Electrical Workers, unless reclaimed by the International Union.

*In Witness Whereof*, we have hereunto set our hands and the seal of this International Union this first day of February in the year of one thousand nine hundred and forty eight

PRESIDENT

SECRETARY

# Why Construction is Different

**WORKSITE**:

- Non permanent
- Improvised
- Episodic
- Changing location
- Changing hazards as project proceeds
- Climate as big risk
- Multi-employer

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**WORKSITE**:

- Non permanent
- Improvised
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**EMPLOYMENT**:

- Short term, non permanent
- No work, no pay
- On-the-job training
  - Apprenticeship
  - Task-specific
- Multi-trade

# PART 4: ORIGIN OF MODERN CONSTRUCTION SAFETY IN EUROPE

# History of Modern COSH

- 1884: Germany: Bauberufsgenossenschaften
  - Early emphasis on rehabilitation and compensation
- 1911 France: Caisse Maladie de Travail
  - Early emphasis on medical fitness for work
- 1934: International Federation of Building and Wood Workers
- 1947: France: First dedicated construction safety and health organization
- 1968: International Section for the Prevention of Occupational Risks in the Construction Industry of ISSA
- **1983: ICOH Scientific Committee**
- 1988: ILO Convention 167
- 1992: EU Directive on Mobile Worksites
- 2004: Bilbao Declaration
- 2009: ISSA Declaration of Brussels

# Two Main Drivers in COSH

**Safety** derives from large disasters

- Tunneling
- Bridges
- Tall structures
- Petrochemical facilities

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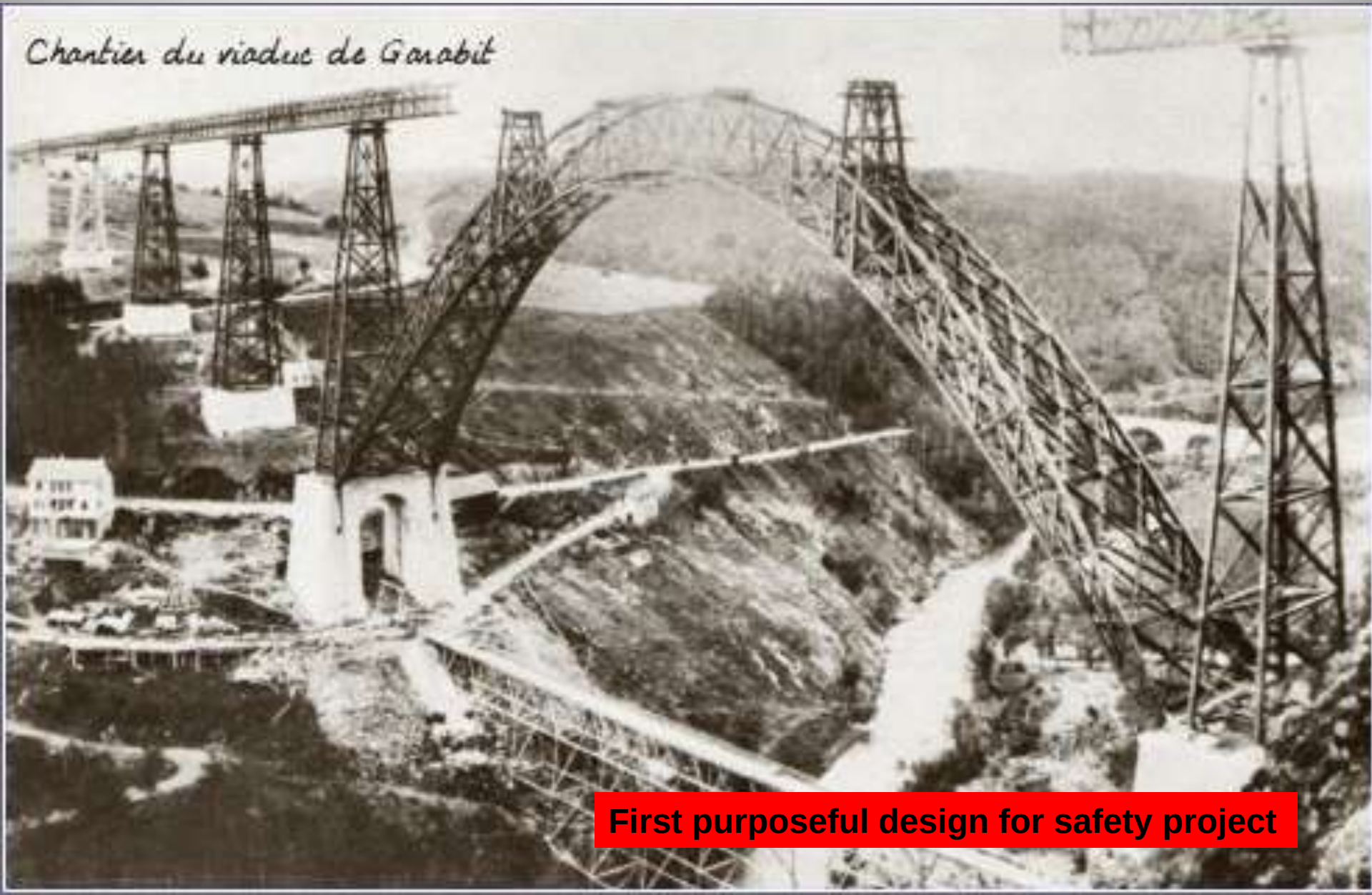
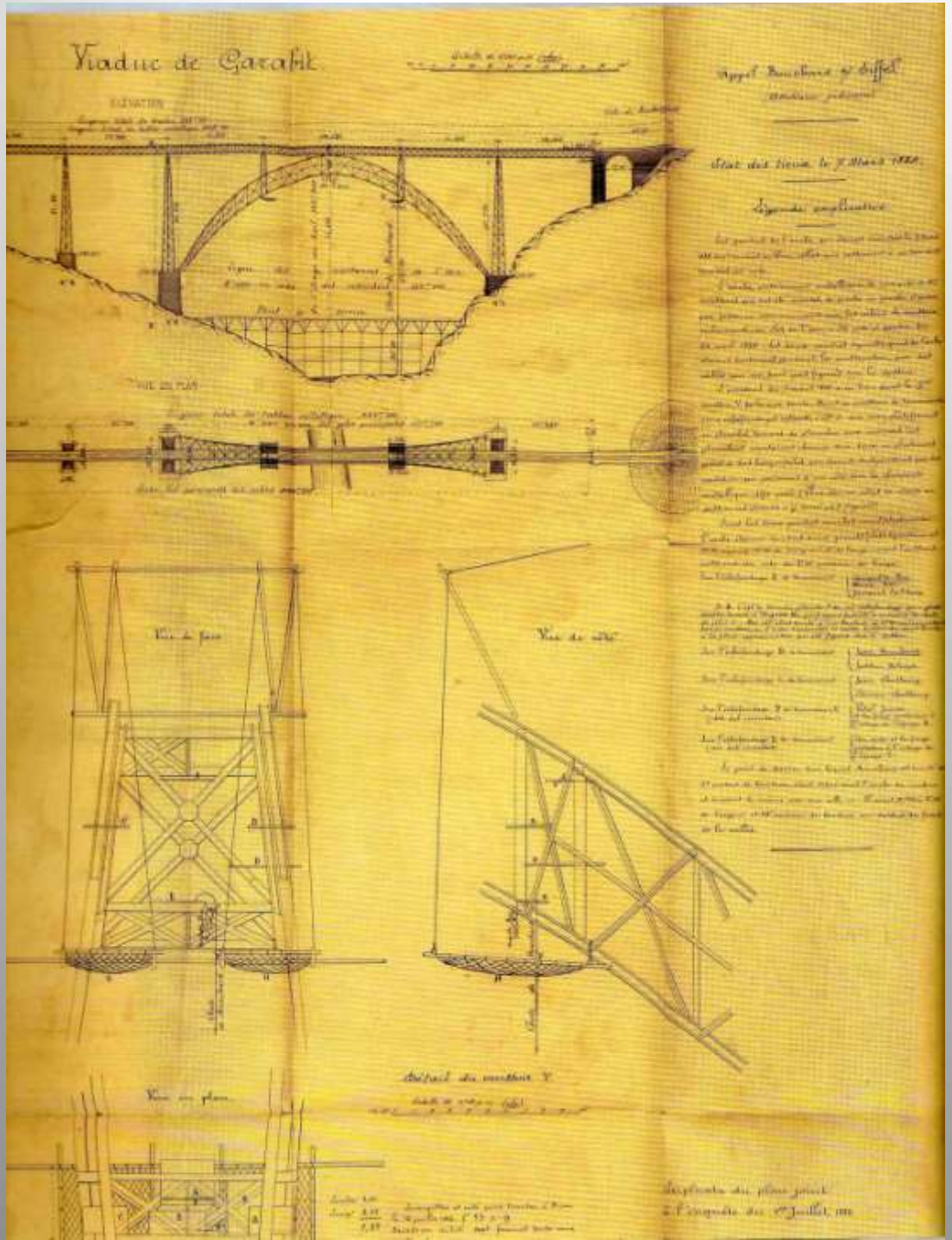
**Health** derives from compensation and parallels development of Social Medicine

- Germany, 1884
- France, 1910

# Precedent-setting Projects:
# Viaduc de Garabit, France, 1880-84




**First purposeful design for safety project**




Drawing by Gustav Eiffel

Thanks to Bruno Bisson, CRAMIF

# Precedents of Modern Systems

| Movement | Anti-revolutionaries | Revolutionaries | Liberals |
|---|---|---|---|
| Origin | Germany | France | England |
| Aim | Stability | Equality | Liberty |

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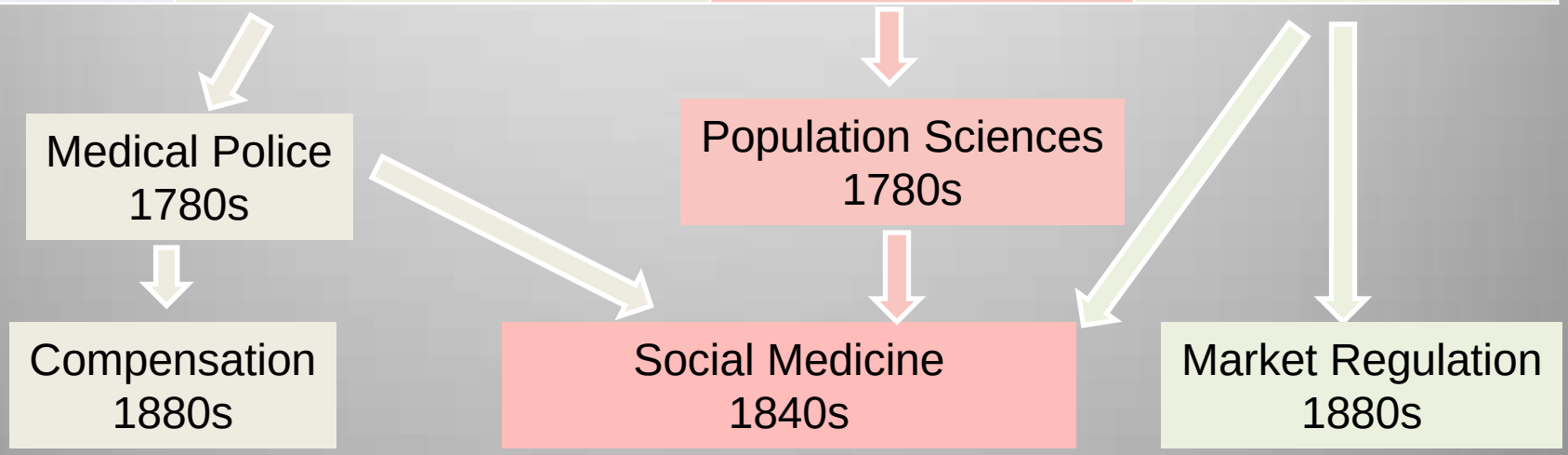

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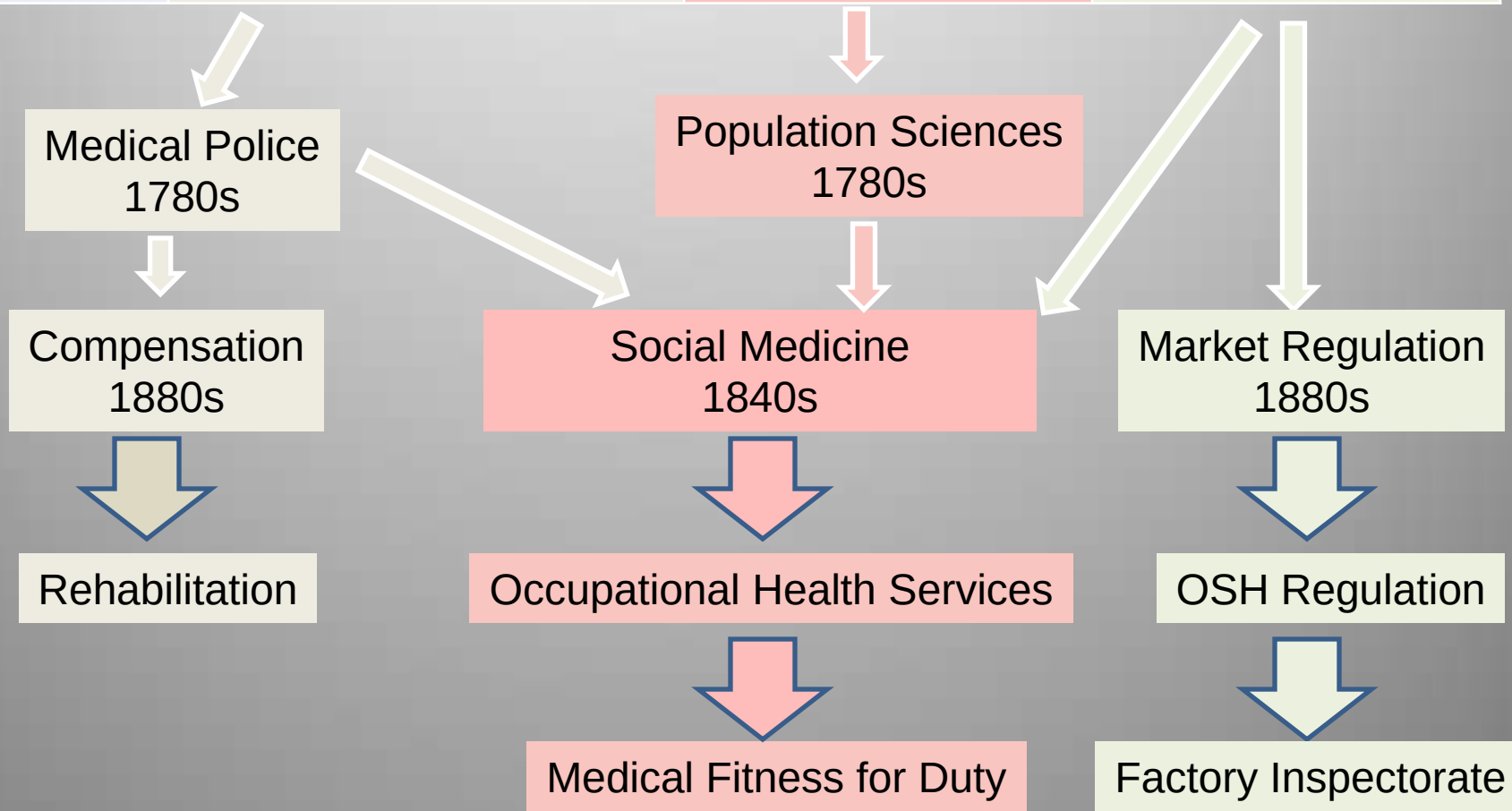

# Framework for Today's Systems

| Philisophy | "Bismarckian" | "Beveridgean" |
|---|---|---|
| Countries | Continental: DE, FR, NL BE AU, CH | Northern/Southern: UK, NO, SE, DK, FI, IT, ES, PT |
| Approach | Insurance-based<br>Employers & Employees<br>Public-private mix | Tax-based<br>Government driven<br>Public provision |
| OSH Regulation | Statutory | Statutory |
| OSH Enforcement | Public and Private | Public |
| OSH Services | Paritarian | Private |
| Compensation | Statutory/Paritarian | Statutory/Public or Private |

Thanks to Francesco Briganti
European Association of Paritarian Institutions
of Social Protection

# "Bismarckian" Influence: Evolution of Safety and Health Organizations

| Year | Country | Organisation Name | Structure | Main Functions |
|---|---|---|---|---|
| 1884 | Germany | BG-Bau | Statutory<br>Bi-partite<br>Funded by employer fees | Compensation, Inspection, Consultation<br>Technical support, Information,<br>Health exams, Medical care, Rehabilitation<br>Research |
| 1911-47 | France | Tri-part<br>• Compensation<br>• Prevention<br>• Medical evaluation | Statutory<br>Bi-Partite<br>Funded by government set rates | Health exams, Compensation, Consultation<br>Information |
| 1972 | Japan | Japan Construction Safety and Health Association | Statutory<br>Employer organization<br>Funded by government and membership fees | Consultation, Information, Training<br>Research |
| 1976 | Netherlands | Arbouw Foundation | Bi-partite agreement<br>Funded by employer fees | Health exams, Consultation, Information<br>Research |
| 1978 | Canada (Ontario) | Construction Safety Association of Ontario | Private Bi-partite organisation<br>Funded by employer fees and fee-for-service | Consultation, Information, Training<br>Research |
| 1980 | Belgium | CNAC/NAVB | Bi-partite agreement<br>Funded by employer fees | Consultation, Information, Training |
| 1990 | US | Center for Construction Research and Training (CPWR) | Private union organization<br>Funded by government grants | Consultation, Information<br>Training, Research |

# Example BG BAU, Germany, 2008

| Functions | Percent of Budget |
|---|---|
| Compensation for wage loss | 55% |
| Rehabilitation | 29% |
| Prevention | 8% |
| Other (admin, legal, etc) | 8% |

Thanks to Bernd Merz, BG BAU

# OPPBTP, France

**1947 : Risk prevention and regulatory control**.

**1985 : No more control actions.**

- **Focus on improving health and safety voluntarily**
- **Training, technical support, information, research**

**2007 : Mission extended adoption of EU mandates**

# "Beveridgean" Influence Legislative Chronology England

- 1926: Building regulations [for sites with mechanical equipment)
- 1931: First crane regulations
- 1948: Building (Safety Health and Welfare) Regulations
- 1961 Factories Act, Section 127 [statutory authority for COSH]
  - 1961: Construction (General Provisions) Regulations
  - 1961: Construction (Lifting Operations) Regulations
  - 1966: Construction (Working Place) Regulations
  - 1966: Construction (Health and Welfare) Regulations
- 1972: Health and Safety at Work Act
  - Keeps much of section 127 regulations in place
- Post 1992: Adaption to EU Requirements
  - 1992: "Six Pack" Rules [COSH Mgt; Manual Handling; PPE; Equipment; Display Screens; Health, Safety and Welfare]
  - 1994: Construction (Design and Management) Regulations

Source: Davis, VJ, Thomason K. Construction Safety Handbook, 2nd ed. London; Thomas Telford Publishing, 1996

# Precedent-setting Projects
# North Sea, 1980s

Alexander L. Kielland Rig, Norway,1980

- 123/212 workers killed

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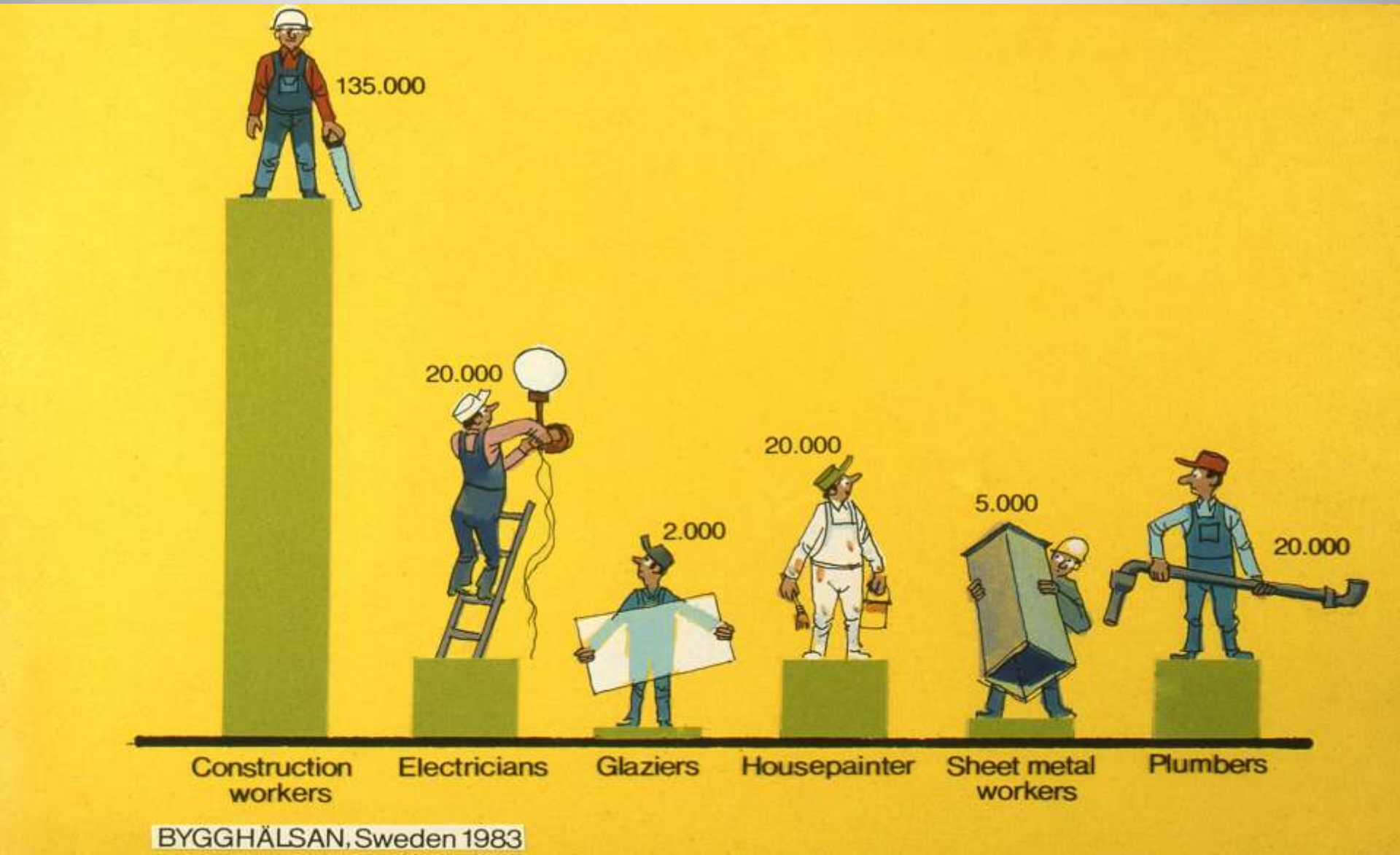
**Led to systematic thinking about safety culture**

# PART 4. ORIGIN OF SCIENCE-BASED COSH

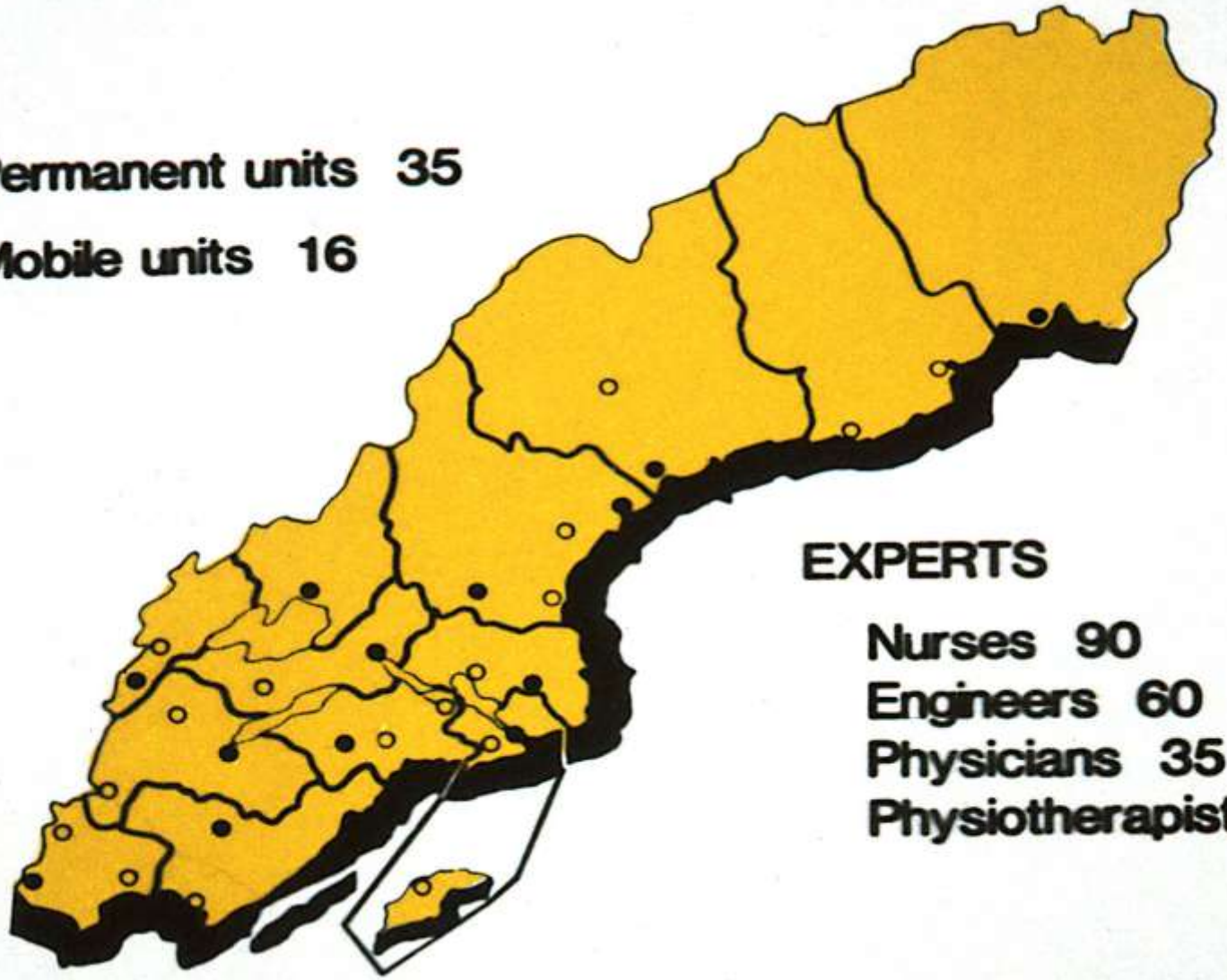
## BYGGHÄLSAN, THE SWEDISH CONSTRUCTION INDUSTRY'S ORGANIZATION FOR WORKING ENVIRONMENT, SAFETY AND HEALTH, 1968-1992

Thanks to Anders Englund and Bengt Järvholm

# Swedish Construction Industry



# Bygghälsan Oveview



# Mobile Unit

# Areas of Focus

## TECHNICAL ACTIVITIES

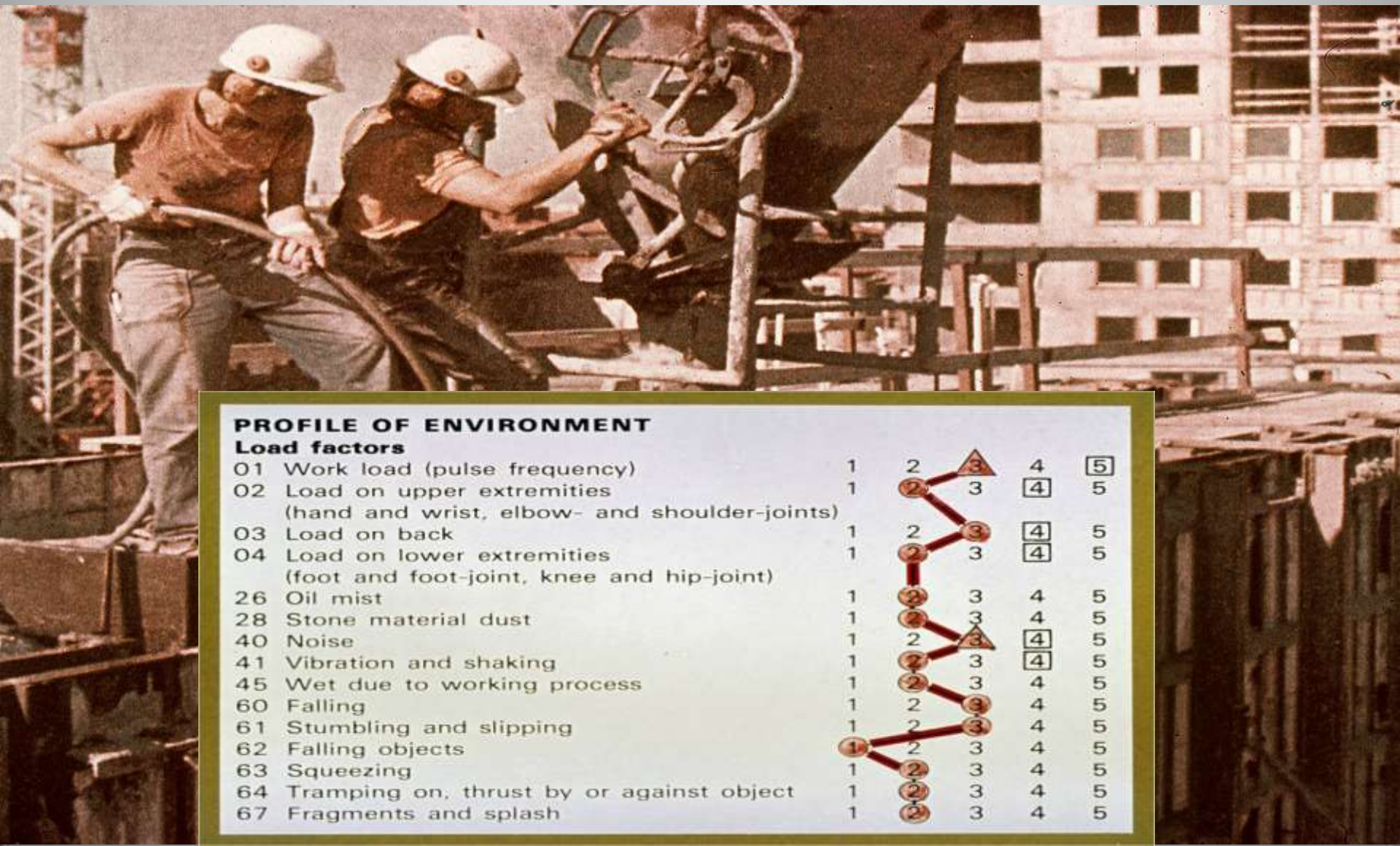
EDUCATION (safety delegates, supervisors)

INFORMATION (workers, foremen, safety committees)

INVESTIGATION (by law, research)

BYGGHÄLSAN, Sweden 1983

# Characterization of Exposures/Risks



**PROFILE OF ENVIRONMENT**

**Load factors**

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 01 | Work load (pulse frequency) | 1 | 2 | 3 | 4 | 5 |
| 02 | Load on upper extremities (hand and wrist, elbow- and shoulder-joints) | 1 | 2 | 3 | 4 | 5 |
| 03 | Load on back | 1 | 2 | 3 | 4 | 5 |
| 04 | Load on lower extremities (foot and foot-joint, knee and hip-joint) | 1 | 2 | 3 | 4 | 5 |
| 26 | Oil mist | 1 | 2 | 3 | 4 | 5 |
| 28 | Stone material dust | 1 | 2 | 3 | 4 | 5 |
| 40 | Noise | 1 | 2 | 3 | 4 | 5 |
| 41 | Vibration and shaking | 1 | 2 | 3 | 4 | 5 |
| 45 | Wet due to working process | 1 | 2 | 3 | 4 | 5 |
| 60 | Falling | 1 | 2 | 3 | 4 | 5 |
| 61 | Stumbling and slipping | 1 | 2 | 3 | 4 | 5 |
| 62 | Falling objects | 1 | 2 | 3 | 4 | 5 |
| 63 | Squeezing | 1 | 2 | 3 | 4 | 5 |
| 64 | Tramping on, thrust by or against object | 1 | 2 | 3 | 4 | 5 |
| 67 | Fragments and splash | 1 | 2 | 3 | 4 | 5 |

# Characterization of Health Effects

## MEDICAL ACTIVITIES

REGULAR SCREENING FOR DISEASE
(mass → selective)

INFORMATION ON RISKS AND ON PREVENTION

MEDICAL SERVICE, conventional and for occupational diseace

REHABILITATION

ERGONOMICS

RESEARCH

BYGGHÄLSAN, Sweden

# ”Bygghälsan Cohort”

- >389 000 persons, mostly men (≈ 95%)
- Occupational title from the check-ups
- History/Exposure questionnaires 1971-1974, 1988-1992.
- Individual data about height, weight, smoking habits, spirometry, blood pressure,  hearing tests, Hb, glucose in urine, blood in urine,
- Unique identification number can be linked to national registers (e.g. mortality, cancer, etc)

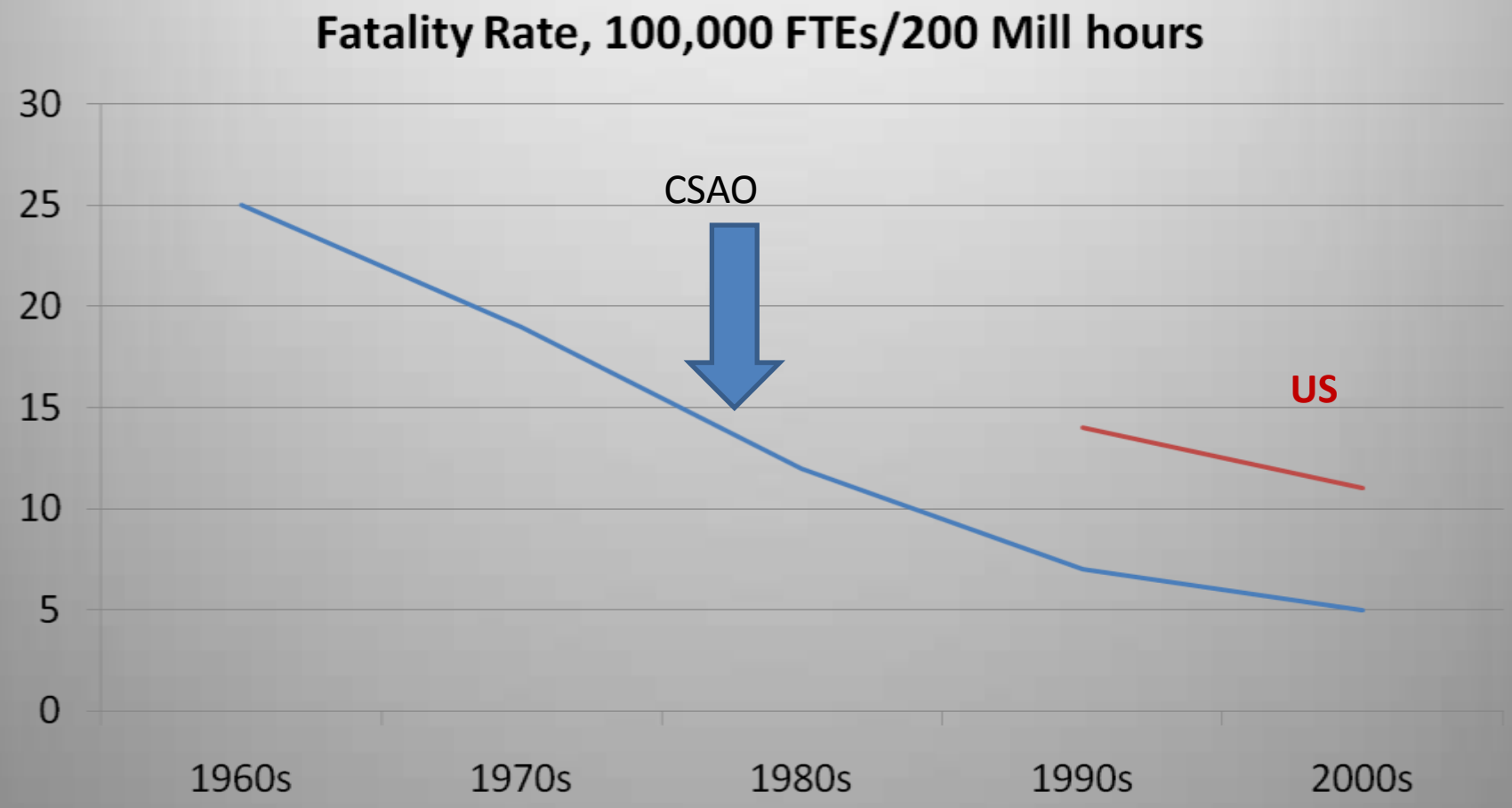
# Important Results for Construction

- First study on the magnitude of **occupational cancer** led to the first ban on **asbestos**
- First study of the magnitude of **musculo-skeletal** diseases and the systematic application of **ergonomics**
- First systematic evaluation of the hazards of **solvents** and introduction of **water based /low voc paints**
- First systematic evaluation of **noise** and introduction of **hearing conservation**
- First systematic evaluation of **cement dermatitis** led to fortification of cement with **iron sulphate**
- First study of **nutrition** among construction workers
- First **smoking cessation** program for construction workers

# PART 5: DEVELOPMENT OF SCIENCE-BASED COSH IN NORTH AMERICA

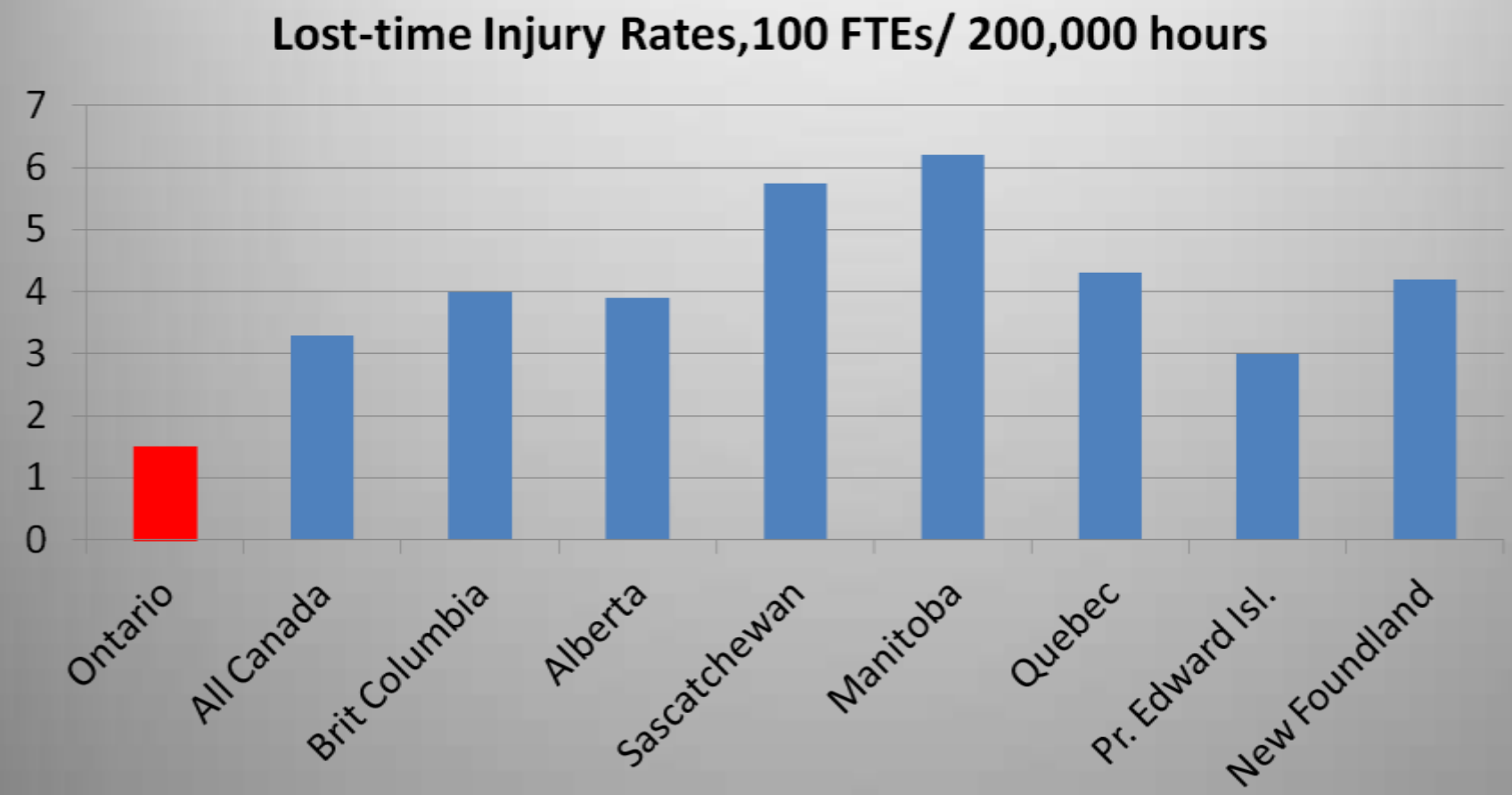
# OH! CANADA!

# Ontario, Canada




CSAO, Annual Report 2008.

# Ontario Compared to Rest of Canada, 2000-2006




Comparable data not available for New Brunswick and Nova Scotia.
Source: CSAO, Annual Report 2008

# Impact of Supervisor Training, Ontario

| Year | Sarnia/Lambton | | Lost Time Injury Rate | |
|---|---|---|---|---|
| | Hours Worked | Cumulative No of Supervisors Trained | Sarnia/Lambton | All Ontario |
| **2004** | 6,443,161 | 555 | 1.27 | 2.56 |
| **2005** | 10,897,814 | 854 | 0.88 | 2.57 |
| **2006** | 11,478,075 | 891 | 0.63 | 2.37 |
| **2007** | 12,671,300 | 1,103 | 0.43 | 2.16 |
| | | | | |
| **No of Trained Supervisors per 100 FTE Workers in 2007** | | | 17.41 | 6.04 |

Thanks to Doug McVittie, CSAO

# Et Tu, USA?

# Chronology of COSH in US

**1775:** Continental Congress orders construction of naval fleet (first Federal construction procurement order)

**1874:** Engineer & Surveyor (now Engineering News Record) founded

**1902:** Maryland passes first State workers compensation law

**1911:** American Society of Mechanical Engineers (ASME) was founded

**1911:** American Society of Safety Engineers (ASSE) founded in New York

**1912:** National Safety Council created in Milwaukee

- Offshoot: Milwaukee Construction Industry Safety Council

**1918:** American National Standards Institute (ANSI)

- 1931: The A10 Committee on Safety and Health in Construction

**1936:** Walsh-Healey (Public Contracts) Act

- Federally procured construction must meet s&h standards

**1968:** Construction Safety Act (Sec. 107 of Contract Work Hours and Safety Standards Act)

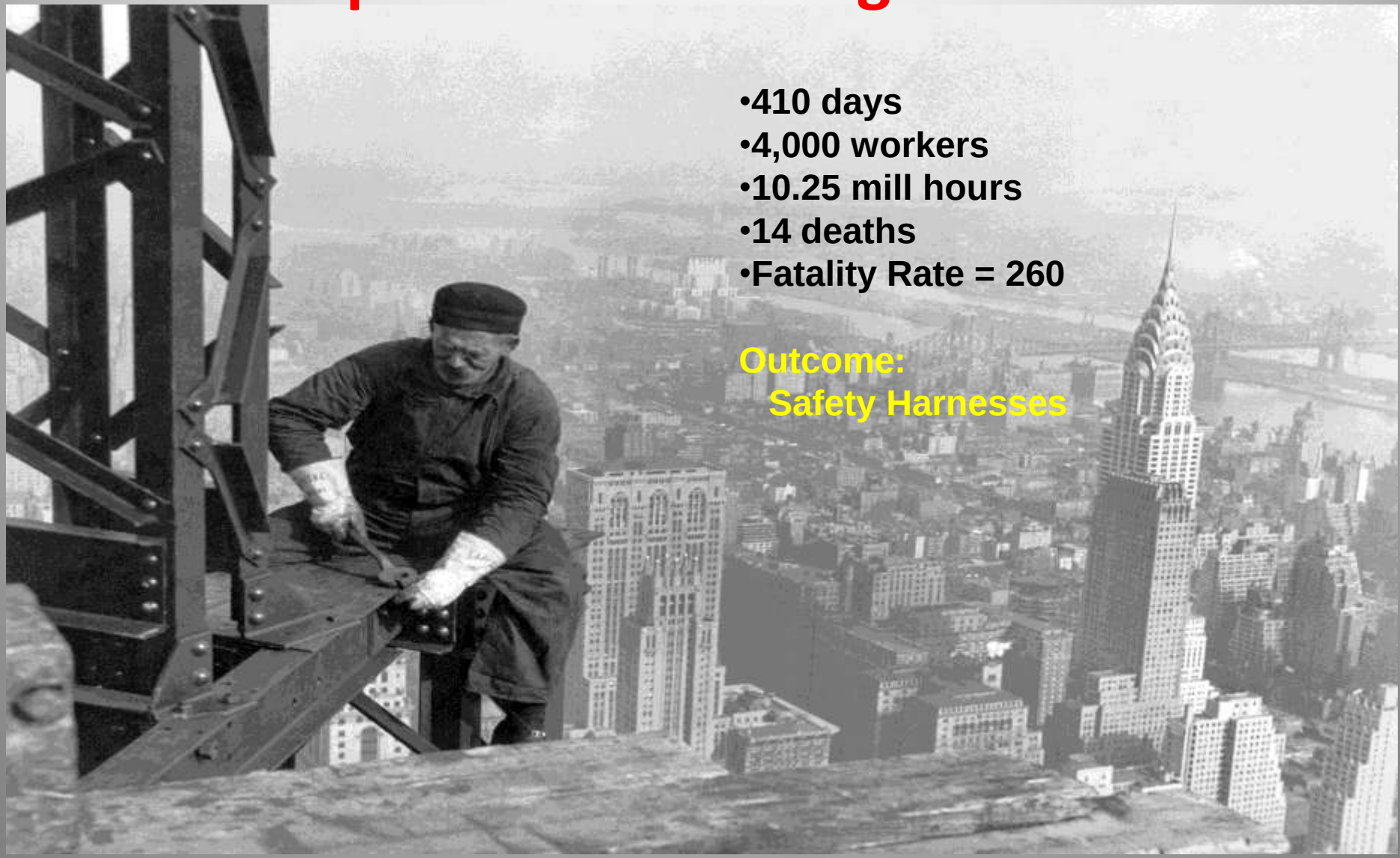
- Advisory Committee on Construction Safety and Health

**1970:** Occupational Safety and Health Act

- 1990: NIOSH construction program created
  - CPWR National Construction Center
    - 1993 and 1995 National Conferences
    - 2000: ELCOSH
- 1994– OSHA Directorate of Construction

**1996:** *Design for Safety* first proposed

# Precedent-setting Projects in US
# Empire State Building 1930-31



- 410 days
- 4,000 workers
- 10.25 mill hours
- 14 deaths
- Fatality Rate = 260

**Outcome:**
**Safety Harnesses**

# Precedent-setting Projects in US
# Golden Gate Bridge, 1933-38

First use of safety nets in US
Outcome:
19 workers saved from certain death
Nets since then in universal use

**First Hard Hat**

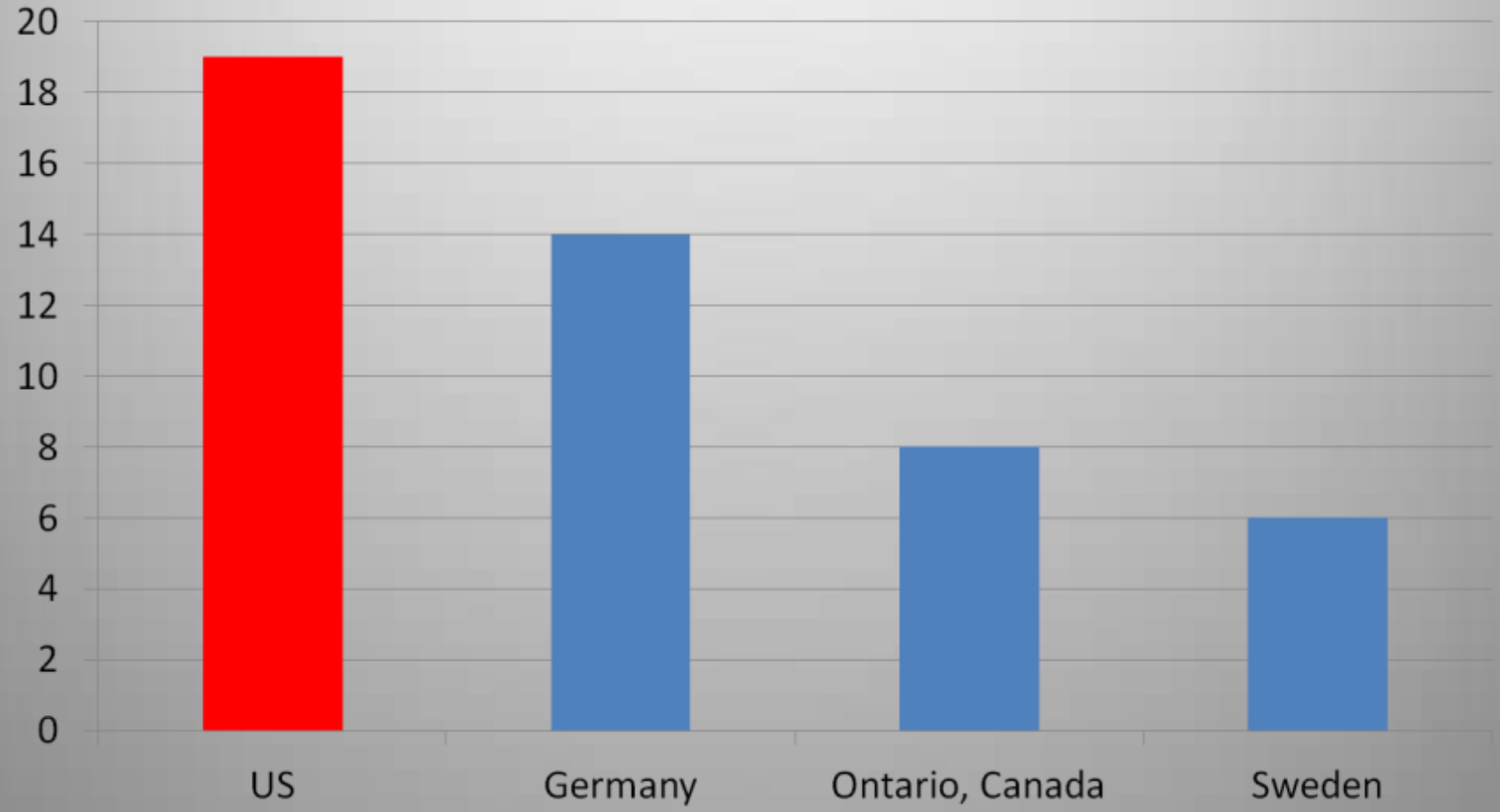
**Also:**

- **First mandatory tie-off**
- **First mandatory gloves**

# Precedent-setting Projects in US
# World Trade Center Towers 1968-72

Led the ban on asbestos in construction in US

# In 1988, US Was Underdeveloped Construction Fatality Rates (1992)



# Congressional Inquiry 1988

- Why does NIOSH spend only $0.08 per construction workers per year while it spends over $2 per manufacturing workers and more than $5 per miner?
- What is NIOSH doing about construction?

# 1988 Agreement

- Unions, large employers and government agree to create systematic program to reduce the risks in construction
- Fundamental premises
  - It had to be ***evidence-based***
  - It had to be ***practical*** and ***cost effective***

# Step 1 Learn from Advanced Countries

- Asked ISSA construction section for help
- Enlisted assistance from Sweden, Germany, Ontario (Canada), Netherlands and Japan

# Step 2: Collect as much Data as Possible

- Union health plan records
- Union death benefit files: PMR studies
- Systematic review of the BLS and other national data

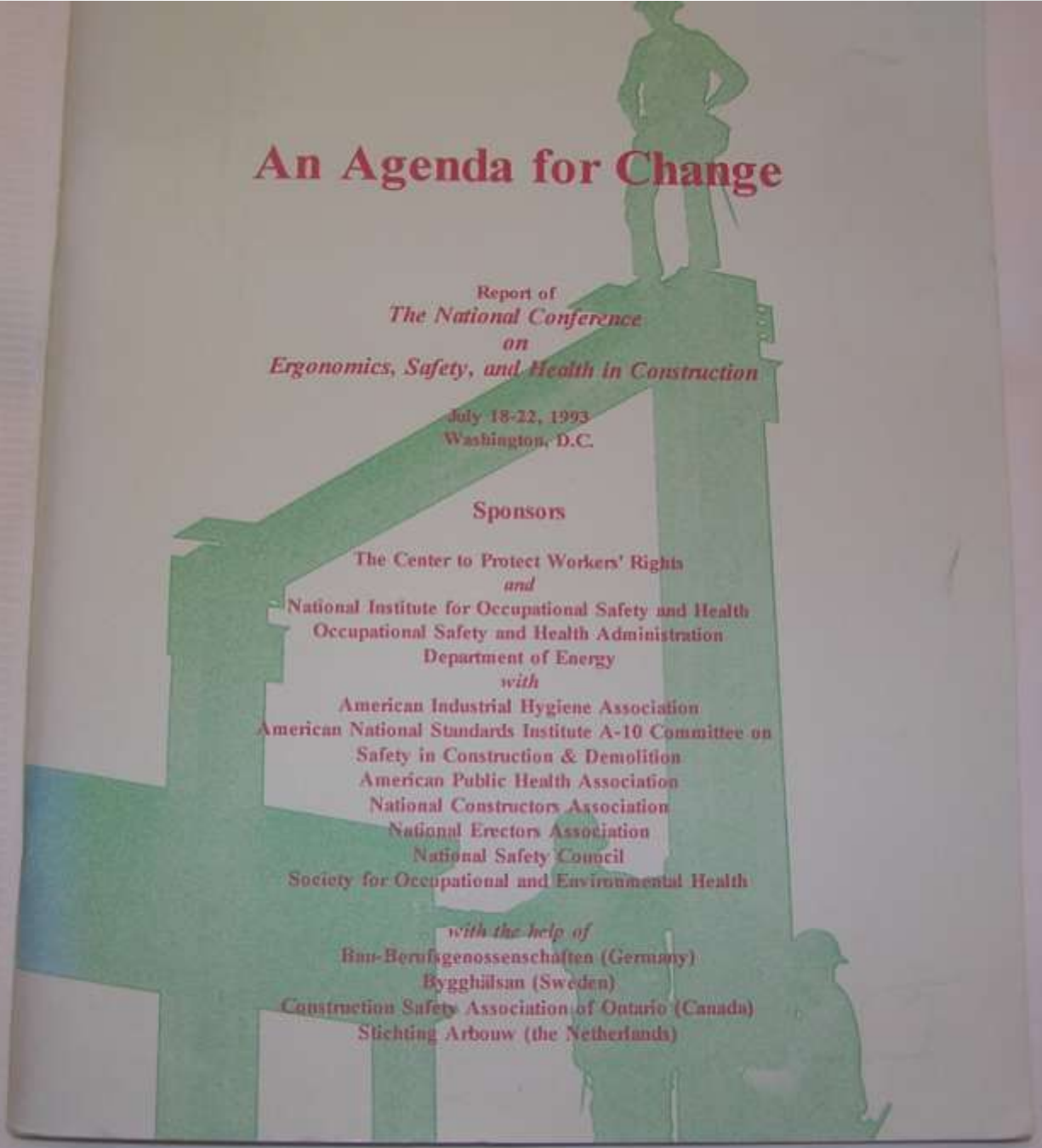
# Step 3: Create National Consensus on Agenda for Change

- 1993 National Conference
  - *An Agenda for Change*
- 1994 Regional Conferences: Boston, Atlanta, Cincinnati, Seattle
  - *Advancing the Agenda for Safety and Health*
- 1995 2nd National Conference
  - *Building a Safety Culture*

# An Agenda for Change

Report of
*The National Conference*
*on*
*Ergonomics, Safety, and Health in Construction*

July 18-22, 1993
Washington, D.C.



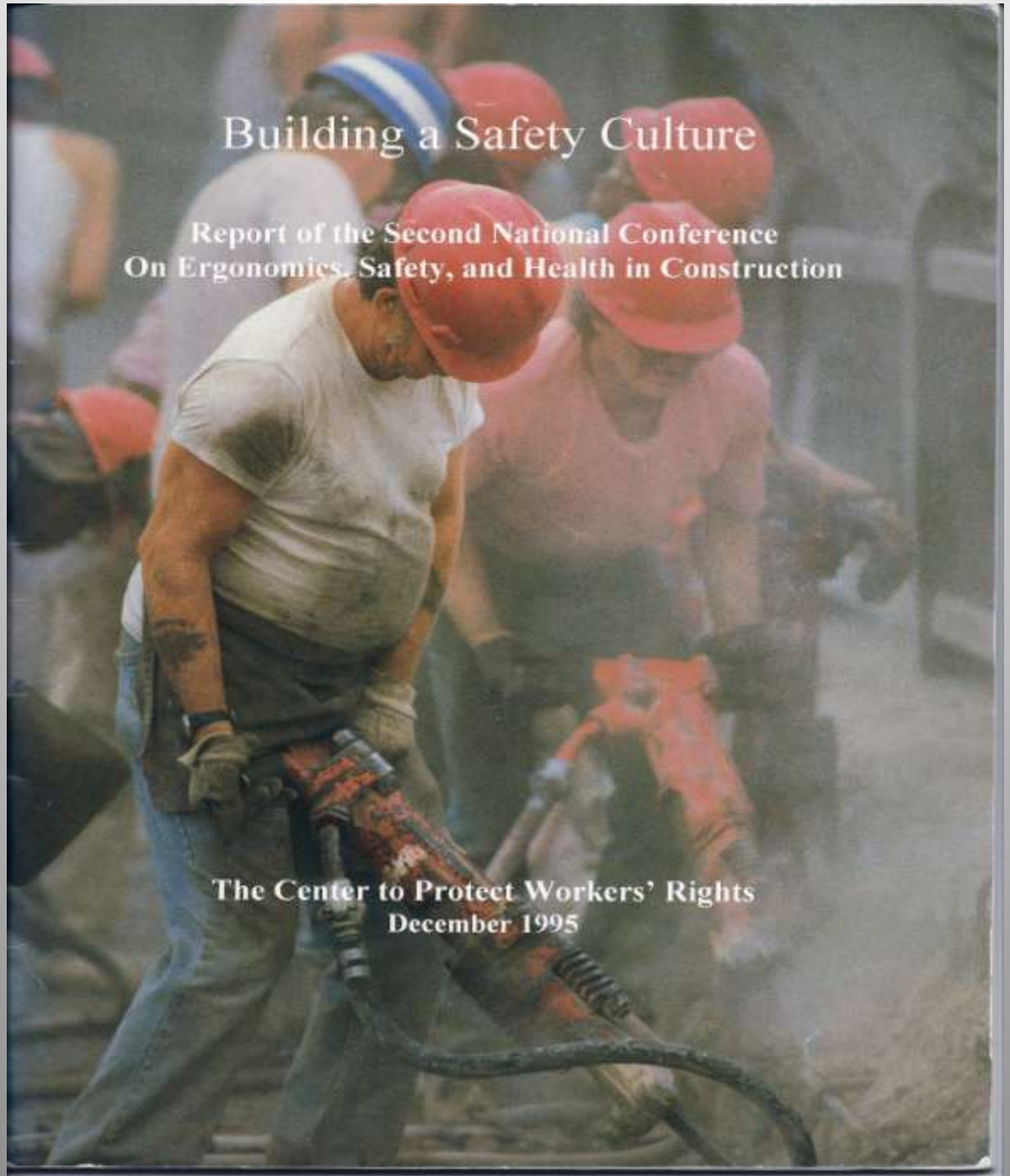
## Sponsors

The Center to Protect Workers' Rights
*and*
National Institute for Occupational Safety and Health
Occupational Safety and Health Administration
Department of Energy
*with*
American Industrial Hygiene Association
American National Standards Institute A-10 Committee on
Safety in Construction & Demolition
American Public Health Association
National Constructors Association
National Erectors Association
National Safety Council
Society for Occupational and Environmental Health

*with the help of*
Bau-Berufsgenossenschaften (Germany)
Bygghälsan (Sweden)
Construction Safety Association of Ontario (Canada)
Stichting Arbouw (the Netherlands)

# Recommendations from 1993 Conference

- Create national and local coalitions
- Require site-specific safety and health plans
- Get vastly improved data
- Find ways to simplify regulatory process
- Simply workers compensation procedures
- Promote combining workers comp and health insurance
- Expand joint labor-management programs
- Strengthen international cooperation
- Expand research programs to characterize industry


Building a Safety Culture
Report of the Second National Conference
On Ergonomics, Safety, and Health in Construction
The Center to Protect Workers' Rights
December 1995

# Recommendations from 1995 Conference

- Safety culture is a shared responsibility
- Safety culture should apply to all construction
- Benchmarks and performance goals are needed
- Labor inspectorate (OSHA) must remain backbone
- International cooperation is critical
- Safety and health training should be mandatory
- More research is needed on effectiveness of interventions

# Step 6: Engage in Systematic Research and Intervention

**1993:** work with leading contractors and government
- Precertification on public works jobs
- Highway work zone
- Falls from heights
- Electrocutions

**1995:** Special Emphasis
- T-BEAM → Hot work, lead
- Ergonomics

**1995:** Demonstrations of negotiated agreements on workers comp

**1996:** Smart Mark basic OSH Training

**1997:** Construction Industry Chart Book (now in 4th ed.)

**1999:** www.elcosh.org

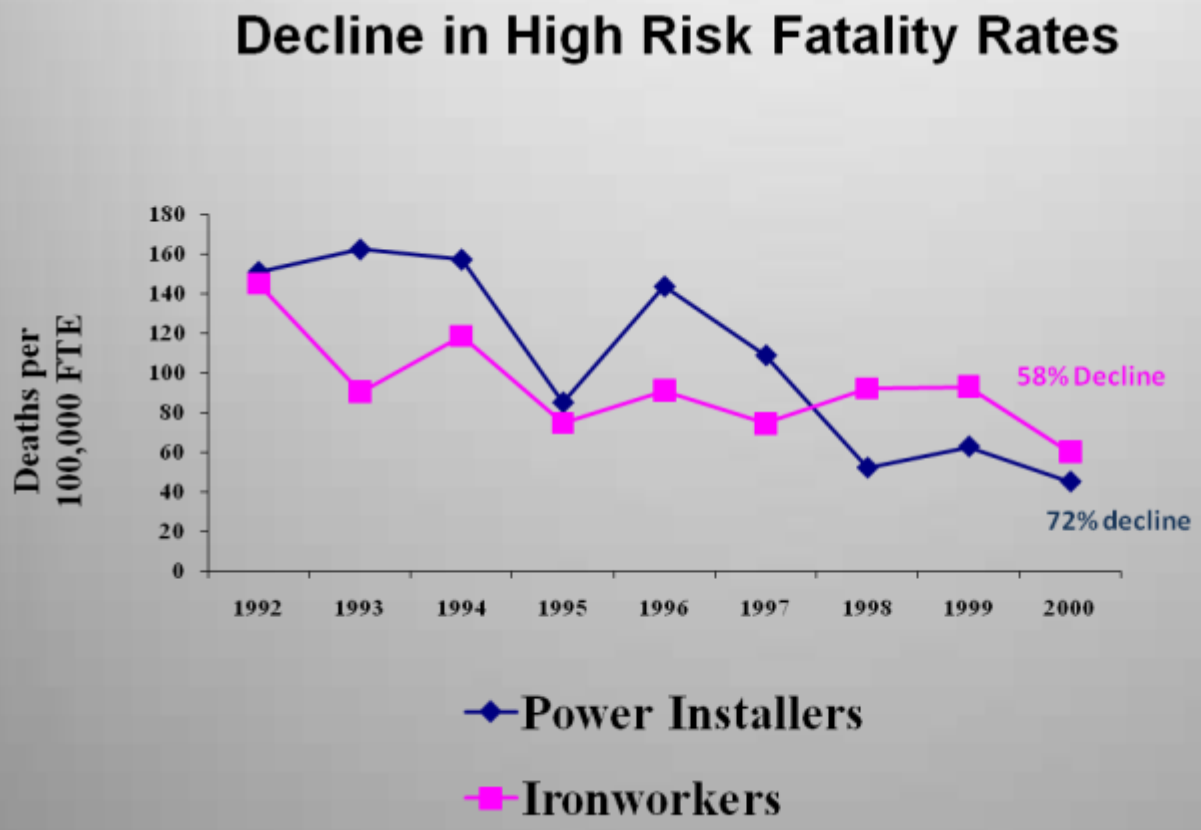
**2003:** Immigrant workers

**2007:** S&H Specifications for "green" construction

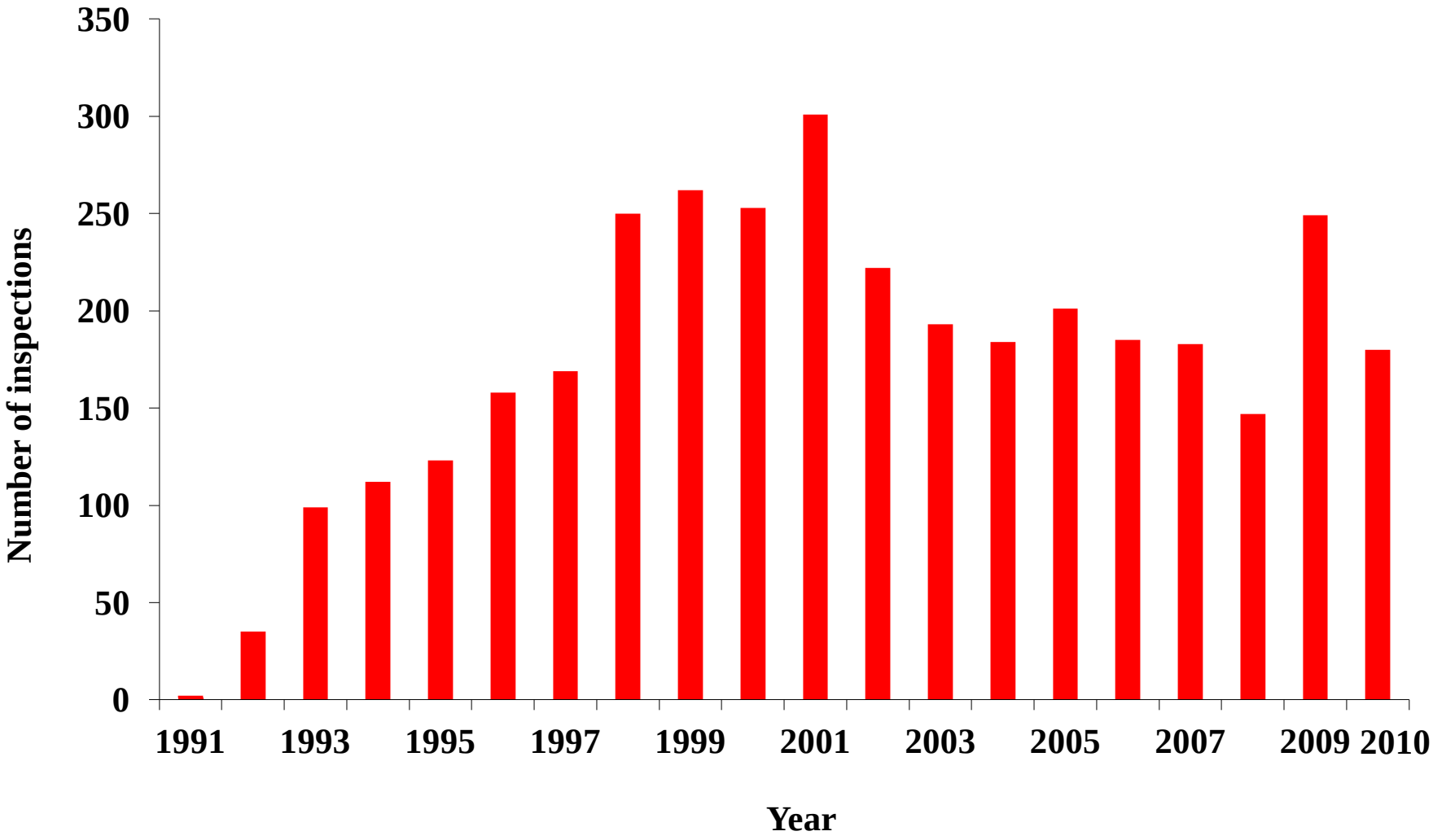
**2008:** www.Constructionsolutions.org

**2010:** Performance (leading)indicators

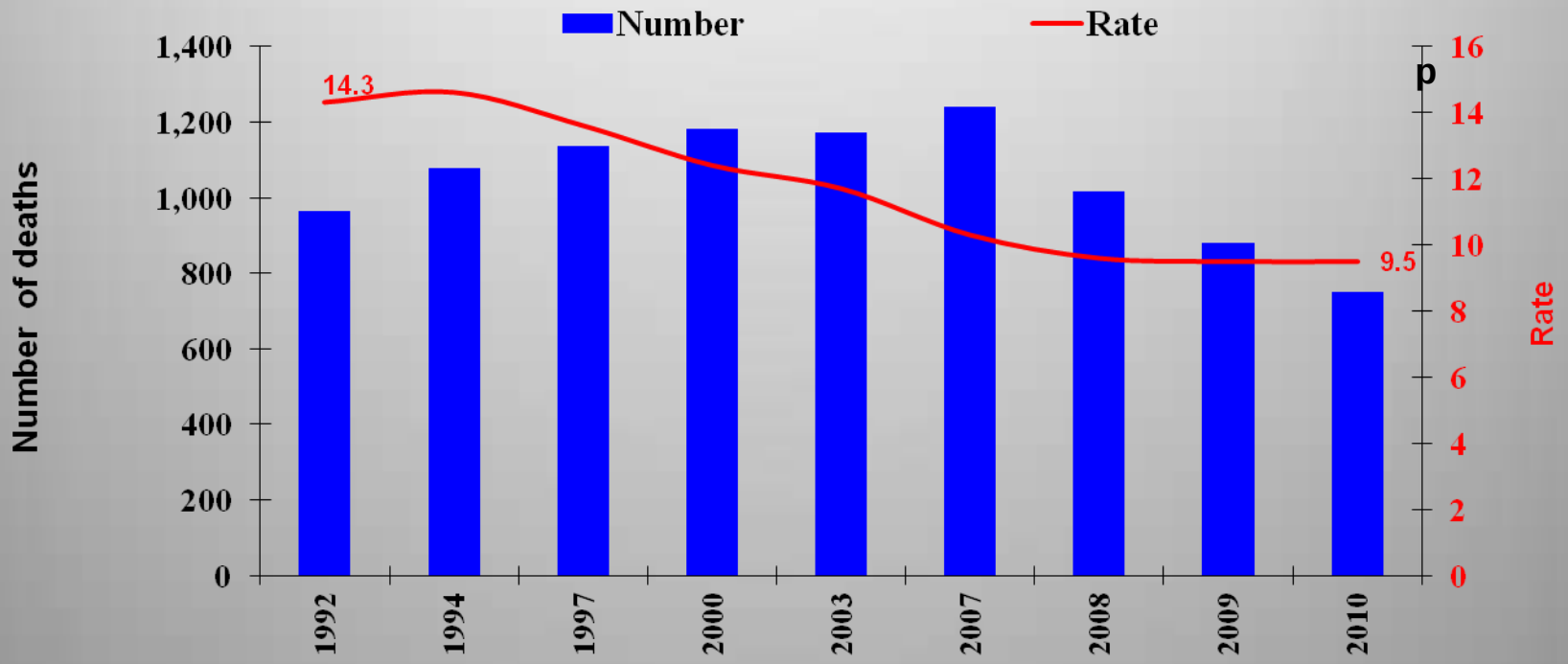
# Example: US Focused Campaigns



## 44d. OSHA lead exposure inspections, 1991-2010



# Fatal Injuries:
## 1992-2010 decline in rate = 33.6%

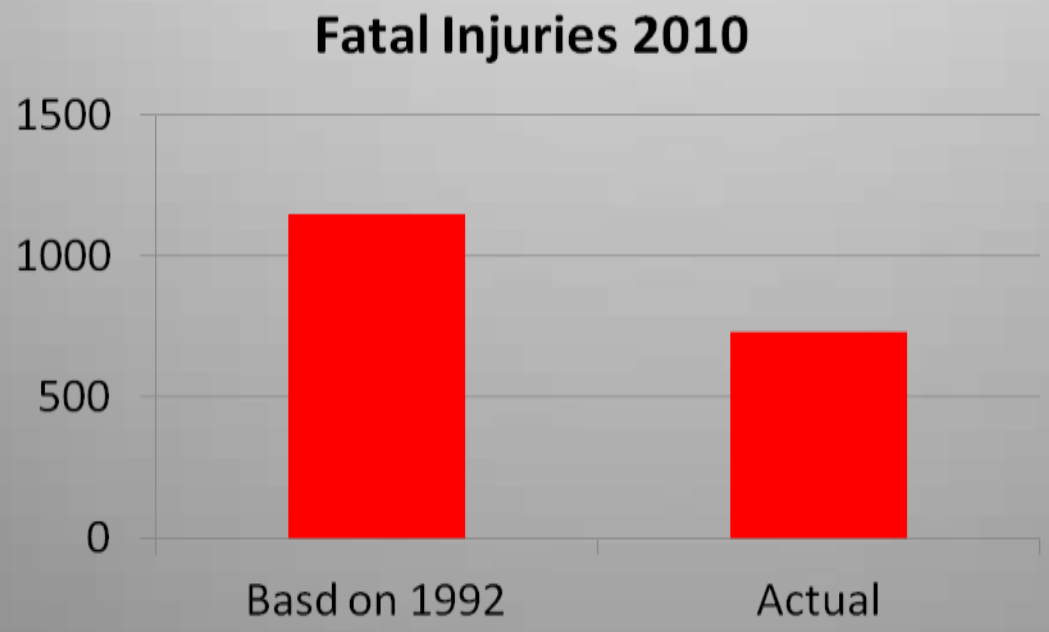



**Construction accounted for 8% of workforce, but 22% of work-related deaths in the U.S.**

Source: U.S. Bureau of Labor Statistics, Current Population Survey (CPS), 1992-2007;
Census of Fatal Occupational Injuries (CFOI), 1992-2007

# Bottom Line

Had fatality rate stayed where it was in 1992 the US construction industry would today be recording  450 additional deaths per year



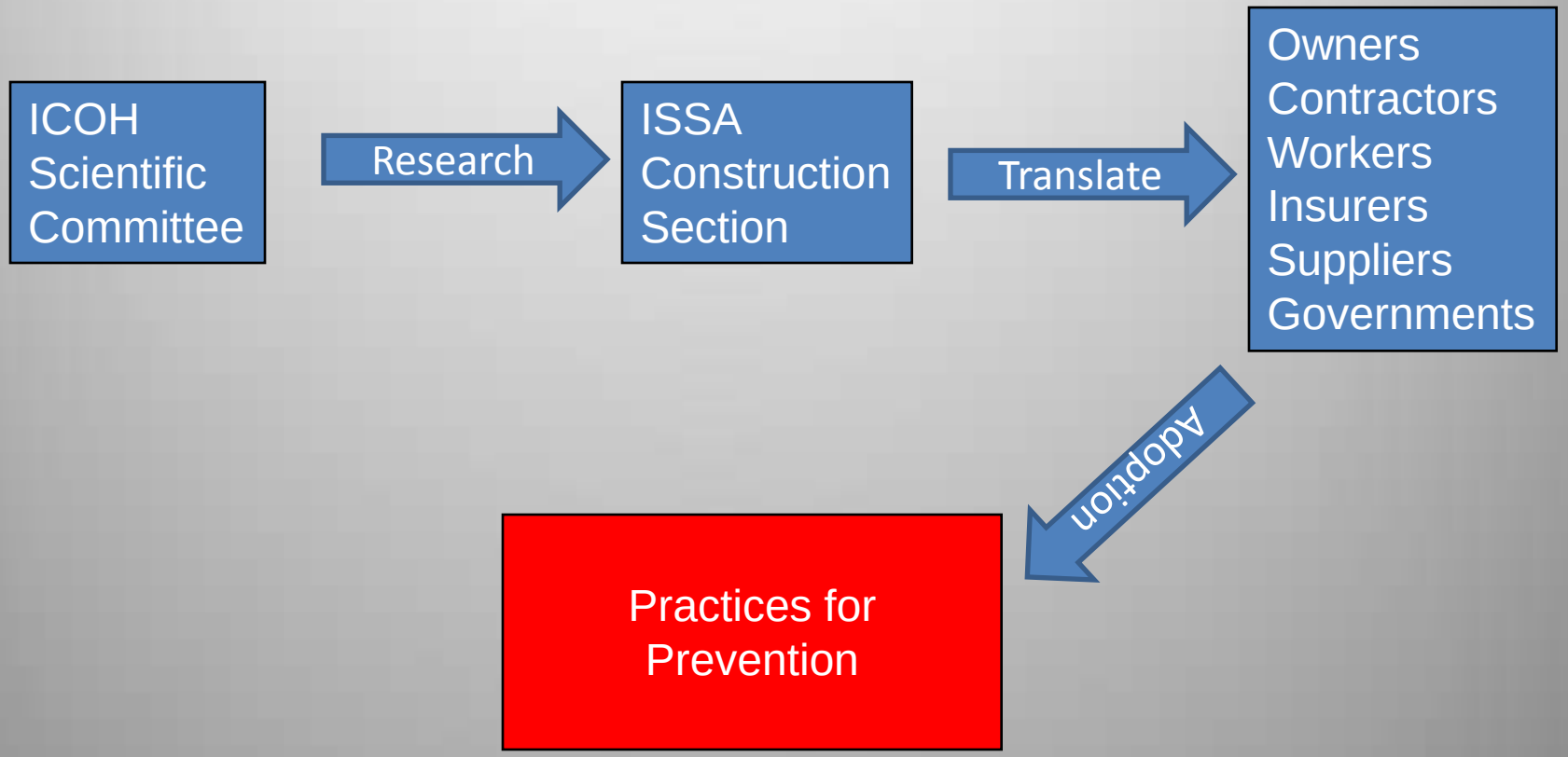
# Part 6:  The State of COSH Policy

# PRECEDENT-SETTING PROJECTS
# Olympic Delivery Authority, London

- 35,000 workers
- No fatalities
- Reportable injury rate=0.03/100FTEs
- **A model for owner-controlled safety performance and safety culture**

Thanks to Paul Gordon, British Safety Council

# Research to Practice (R2P)



issa
INTERNATIONAL SOCIAL SECURITY ASSOCIATION
ASSOCIATION INTERNATIONALE DE LA SÉCURITÉ SOCIALE
ASOCIACIÓN INTERNACIONAL DE LA SEGURIDAD SOCIAL
INTERNATIONALE VEREINIGUNG FÜR SOZIALE SICHERHEIT
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Section on Prevention in the Construction Industry
www.issa.int/prevention-construction

## Board Members

ARBOUW
BG BAU Berufsgenossenschaft der Bauwirtschaft
CRAMIF Assurance Maladie d'Ile-de-France
IFI
navb·cnac constructiv
CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

## Members

CNSS
OPPBTP La prévention BTP
CSST
NPS
AAA
BG RCI Berufsgenossenschaft Rohstoffe und chemische Industrie
MINISTÉRIO
FUNDACENTRO
JCOSHA Japan Construction Occupational Safety and Health Association
TEE
KOSHA
suva insurance plus
GNM ST
CNAM
BWI
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AUVA Soziale Unfallversicherung
OPREBATPH
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ivme
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L&T Hydrocarbon Construction & Pipelines

# THE DECLARATION OF BRUSSELS

*25th november 2009*

issa | INTERNATIONAL SOCIAL SECURITY ASSOCIATION

*Section on Prevention in the Construction Industry*

## XXIXTH INTERNATIONAL SYMPOSIUM OF THE ISSA CONSTRUCTION SECTION ON OCCUPATIONAL SAFETY AND HEALTH IN THE CONSTRUCTION INDUSTRY

***BRUSSELS, BELGIUM 23-25 NOVEMBER 2009***

**WHEREAS** the International Social Security Association (ISSA) was established to perfect and develop public social protection based on the solidarity of all citizens through international cooperation;

**WHEREAS** the ISSA Bureau established the Construction Section to carry out actions to prevent occupational accidents and diseases in the construction industry;

**WHEREAS** one of the main activities of the Construction Section has been to convene the International Symposium of the ISSA Construction Section on Occupational Safety and Health in the Construction Industry to identify and address important safety and health demands through research, innovation and good practice;

**WHEREAS** life expectancy has increased significantly in most nations during the last 20 years, whether they are developed or emerging economies, and will most likely continue to do so, thereby placing greater pressure on the Social Security arrangements that have been created;

**WHEREAS** progress has been made in safety and health, the construction industry is still a high risk sector with respect to accidents and occupational diseases, often resulting in premature death or disability retirement; and

**WHEREAS** globalization has provided economic opportunities for many parties involved, it has also affected the Social Security arrangements that have been created worldwide and has challenged the progress that has been made in safety and health performance in the construction industry. This is in particular due to the use of workers from low-wage countries as those workers are often employed under the worst working conditions.

# Overarching Resolutions

- All nations should :
  - Recognize that the construction industry is still **a high risk industry**
  - Ensure that construction is conducted according to the **highest labor standards**.
  - All workers are entitled to **risk prevention**, **rehabilitation** and proper **compensation** for injured workers.
  - Provide for working conditions that enable workers to **reach their normal retirement age** without any harmful effects on their health
  - Require that **work tasks be adapted** to the workers' functional capacity**.**
  - Reaffirm their commitments to safety and health **as an essential part of Social Security arrangements**

# Recommended Actions

1. OSH policies should be kept current with global best practices;
2. OSH strategies should consider unique characteristics of each country;
3. Social security agencies should foster a culture that favors safety and health;
4. All stakeholders have a responsibility for ensuring safety and health;
5. On the company level, workers should be involved in all phases of safety and health operations;
6. Safety and health performance should be measured on all levels and should be improved based on findings;
7. Strengthened labour inspectorates is an essential underpinning;
8. Public clients should lead in the adoption of tenders requiring best safety and health practices.

# *Please Come to Boston…*

**BOSTON • USA • 16-18 October 2012**

XXX$^{th}$ International Symposium of the ISSA Construction Section on Occupational Safety and Health in the Construction Industry

CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

issa

**www.issaboston2012.org**

Incredible India

# PART 5: ADOPTION IN INDIA

# Incredible, but for…

- 35,000-150,000 fatalities/yr
  - Official count is 1,600
- Child labor common
- Abuse of women workers widespread
- Obsolete hazards such as asbestos widely used

# Construction Industry, India

- 31,000,000 workers
- Construction spending doubling every five years

*"Workers employed in Construction works are highly vulnerable segments of labour force particularly because of its unorganized nature. The workers in construction industry are characterized by inherent risk to the life and limbs. The construction activities are also characterised by its casual nature, temporary relationships between employer and employee, uncertain working hours, lack of basic amenities, inadequacy of welfare facilities and casual approach of employers for the problems of workers. In the absence of adequate statutory provisions, the requisite information regarding the nature and number of accidents is also not generally available."*

*11th Five Year Plan (2007-2012),* p. 57.

# But, India Has Excellent Legislation

| Year | List of Applicable Laws |
|---|---|
| 1884 | The Explosives Act (amended 1983) |
| 1923 | The Indian Boiler Act (amended 2007) |
| 1934 | The Petroleum Act |
| 1962 | The Atomic Energy Act (amended 1987) |
| 1983 | The Static and Mobile Pressure Vessel (unfired) Rules |
| 1983 | The Dangerous Machines (Regulation) Act (amended 2001) |
| 1988 | The Motor Vehicles Act |
| 2002 | The Petroleum Rules |
| 2003 | The Electricity Act, 2003 (replaced The Indian Electricity Act, 1910) |
| 2004 | The Gas Cylinder Rules |
| 2004 | Radiation Protection Rules |
| 2005 | The Disaster Management Act |

# Comprehensive Laws

- Act No. 27 of 1996: The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act
  - Provides a full range of safety and health protections
- Act No. 28 of 1996: The Building and Other Construction Workers Cess Act
  - Authorizes the States to collect a tax on all construction to be used for the welfare of construction workers and their families.

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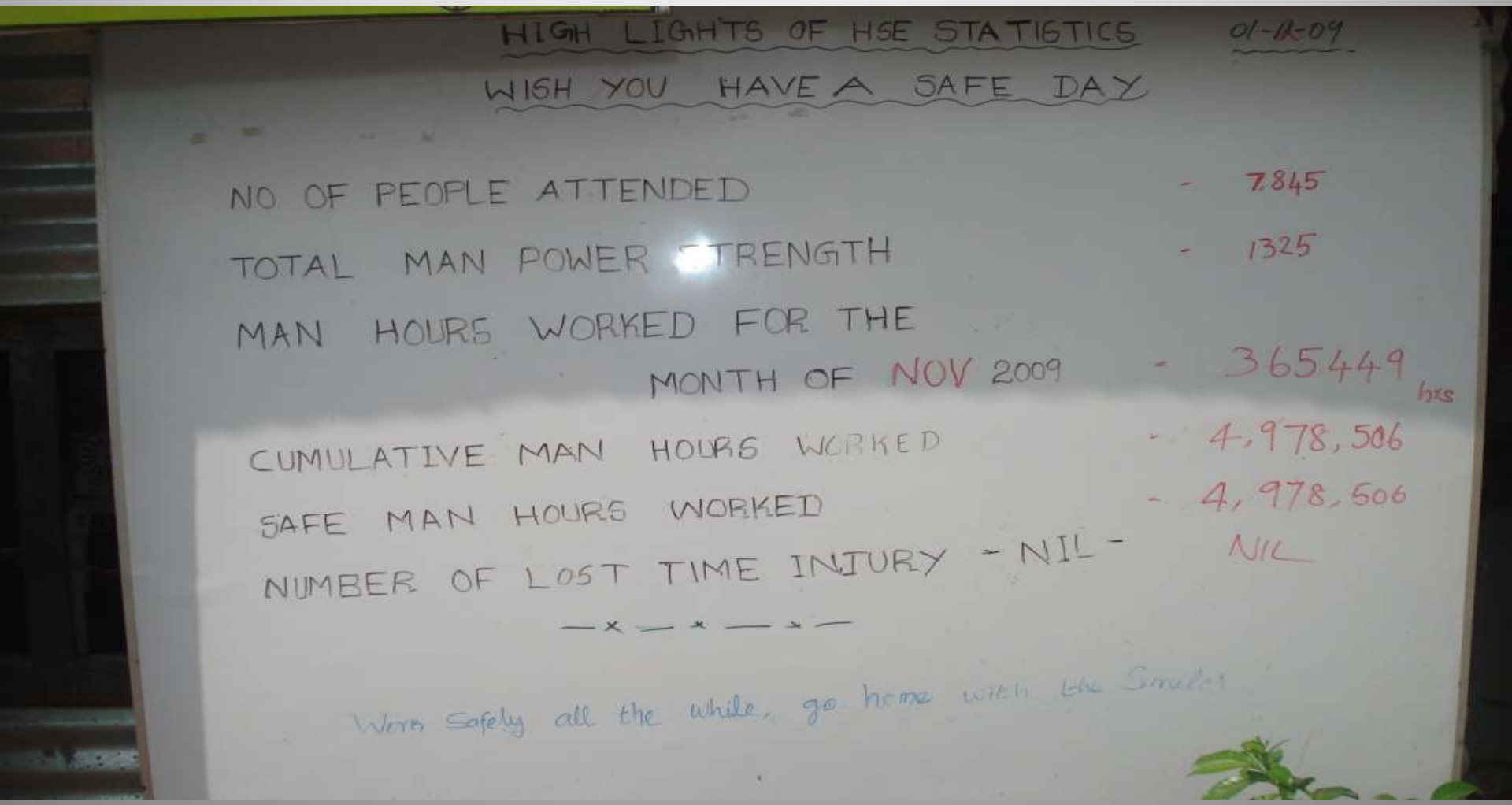
  - Authorizes the States to collect a tax on all construction to be used for the welfare of construction workers and their families.

*…But the laws have not been acted on*

# GLOBAL HSE PRACTICES IN CONSTRUCTION

# Safety Shack, Construction Project, Chennai

# Safety Shack, Construction Project, Chennai



# TYPICAL PRACTICES IN CONSTRUCTION

# The Unskilled Workforce

- In 2009, wages were Rs 130-150day/worked
- Employed is taken from desperation and given with distain
- At this level of pay, there is no economic incentive for safety
- Occupational injuries for these workers not recorded

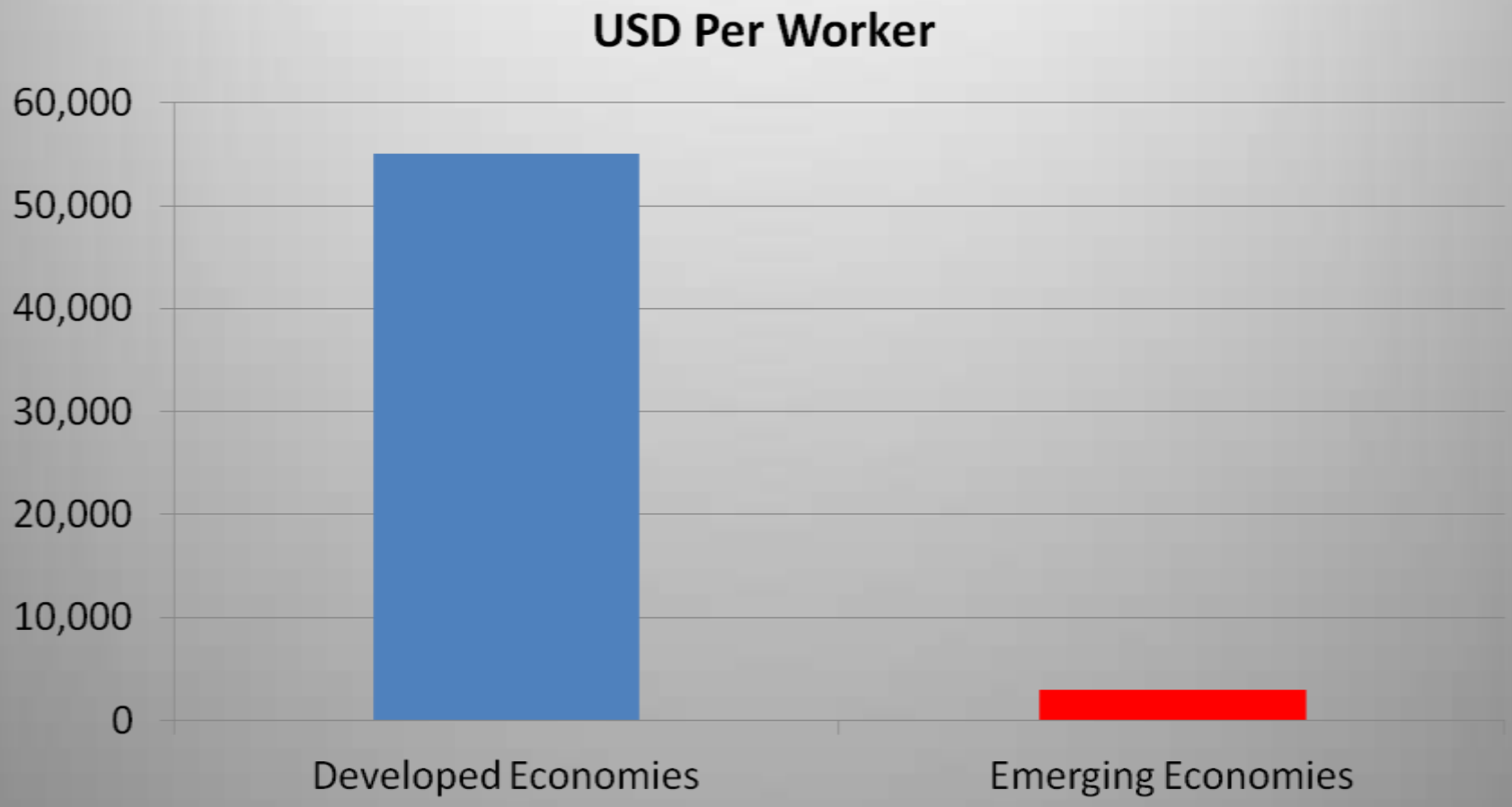
# The Unskilled Workforce

- In 2009, wages were Rs 130-150day/worked
- Employed is taken from desperation and given with distain
- At this level of pay, there is no economic incentive for safety
- Occupational injuries for these workers not recorded

## The Dilemma

- To make safety pay, skill levels and productivity need to be increased
- This conflicts with policy goal of full employment

# Capital Investment
# Top Tier Contractors



# Other Key Challenges

- Weak knowledge base for both exposures and outcomes
- Solutions must be *practical* and *cost effective*

# New Delhi, December 2009

# Goal 1: India should aim to adopt policies in accordance with the Declaration of Brussels

1. OSH policies should be kept current with global best practices
2. OSH strategies should take into account unique characteristics of each country
3. Social security agencies should foster a culture that favors safety and health
4. All stakeholders have a responsibility foe ensuring safety and health
5. On the company level, workers should be involved in all phases of safety and health operations
6. Safety and health performance should be measured on all levels and should be improved based on findings
7. Strengthened labour inspectorates is an essential underpinning
8. Public clients should lead in the adoption of tenders requiring best safety and health practices

# Goal 2. India should adopt a goal of making its construction industry as fully sustainable as possible in terms of safety and health

a) A sustainable construction industry is in the interest of all stakeholders: the clients who get a better quality product, the employers who get a more productive work force and the workers who get a better work environment.

b) It must be the industry's responsibility to create a sustainable environment, but this can only be realized if the government at all levels assures the enforcement of Building and other Construction Worker Act by qualified personnel.

c) India's construction industry lacks sustainability in general and in particular for its unskilled labor force. There is an urgent need to upgrade the working conditions for unskilled workers, and to expand skills training for all workers.

d) The leading construction clients, including the energy sector and public works, and the leading construction contractors, suppliers and relevant industrial accident insurance providers, should serve as role models and leaders in promoting best safety and health practices

# Goal 3. Safety and health needs to be strengthened in several key areas

a) Mandatory comprehensive safety and health training and certification of such training for all workers and supervisors should be implemented. International assistance for capacity building should be sought.

b) The lack of valid data on employment, hazardous exposures, and work-related deaths, injuries and illnesses is a major impediment to the implementation of this action plan. Documentation of the current baseline and changes in the future is needed to guide an effective national policy. A national data base on employment and OSH is needed.

c) The level of knowledge of traumatic risks, chemical and other health hazards including ergonomic risks needs to be improved urgently. There is a great need for better integration of safety engineering, industrial hygiene, ergonomics and human factors sciences, and occupational medicine

d) Workers should be involved in all aspects in the recognition and prevention of hazards and should receive training for this purpose

***A white paper based on these action items will be prepared and submitted to the industry and government.***

A WHITE PAPER

*PRESENTED TO*
THE PEOPLE OF INDIA AND THEIR GOVERNMENTS
*AND*
THE CONSTRUCTION INDUSTRY OF INDIA

# *STRENGTHENING OCCUPATIONAL SAFETY AND HEALTH IN INDIA'S BUILDING AND CONSTRUCTION INDUSTRY*

BASED ON THE ACTION PLAN
ADOPTED BY
*International Symposium on Safety and Health in Building and Construction*

# Key Recommendations

- Strengthen labour inspectorate
  - In 2011, the Factory Inspectorate of India created a directorate dedicated to construction, which is located in Chennai

# Key Recommendations

- Strengthen labour inspectorate
  - In 2011, the Factory Inspectorate of India created a directorate dedicated to construction, which is located in Chennai
- Establish partitarian safety and health dedicated to construction safety and health organization using the authority and funding in the Cess Act
  - Several States are acting on this recommendtion

# CONCLUDING COMMENTS

# A New Era: Sustainable Construction

- Life cycle perspective
- Energy optimization
- CO2 emission minimization
- Minimal waste of resources
  - **Including human resources**

**Sustainable construction =**
**Enabling workers to enjoy life-time careers**
**free of work-related disability or death**

**The Basics of Construction Safety are Not complicated**

**There is no excuse not to act**

# ISSA: Pictures for Prevention

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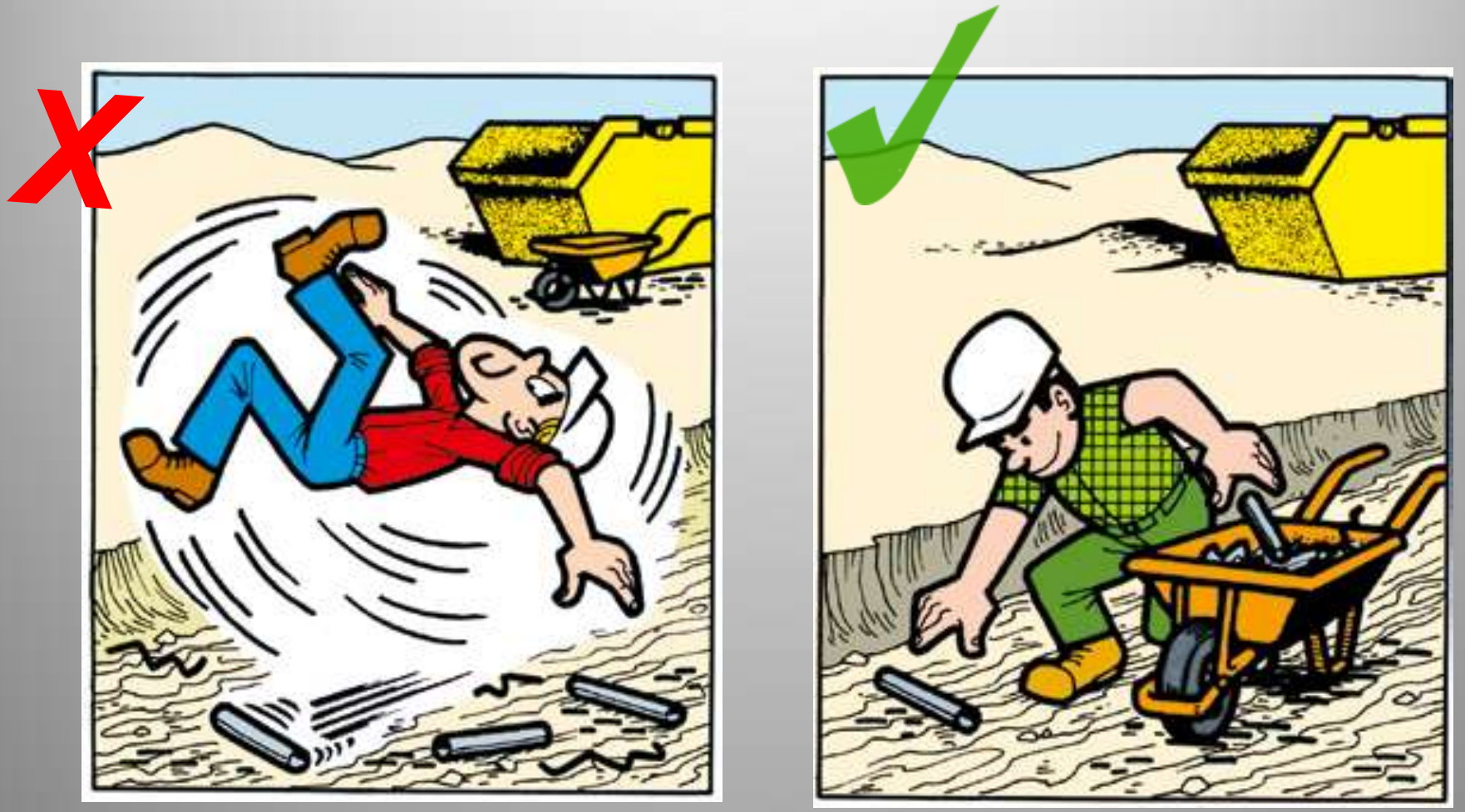

http://dl.dropbox.com/u/909355/DOCs/2009_11_ISSA-C_Brochure_of_Pictures.pdf

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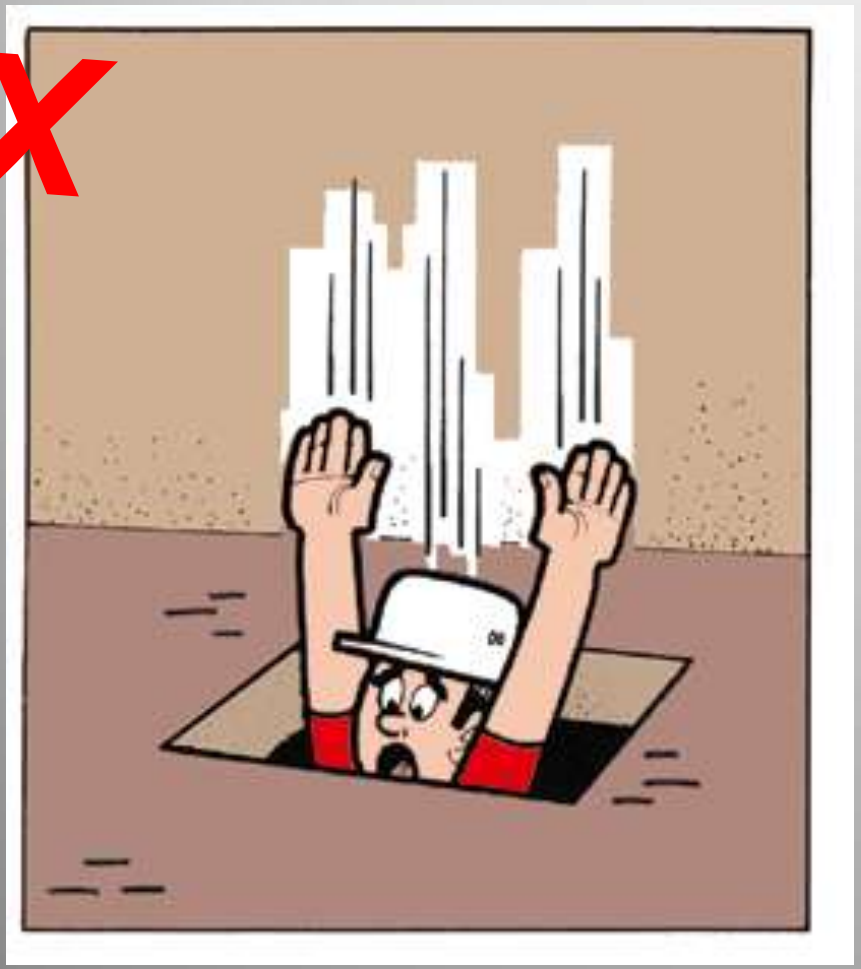

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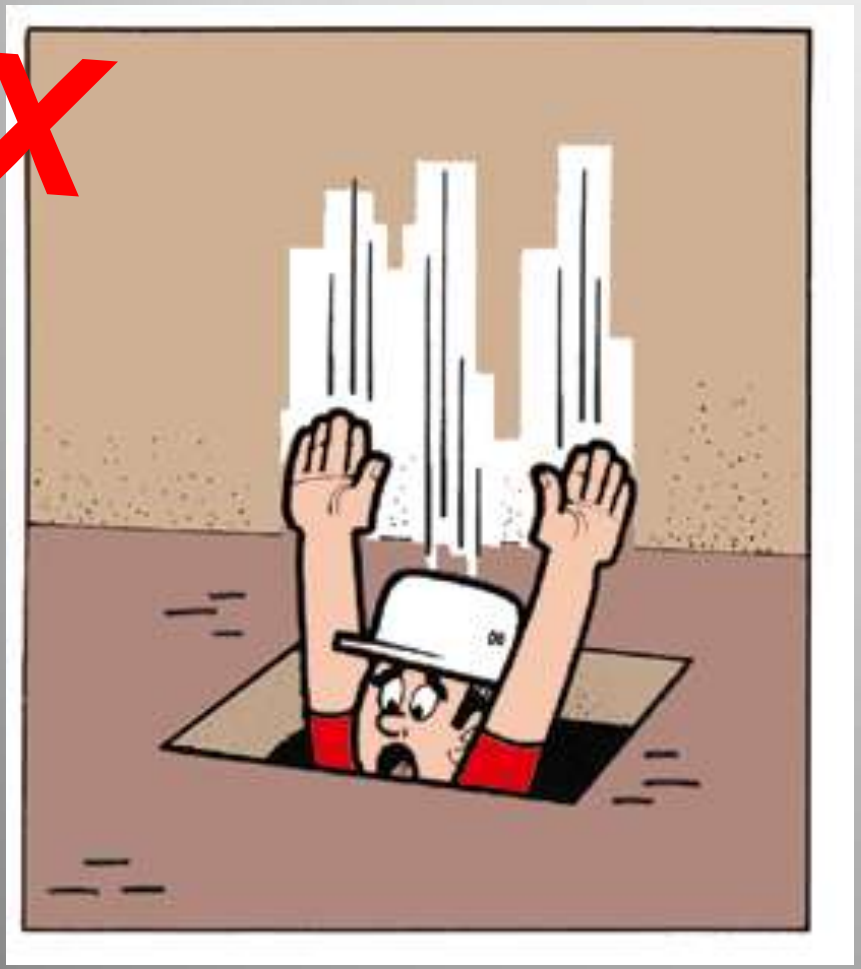

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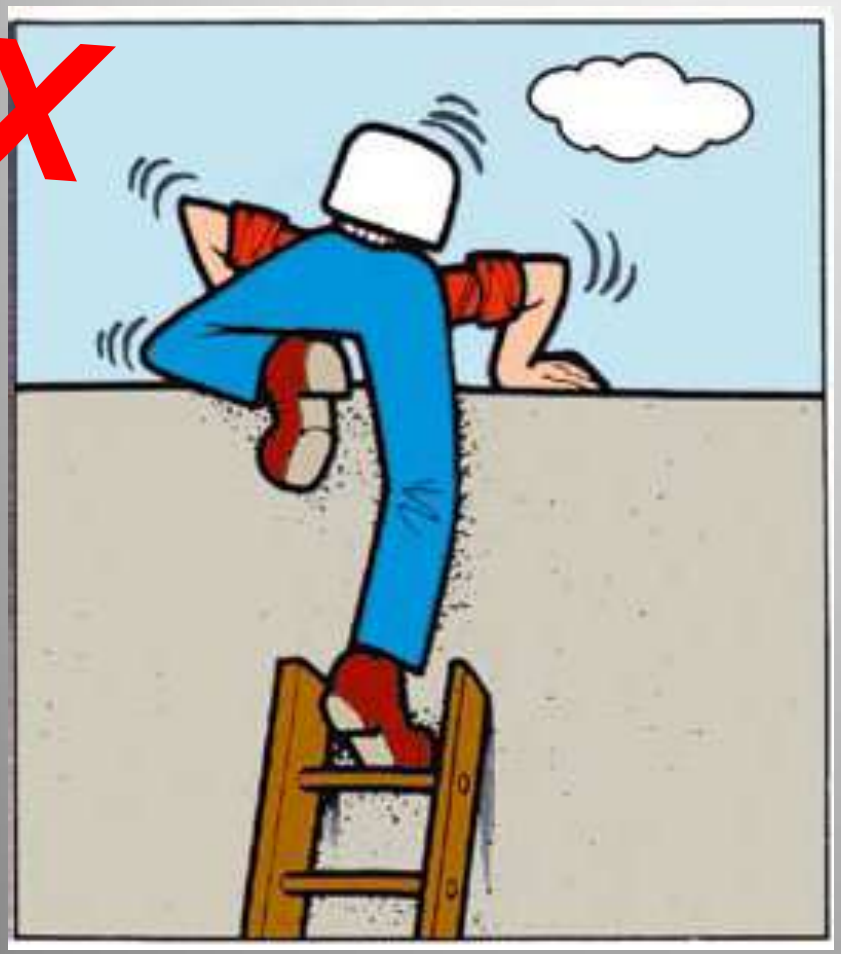

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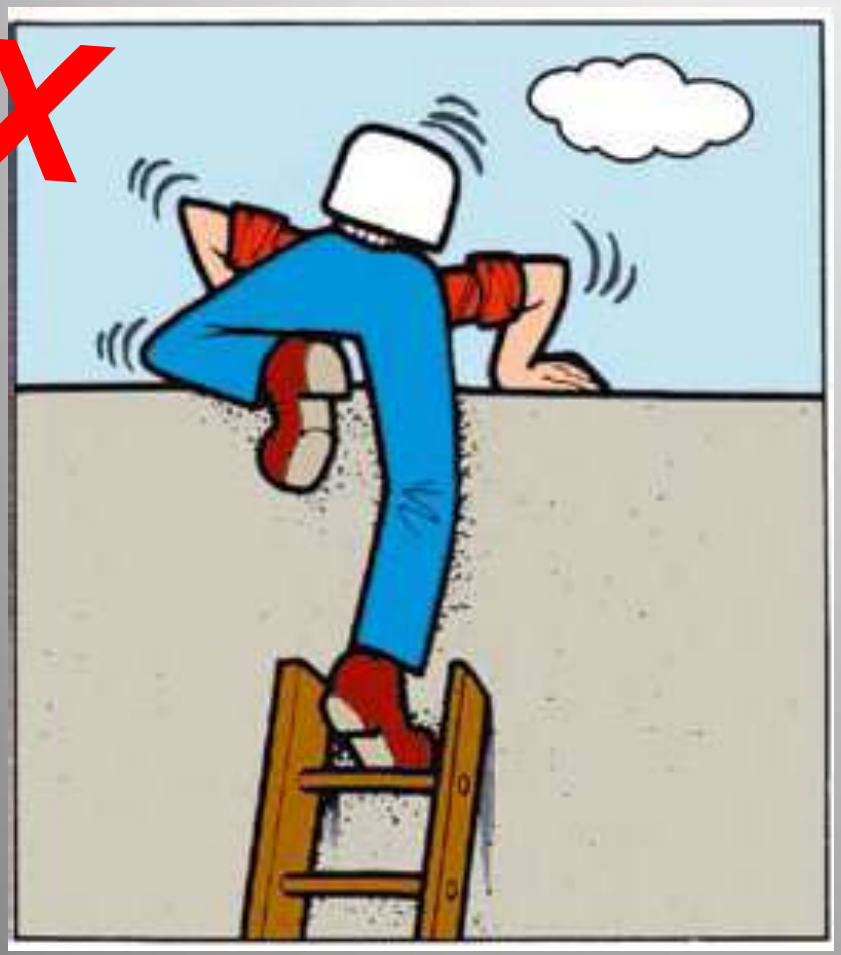

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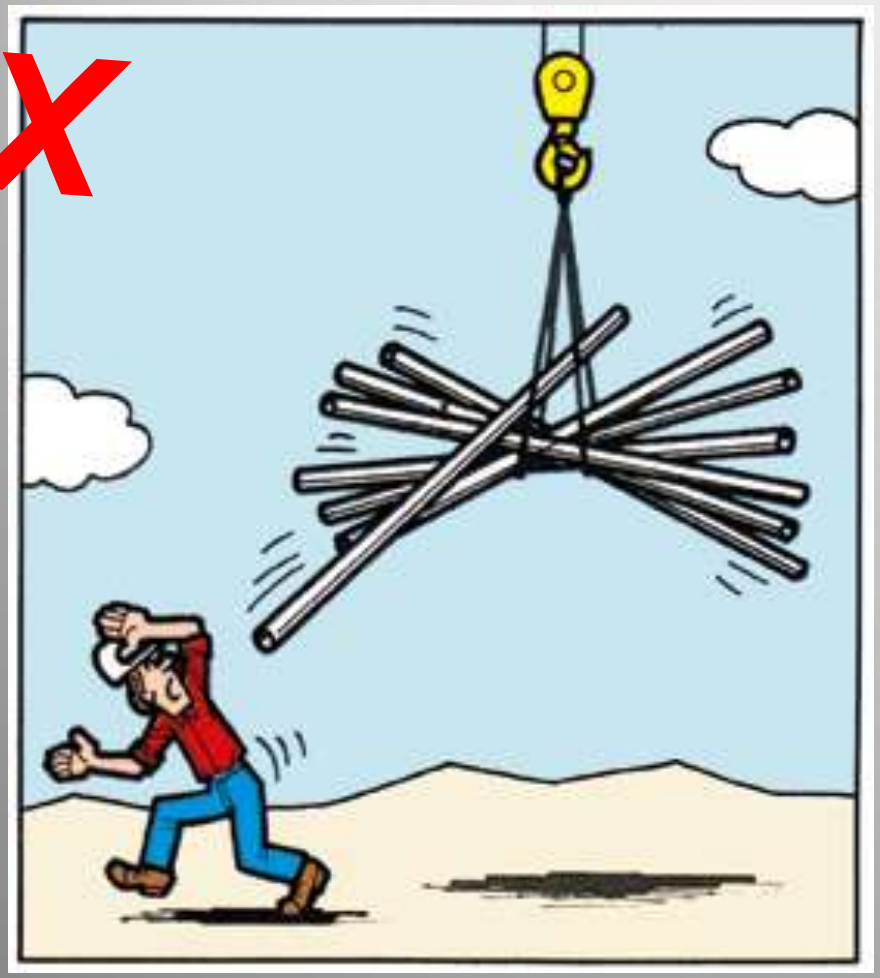

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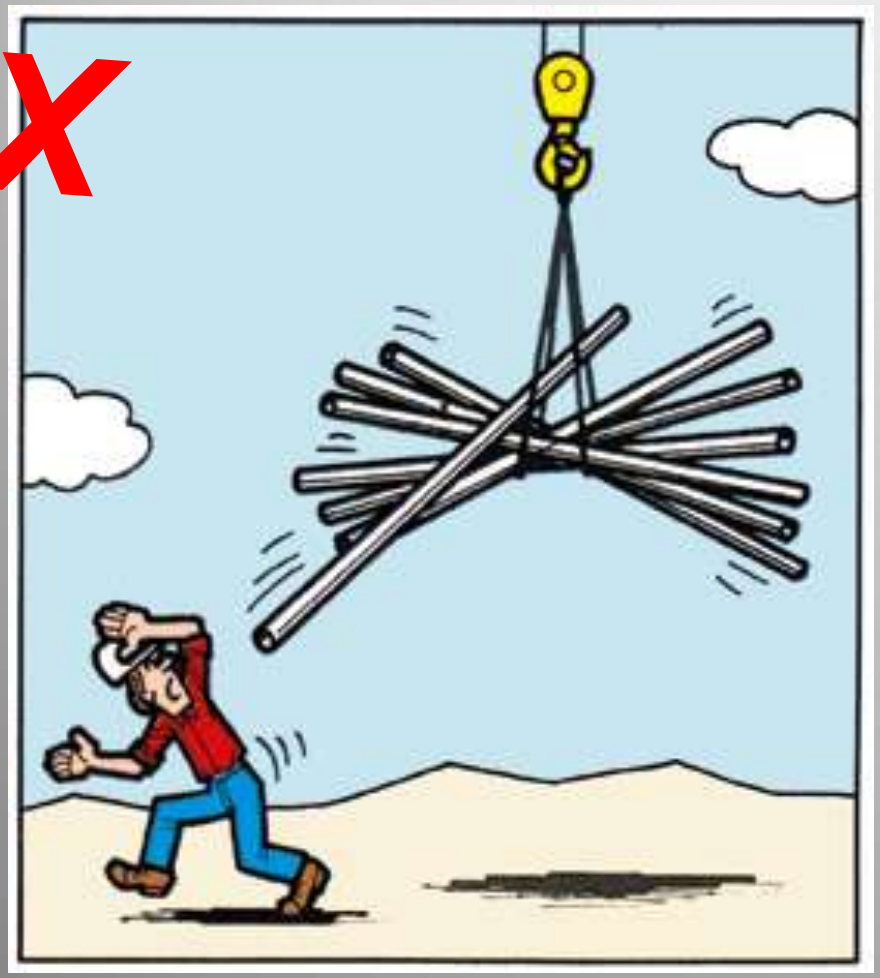

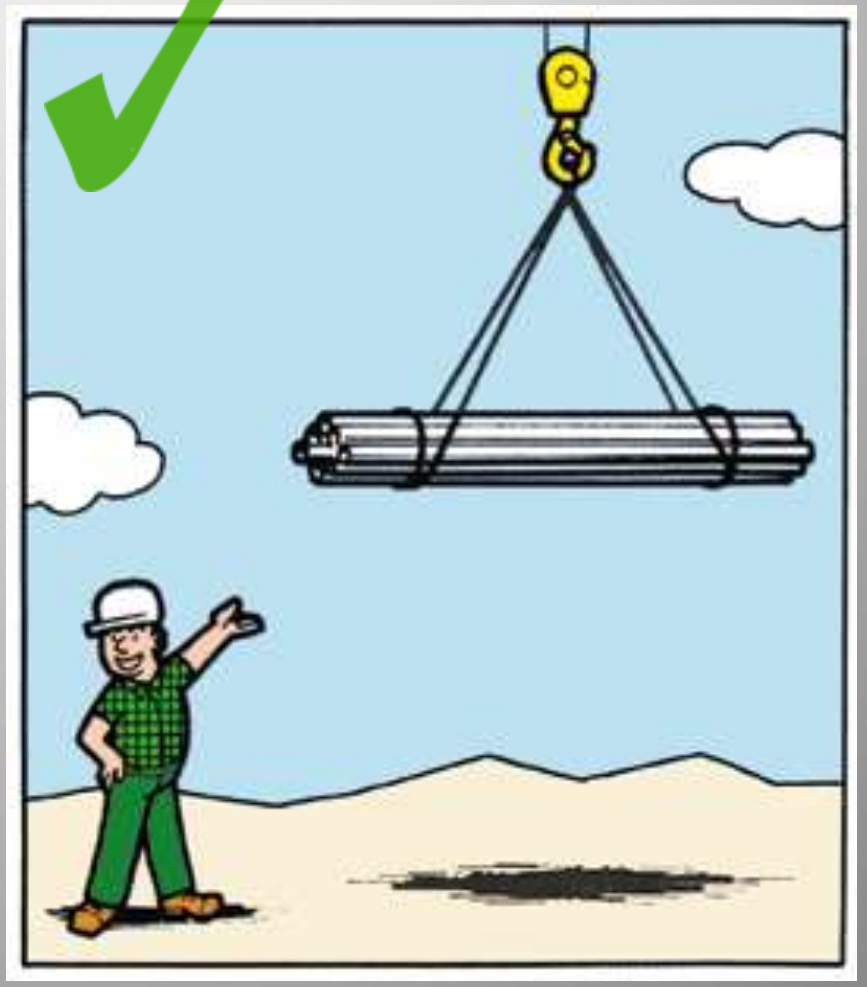

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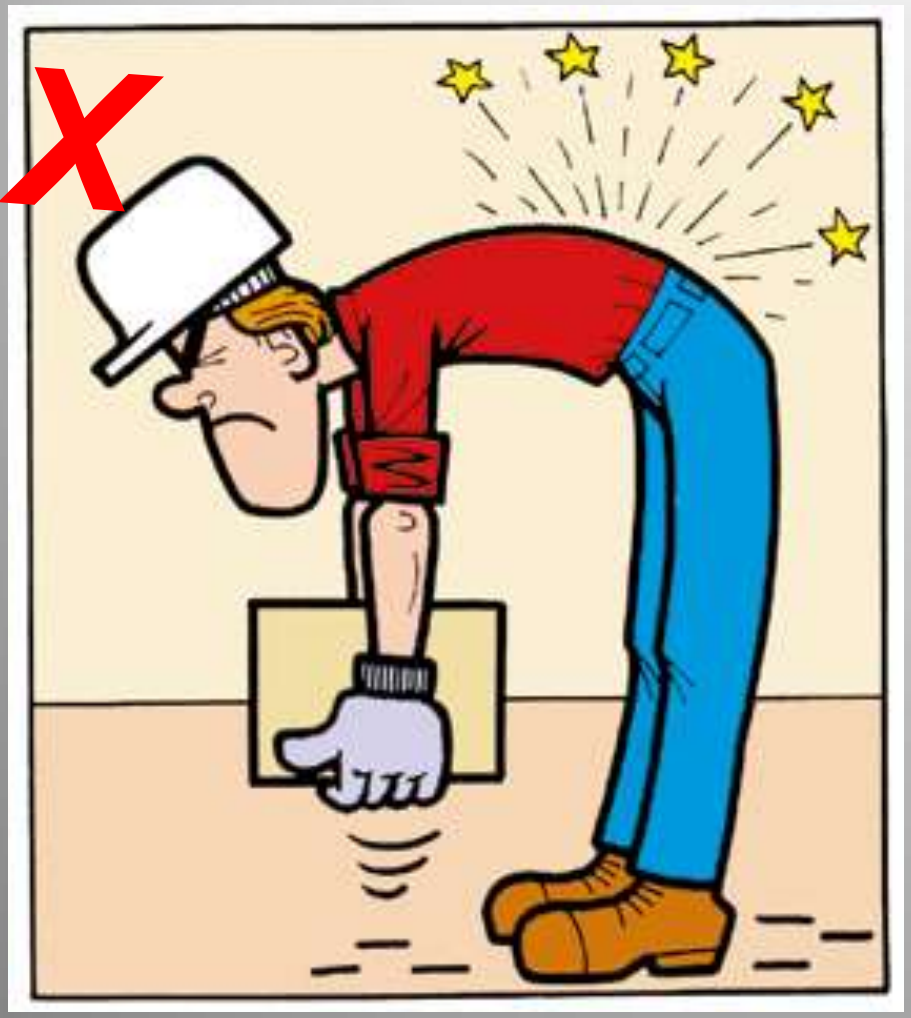

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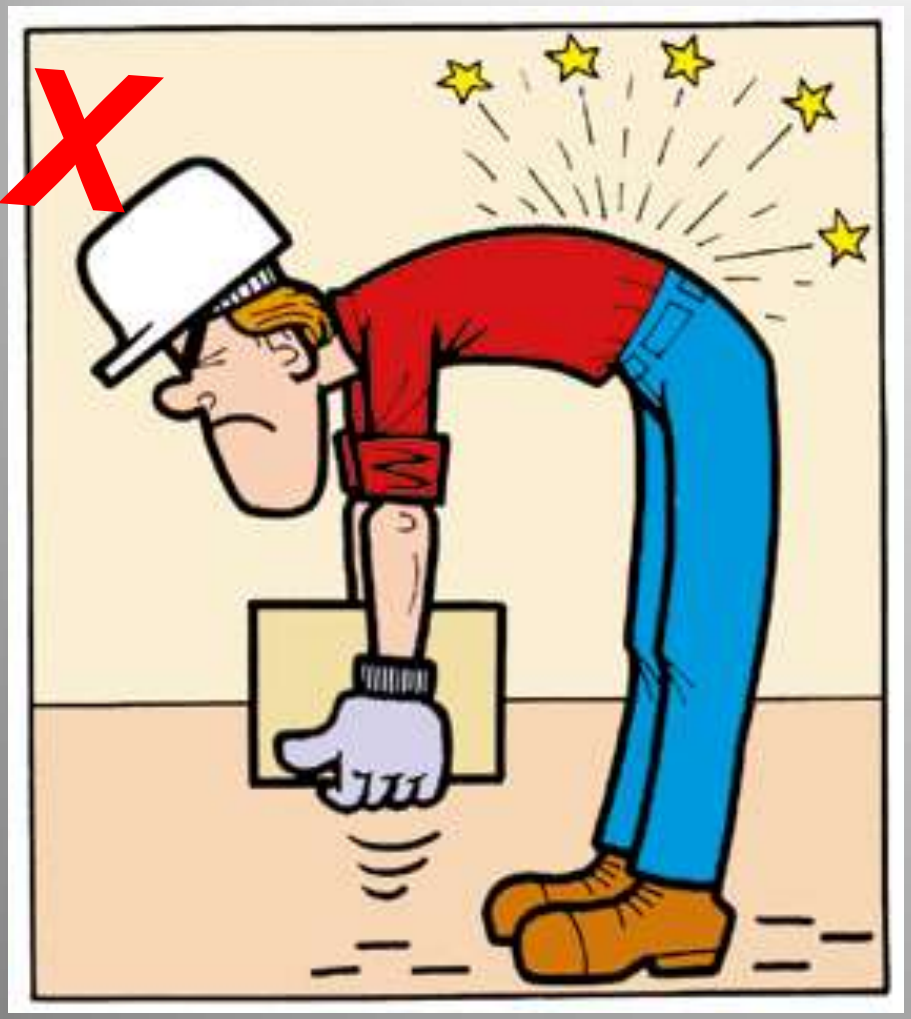


www.elcosh.org

# We Need a Virtual Memorial for Construction Workers Killed on the Job So they are not Forgotten

# Precedent Setting Project: City Center, Las Vegas, 2006-2011

**8 Workers Killed**

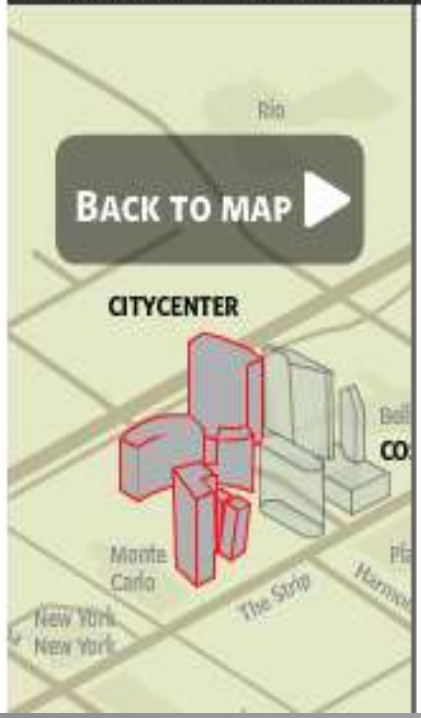
- Lack of oversight by owners
- Lack of coordination
- Missing safety culture
- OSHA derelict in its duties

*Harvey Englander, operating engineer, Pelli Hotel Tower*

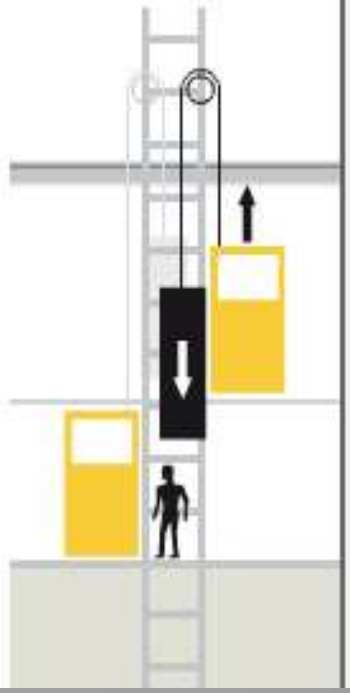
TOPIC:

# Construction Deaths

## Fatal Construction Accidents on the Strip




Worker was killed when a descending counter-weight to an elevator "man-lift" struck him as he serviced the alternate man-lift.



**OSHA Investigation**

The worker was not trained to lock out the manlift system before servicing it. Operators and supervisors were not following the manufacturers's rules in lubricating the manlift. OSHA found six violations and fined Perini Building Company $21,000.

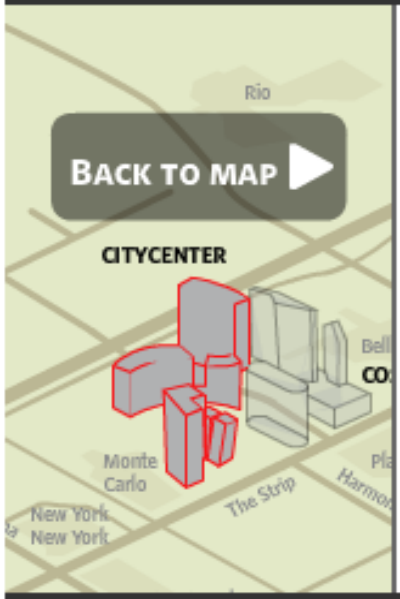
**Follow-up**

At an informal conference between OSHA administrators and Perini, an OSHA administrator withdrew all citations for total fines of $0.00.

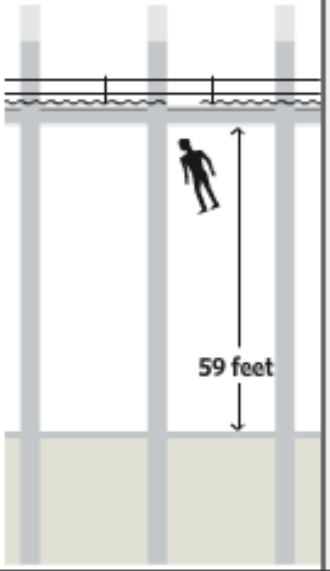
*Harold Billingsley, Ironworker, City Center Casino*

# Construction Deaths

## Fatal Construction Accidents on the Strip




Worker fell through a 3-foot by 11-foot opening in temporary corrugated metal decking on the second floor, falling 59 feet to his death. The worker did not have his safety harness attached.




**OSHA Investigation**

Safety lanyards on the worker's body harness did not have hooks on the ends. This safety system allows the worker to "clip" themselves to other railings or fixed material. There should not have been a hole in the decking. There was no netting, guardrail or personal fall arrest system in place to protect the employee from falls. OSHA found three violations and fined SME Steel $13,500.

**Follow-up**

At an informal conference between OSHA administrators and SME, an OSHA administrator withdrew all citations for total fines of $0.00.

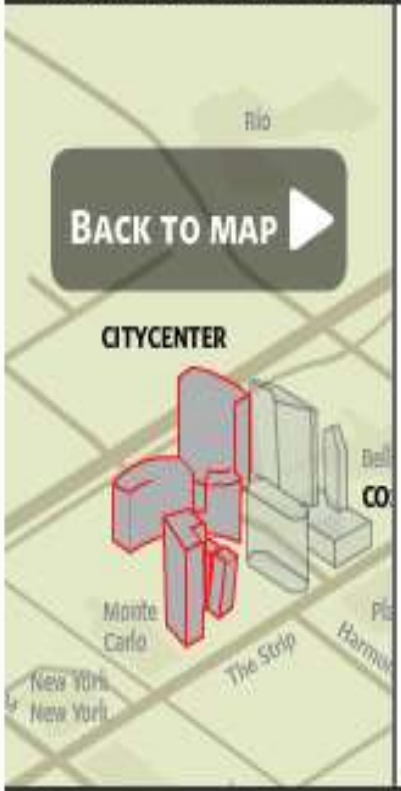
**Harold Billingsley, Ironworker, died Oct. 5, 2007 at CityCenter Casino**

view Harold Billingsley's Bio

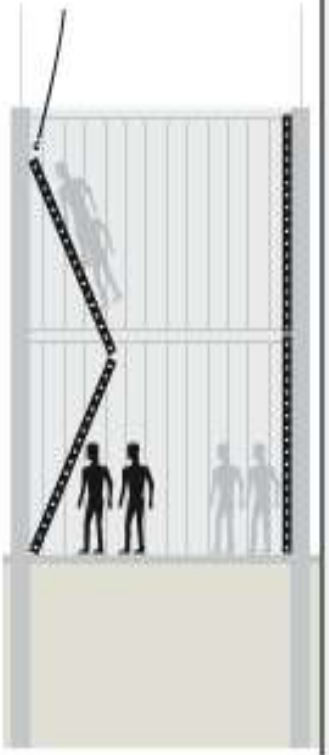
*Angel Hernandez,*

*Carpenter, City Center*

## Fatal Construction Accidents on the Strip




Two workers were killed when 7,300-pound forms that support poured concrete were improperly removed and collapsed inward. A crane that had been attached to the large metal forms was unhooked and there were not enough connection points to support the standing forms. Two workers were on top of the concrete forms and two others were inside the elevator core.



### OSHA Investigation

The inspection showed no evidence of ties, bolts, pipe bracing or other methods in place that would have prevented the forms from falling away from the elevator core walls after being released from the crane. Employers did not make sure the forms were properly secured and did not train employees in the proper removal of the forms. OSHA found two violations and fined Perini $14,000.

### Follow-up

At an informal conference between OSHA administrators and Perini, an OSHA administrator withdrew one violation and left the other intact, for total fines of $7,000.

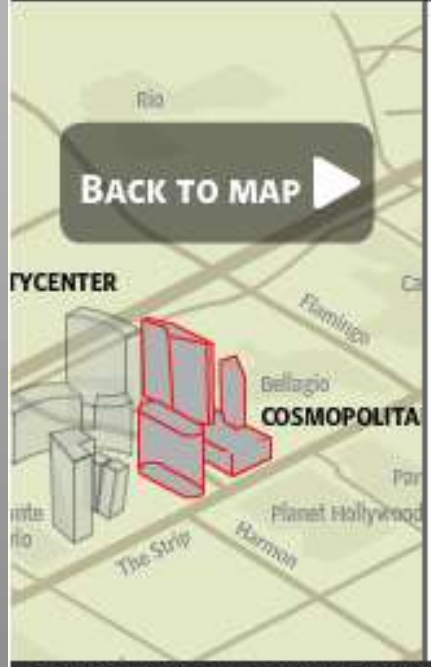
**Angel Hernandez, Carpenter, died February 6, 2007 at CityCenter - Vdara Condo Hotel**

*David Rayburn, Jr.*
*Ironworker, Cosmopolitan*

TOPIC:

# Construction Deaths

## Fatal Construction Accidents on the Strip




While "bolting-up" a spreader I-beam inside the east elevator core at the fourth floor level of the Cosmopolitan, an ironworker fell 44 feet to his death when the beam broke free of the wall plate. His safety harness could not save him because the only place he could tie it off to was the beam that he was balanced on, which fell.

### OSHA Investigation

The employer, Schuff Steel, didn't make sure that the steel was secure. From gathered evidence is it not clear how many bolts were used to hold the beam in place. Only two bolt heads were found on-site, indicating that each end had only one 3/4-inch bolt holding it up. Schuff should have made sure there were nets or decking below the worker. OSHA found six violations and fined Schuff Steel $12,150.

### Follow-up

In an informal conference, OSHA and Schuff Steel did not come to a settlement. The case will most likely be heard by a review panel.

David Rabun Jr., Ironworker (apprentice), died Nov. 27, 2007 at Cosmopolitan

view David Rabun Jr.'s Bio

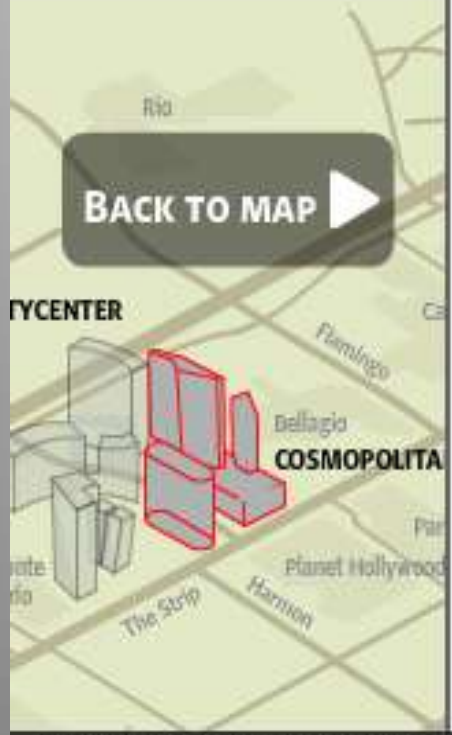
*Michael Taylor,*

*Safety Engineer*

*Cosmopolitan*

# Construction Deaths

## Fatal Construction Accidents on the Strip




A Perini safety engineer appeared to fall five floors when a corner iron post that helped hold up a guardrail system collapsed. The corner posts are usually held in place by support pieces called "kickers," welded to the bottom, but one of the steel subcontractors had removed the kickers to install a steel beam.

### OSHA Investigation

A steel subcontractor, Reliable Steel, created circumstances that compromised the strength of the iron posts by removing the kickers and by welding other pieces incorrectly. OSHA found four violations, and fined Reliable Steel $2,850.

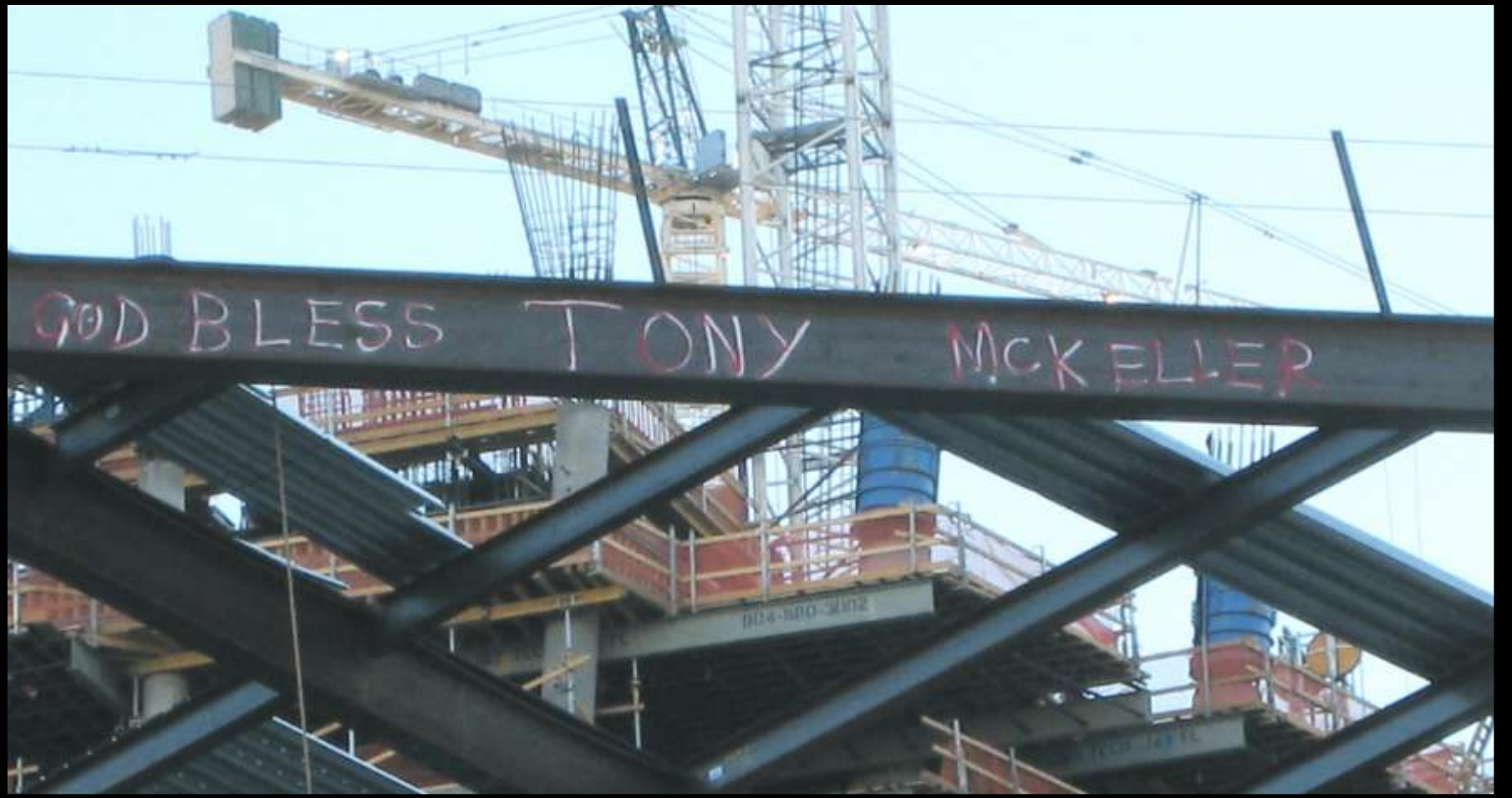
### Follow-up

An informal conference between Reliable Steel and OSHA is scheduled for April 3.

Michael Taylor, Safety engineer, died Jan. 14, 2008 at Cosmopolitan

view Michael Taylor's Bio

# Tony McKeller
# Ironworker. Killed 2009

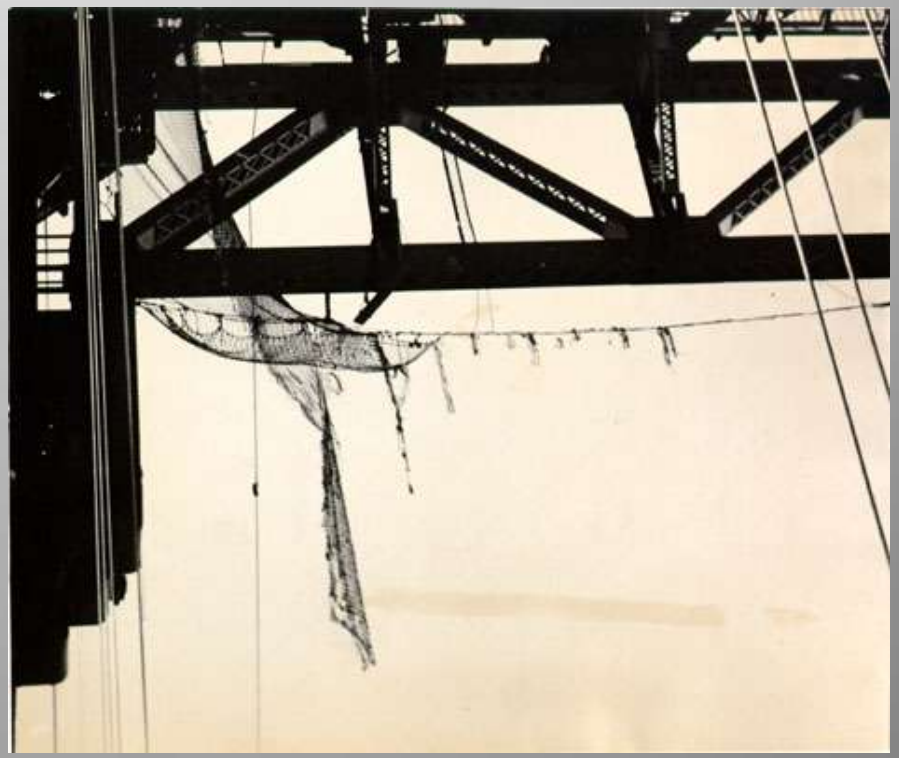


# St Gotthard Tunnel, 1872-82


200+ workers killed

# Golden Gate Disaster 1937

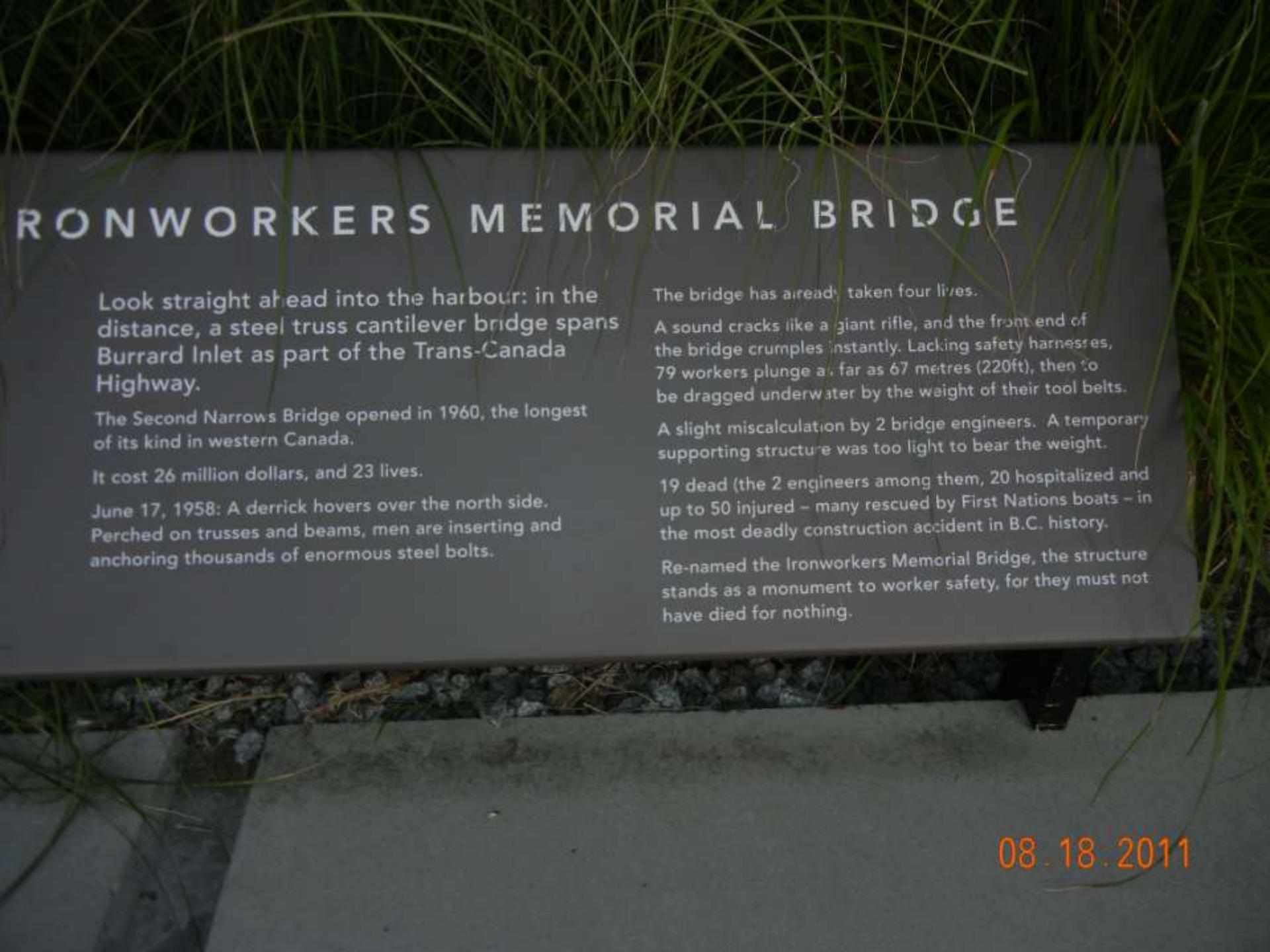
**10 Workers Killed**



# Golden Gate Bridge Memorial Plaque

# Iron Workers Memorial Bridge, Vancouver, BC, 1958

**19 workers killed**


RONWORKERS MEMORIAL BRIDGE
Look straight ahead into the harbour: in the distance, a steel truss cantilever bridge spans Burrard Inlet as part of the Trans-Canada Highway.
The Second Narrows Bridge opened in 1960, the longest of its kind in western Canada.
It cost 26 million dollars, and 23 lives.
June 17, 1958: A derrick hovers over the north side. Perched on trusses and beams, men are inserting and anchoring thousands of enormous steel bolts.
The bridge has already taken four lives.
A sound cracks like a giant rifle, and the front end of the bridge crumples instantly. Lacking safety harnesses, 79 workers plunge as far as 67 metres (220ft), then to be dragged underwater by the weight of their tool belts.
A slight miscalculation by 2 bridge engineers. A temporary supporting structure was too light to bear the weight.
19 dead (the 2 engineers among them, 20 hospitalized and up to 50 injured – many rescued by First Nations boats – in the most deadly construction accident in B.C. history.
Re-named the Ironworkers Memorial Bridge, the structure stands as a monument to worker safety, for they must not have died for nothing.
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# Send Information, please

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