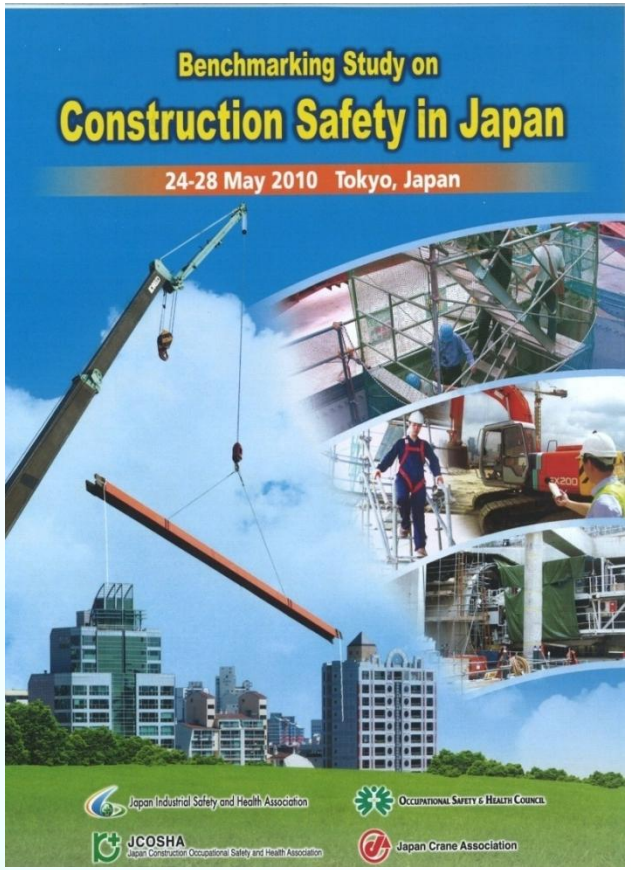
Benchmarking Study on Construction Safety in Japan

Occupational Safety and Health Council
19 October 2010

24-28 May 2010 Tokyo, Japan

Co-organizers

- **Occupational Safety and Health Council**
- **The Japan Industrial Safety and Health Association (JISHA)**
- **Japan International Centre for Occupational Safety and Health (JICOSH)**
- **Japan Crane Association**

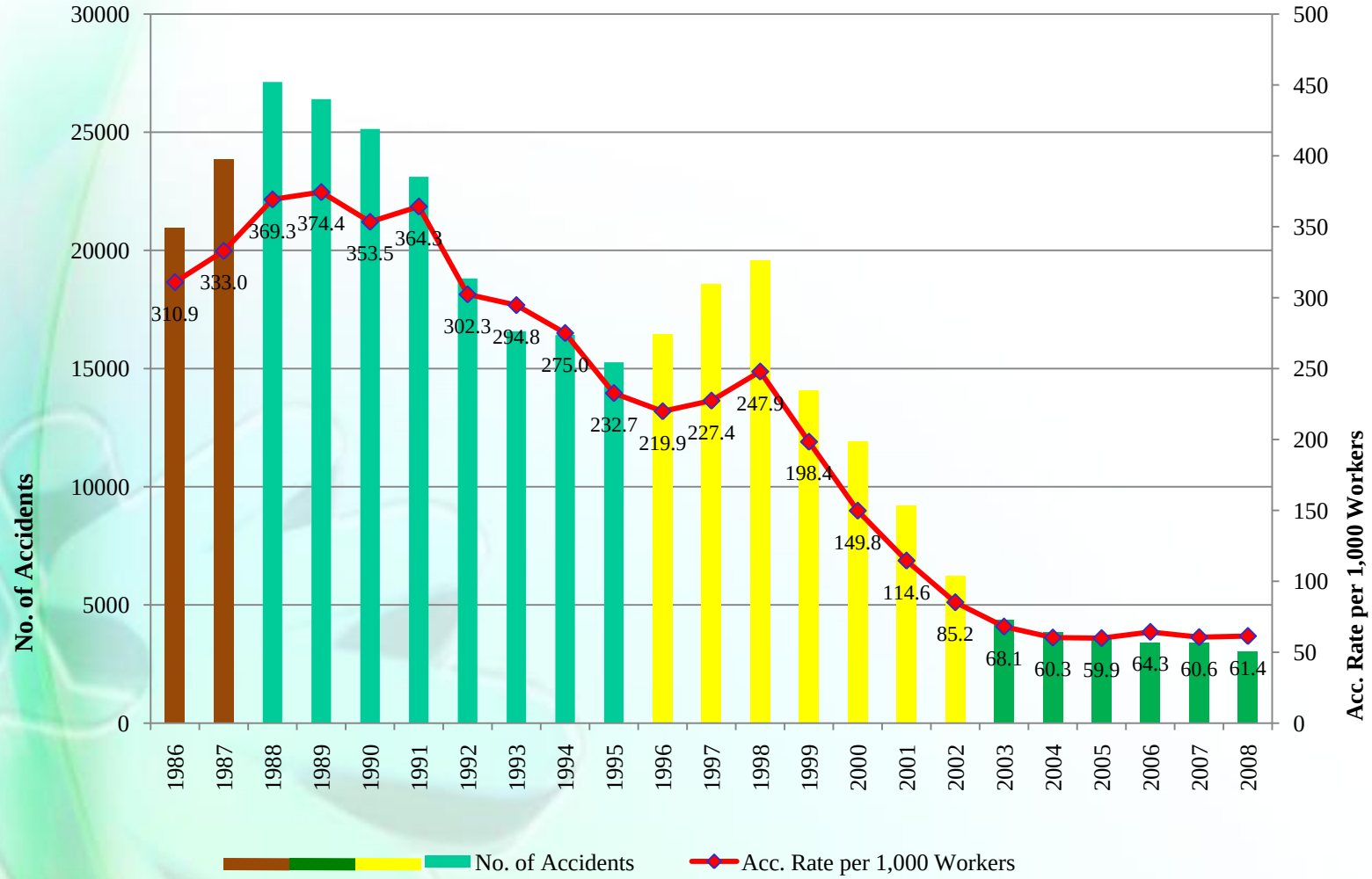


24-28 May 2010 Tokyo, Japan

Major Activities

1. **Construction industry in Japan and strategy for zero accident**
2. **Logics and Practice of Safe Operating Cycle**
3. **Safety Design and Structure of Tower Crane**
4. **Accident Case Study**
5. **Safety Management**
6. **Site visits**
7. **Others**

Construction Safety Injury Rate in Hong Kong



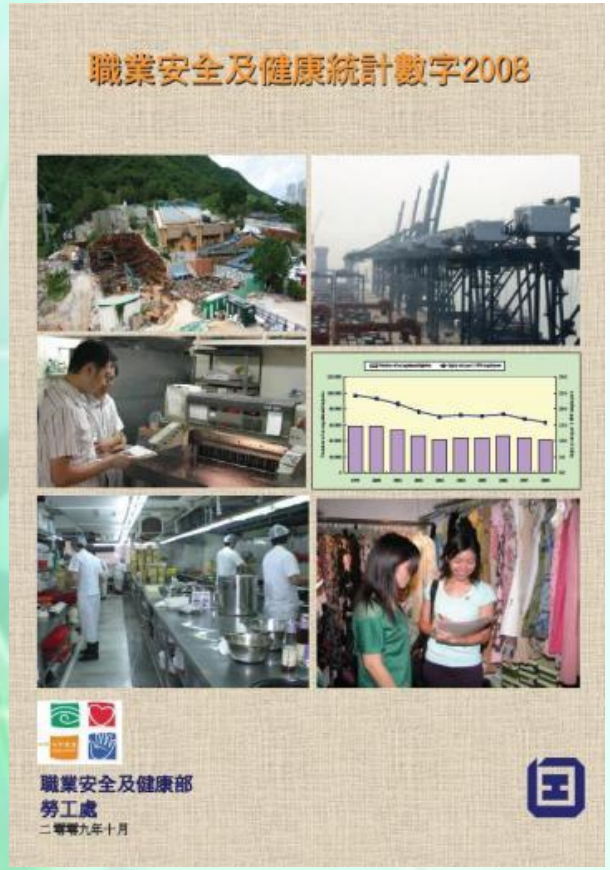
Definition of Accident in Hong Kong

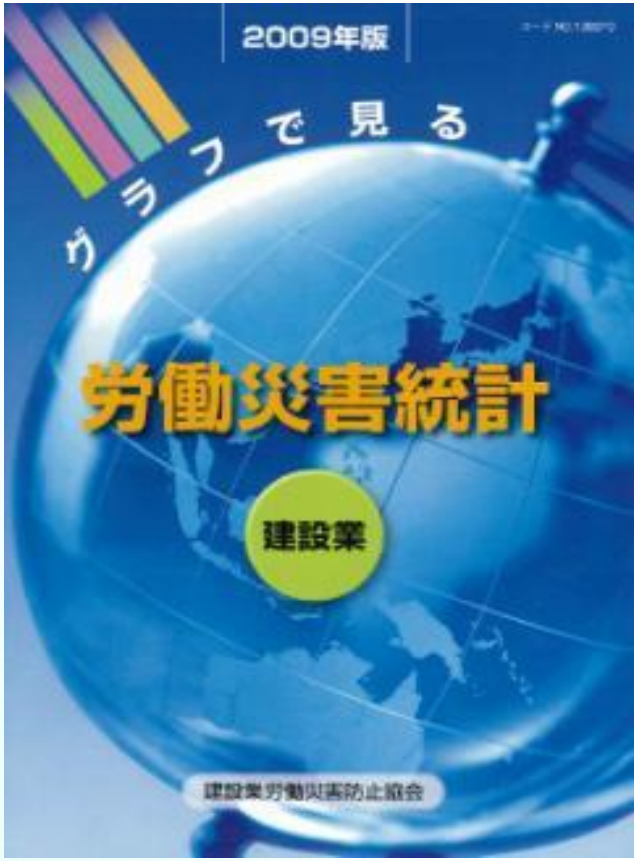
1. Occupational injuries (including industrial accidents) are injury cases arising from work accidents, resulting in death or incapacity for work over **three** days, and reported under the Employees' Compensation Ordinance.
2. Industrial accidents refer to injuries and deaths arising from industrial activities in industrial undertakings as defined under the Factories and Industrial Undertakings Ordinance

3. Employment size was based on the Quarterly Report of Employment and Vacancies Statistics (SEV) published by the Census and Statistics Department.
4. Since 2009, SEV has been changed to the Hong Kong Standard Industrial Classification (HSIC) Version 2.0
5. Injury rate per 1,000 workers

$$\frac{\text{No. of reportable occ. Injuries}}{\text{No. of persons employed each year}} \times 1{,}000$$

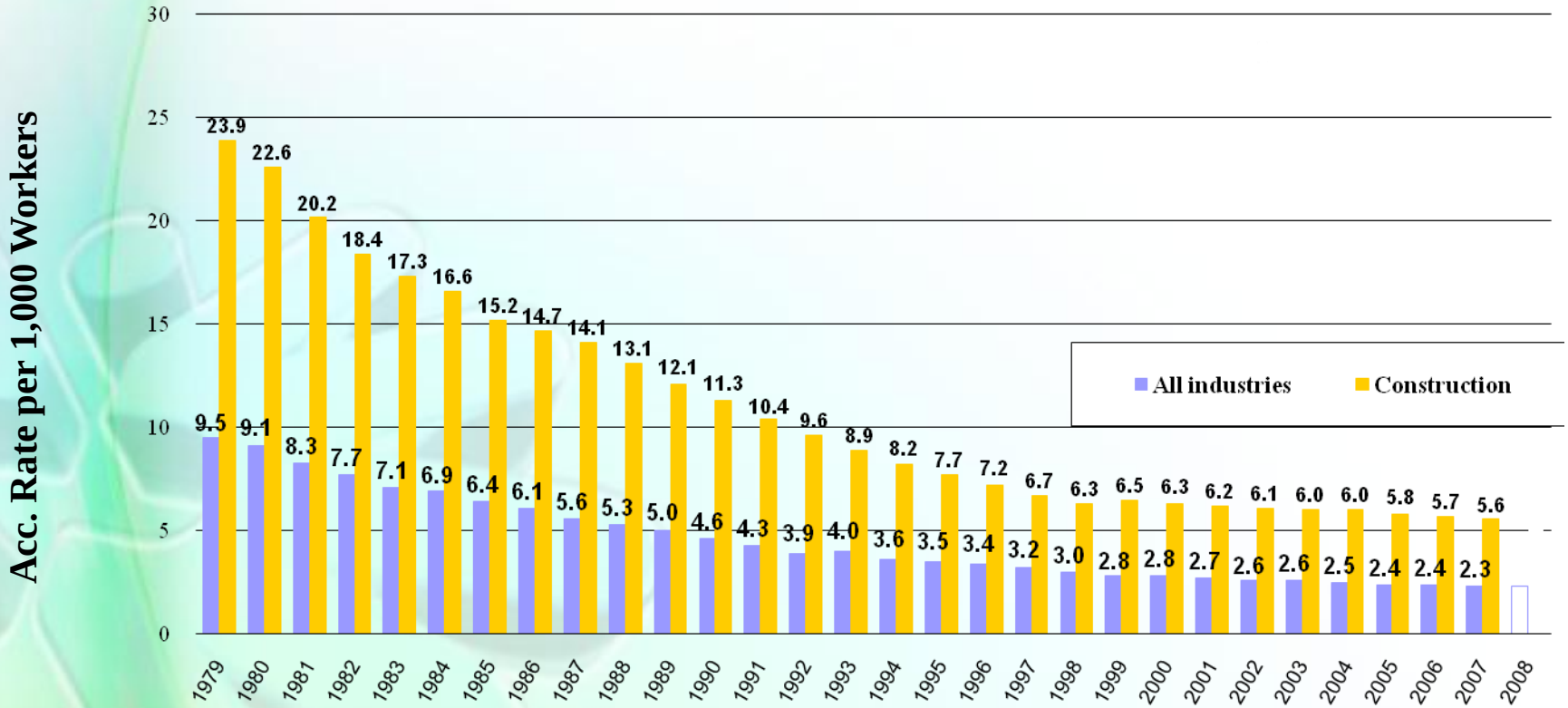
Reference





1. Construction Injury Rate in Japan

	2006	2007	2008	2009
Hong Kong	64.3	60.6	61.4	56
Japan	5.7	5.6	-	-



Comparison with Japan

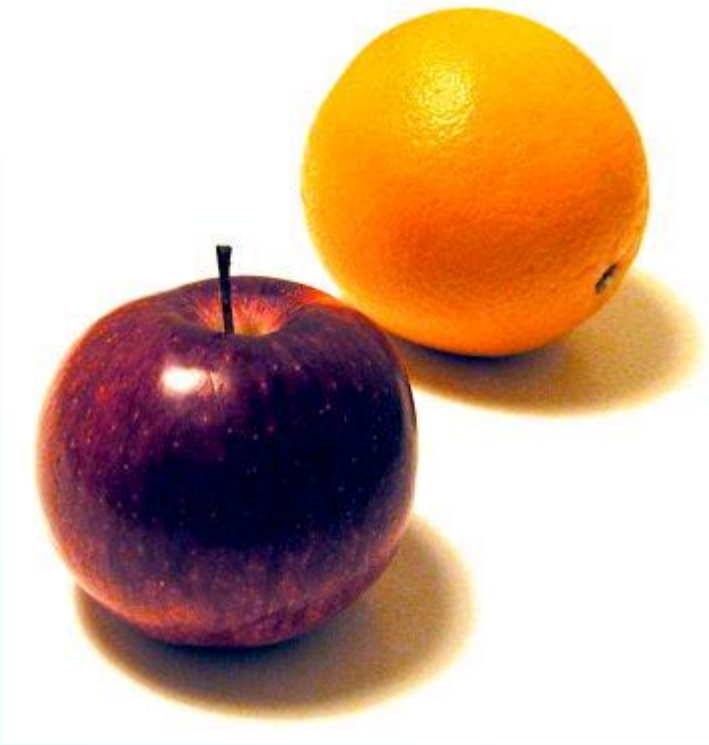
	Hong Kong	Japan
Injury rate per 1000 workers	60.6 (2007) (3 days of absence or over)	5.6 (2007) (4 days of absence or over)
Fatal /accident cases	20/3033 (2008) 19/2755 (2009)	430/24,382 (2008)
Accident Rate (2008)	LD: N/A ASD: per 100,000 man-hours Fatality rate : 0.011 Accident rate : 1.71	per 1 ,000,000 man-hours Accident rate: 1.89
Major causes of fatal accident (2008)	1. Fall of person from height – 8 workers (40%) Contact with electricity – 25% 2. Striking against or struck by moving object – 20%	1. Fall of person from height - 172 workers(40%) 2. Machine operation – 12% 3. Traffic accidents – 10%
Construction Industry Accidents (2008)	19.9% of all industries	33.9% of all industries

Ratio of fatal to reportable injuries (2008)		2008	2009
Hong Kong 20/3033		1:151	1: 144
Japan 430/24,382		1:56	-

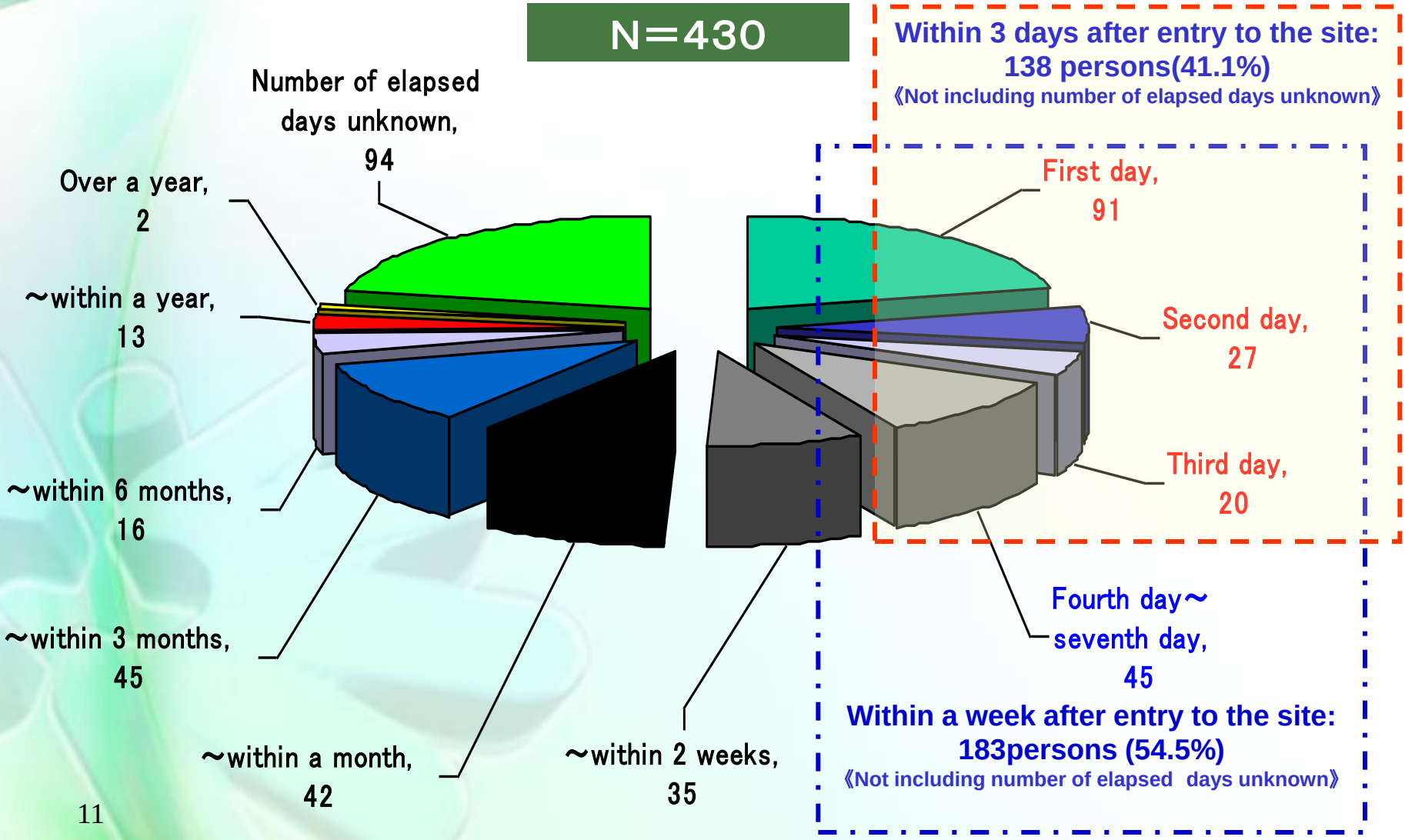
Accident Triangle –Bird 1969

Which is better?

- Different bases for employment sizes
  - HK (about 50,000)
  - Japan (about 4.7 million)
- Different definitions of reportable accidents
  - HK (work accidents, resulting in death or incapacity for work over **three** days)
  - Japan (**four** days)



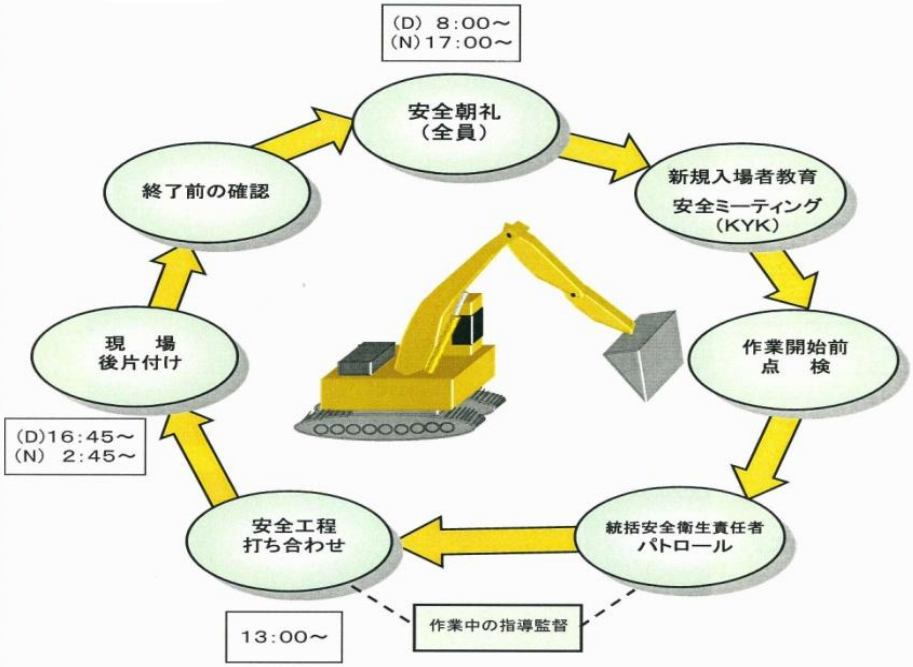
Conditions of fatalities classified by number of elapsed days after entry to the site in 2008



New-comers in workplaces

- Within 3 days after entry to the site – **about 40%** of the total fatal cases.
- Within 1 week after entry to the side **– about 50%** of the total fatal cases.
- Possible causes
  - Large portion of workers belong to short term employment
  - Not familiarize working environment, operation and safety procedures, systems, rules and associated risks

Education of new-comers

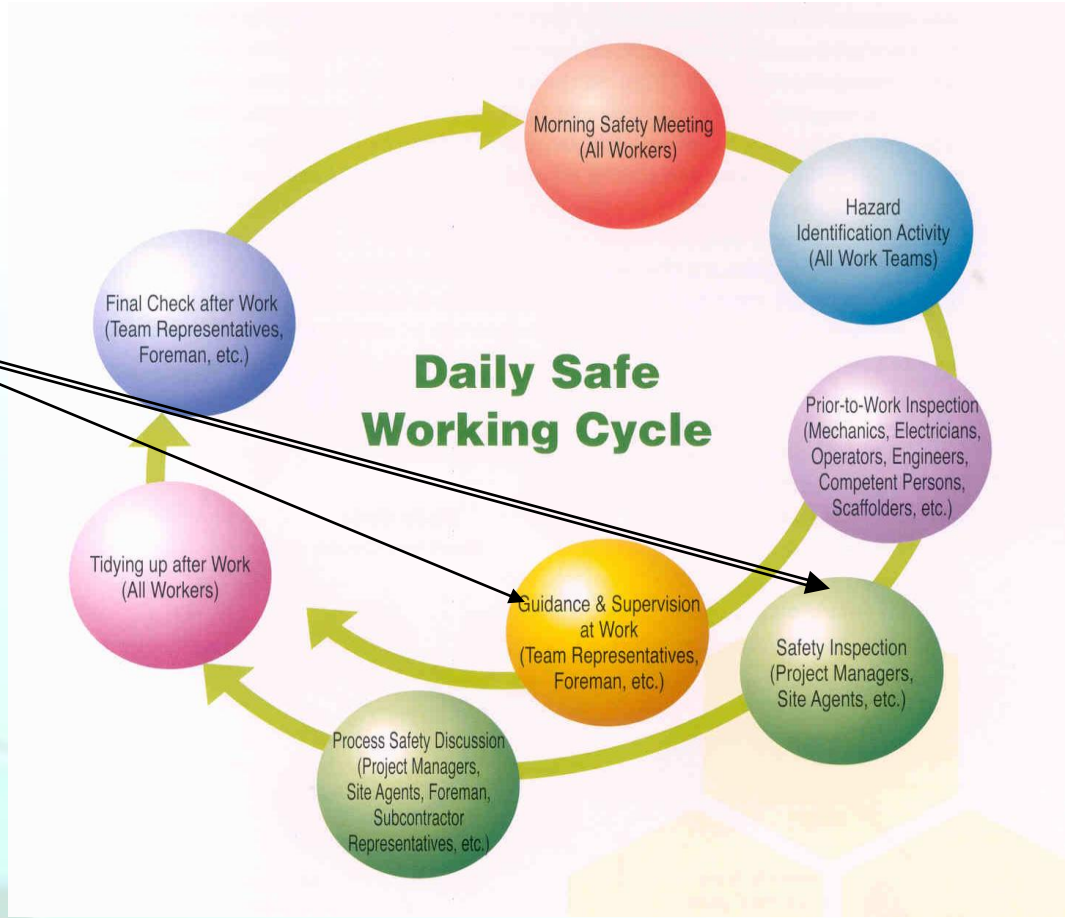


2. Safe Working Cycle

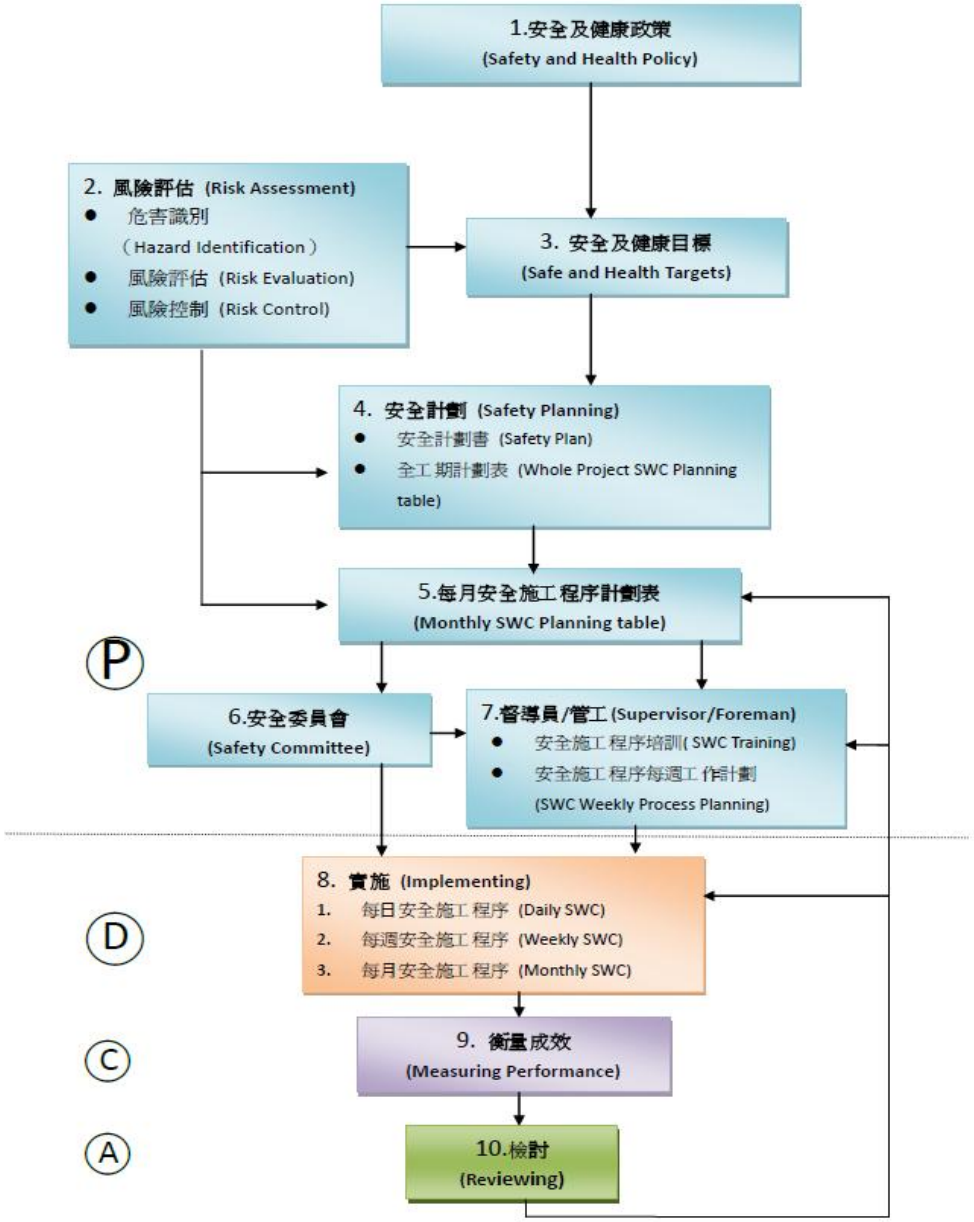
1. **K Y (***Kiken Yochi)* activities (risk prediction) is used to eliminate of at-risk behaviour of workers
2. Site K Y activities are carried out at each construction site
3. K Y activities will cover:
   - Checking safety facilities, etc
   - Recognizing risk areas
   - Setting today's action goal

Enhancement Of Safe Working Cycle (HK) 2004

At-risk Behaviours
Unsafe Conditions

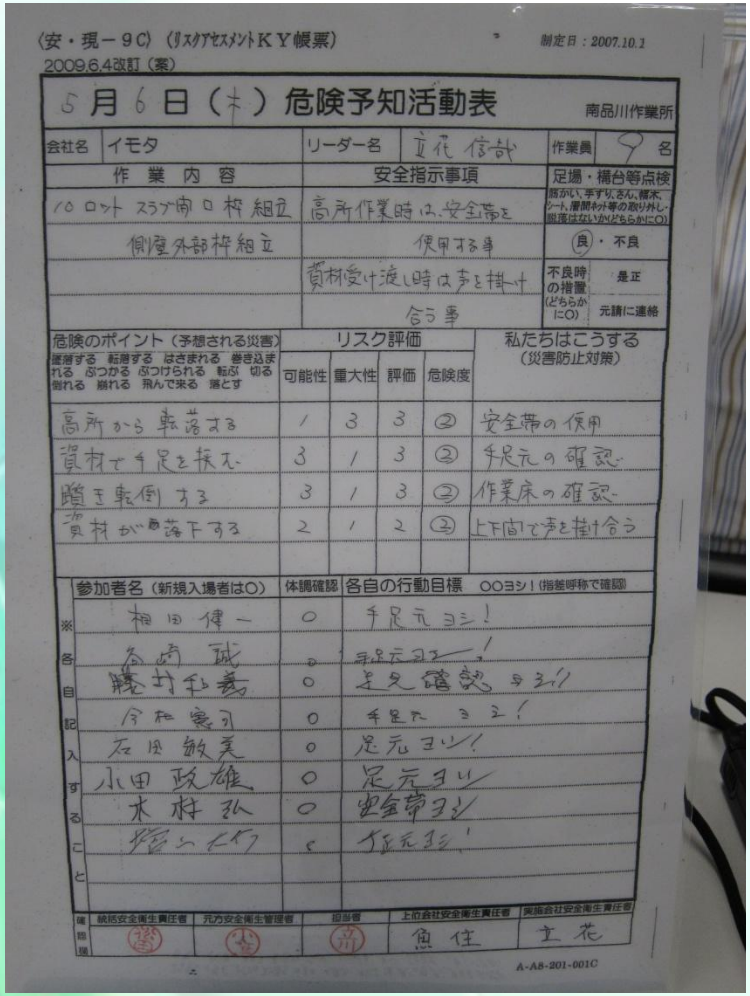


Proposed Enhancement Of Safe Working Cycle (HK)



P – Plan
D – Do
C – Check
A - Act

Proposed Enhancement Of Safe Working Cycle (HK)



〈安・現－9C〉〈リスクアセスメントＫＹ帳票〉 制定日：2007.10.1
2009.6.4改訂（案）

5月6日（木）危険予知活動表 南品川作業所

会社名	イモタ	リーダー名	立花 信武	作業員	9 名

作業内容	安全指示事項	足場・構台等点検
10ロット スラブ開口枠組立	高所作業時は、安全帯を	筋かい、手すり、さん、幅木、シート、層間ネット等の取り外し・脱落はないか(どちらかに○)
側壁外部枠組立	使用する事	良・不良
	資材受け渡し時は声を掛け	不良時の措置(どちらかに○): 是正
	合う事	元請に連絡

危険のポイント（予想される災害）墜落する 転落する はさまれる 巻き込まれる ぶつかる ぶつけられる 転ぶ 切る 倒れる 崩れる 飛んで来る 落とす	リスク評価: 可能性	重大性	評価	危険度	私たちはこうする（災害防止対策）
高所から転落する	1	3	3	②	安全帯の使用
資材で手足を挟む	3	1	3	②	手足元の確認
躓き転倒する	3	1	3	②	作業床の確認
資材が落下する	2	1	2	②	上下間で声を掛け合う

※各自記入すること

参加者名（新規入場者は○）	体調確認	各自の行動目標 ○○ヨシ！(指差呼称で確認)
[illegible]	○	手足元ヨシ！
[illegible]	○	手足元ヨシ！
[illegible]	○	足元確認ヨシ！
[illegible]	○	手足元ヨシ！
[illegible]	○	足元ヨシ！
小田 政雄	○	足元ヨシ
木村 弘	○	安全帯ヨシ
[illegible]	○	手足元ヨシ！

確認欄: 統括安全衛生責任者	元方安全衛生管理者	担当者	上位会社安全衛生責任者	実施会社安全衛生責任者
(stamp)	(stamp)	(stamp)	魚住	立花

A-A8-201-001C

1. Hazard Identification Activities (KY) by Risk Assessment approach
2. Group operation approach of SWC can be strengthened by individual KY activities
3. Each New operation with different risks need KY activities
4. Pointing and calling practice

3. Safe Design and Structure of Tower Crane

Legislative structure for safe design and manufacture

1. Prior to manufacturing: Obtaining the manufacturing permission from The Prefectural Labour Bureau.
2. Design/Manufacturing: Complying the Construction Codes for cranes
3. At manufacturing: notifying the installation to the Government Authority

The Construction Codes for Cranes

Chapter 1 Structural Part

Chapter 2 Mechanical Part

Chapter 3 Auxiliary Part (Access, Restraints)

Chapter 4 Manufacturing (Processing)

Chapter 5 Wire Ropes etc.

Chapter 6 Miscellaneous Provisions

Accident cases of cranes in Japan 2008

Number of deaths by types of crane, etc	
• Crane	46
• Mobile Crane	41
• Construction elevator	8
• Light capacity lift or construction lift only for cargo	5
• Derrick	1
Total	**101**

Accident classification	
• Fall of lifted loads	35
• Caught in-between	32
• Fall from height	17
• Collapse of machine part or structural part	10
• Struck by or against lifted loads, etc.	7
Total	**101**

4. Accident Case Study

Accident case study using four round method (四段階層法)

- **Step 1: Confirmation of facts**
- **Step 2: Identification of problems**
- **Step 3: Narrowing down to fundamental problems**
- **Step 4. Establishment of countermeasures**

Step 1: Confirmation of facts

Background of Accident (in chronological order)

Month Day Time	No.	**Fact** 1. Content and implementation of a work plan and an operation procedure 2. Monthly meeting/weekly meeting 3. Meeting of the day before 4. Education for newcomers 5. Daily Safe Working Cycle	Notes

Step 2 and Step 3

Identification of Problems and Narrowing down to fundamental problems

(Method by Cause and Effect Diagram)

(Format 3)

Fact No.	Ⅲ—Ⅰ Identification of Problems (What facts were there?)	Ⅲ—Ⅱ Background of Problems (Why did it happen?)	Ⅲ—Ⅲ Determination of fundamental problems			Ⅲ—Ⅳ—Ⅰ Human defects (A)							Ⅲ—Ⅳ—Ⅱ Material defects (B)							Ⅲ—Ⅳ—Ⅲ Managerial defects (C)					Ⅲ—Ⅴ Narrowing down to fundamental problems
	1. Identify the facts that does are outside the norms as a problem	2. Ask yourself why it happened P:Principal contractor S: Subcontractor	Human	Material	Managerial	A1 Breach of discipline	A2 Dangerous action	A3 Personal factor	A4 Action in collaborative work	A5 Unsafe location or posture	A6 Unsuitable work clothing	A7 Other	B1 Defect in object	B2 Defect in safe-guarding measures	B3 Defect in protective equipment ect.	B4 Defect in workplace	B5 Defect in working environment	B6 Defect in production process	B7 Other	C1 Defect in education and guidance	C2 Defect in management of vehicles, machines	C3 Defect in work management	C4 Defect in inspection	C5 Other	
			P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S

Ⅲ—Ⅷ Analyze the causes of the accident. (Determine the causes of the accident from fundamental problems)

(No.) 1. _____ (No.) 4. _____

2. _____ 5. _____

3. _____ 6. _____

Step 2 and Step 3

Identification of Problems and Narrowing down to fundamental problems

(Method by Cause and Effect Diagram)

(Format 3)

Fact No.	III—I Identification of Problems (What facts were there?)	III—II Background of Problems (Why did it happen?)	III—III Determination of fundamental problems			III—IV—I Human defects (A)							III—IV—II Material defects (B)							III—IV—III Managerial defects (C)					III—V Narrowing down to fundamental problems
						A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	C5	
	1. Identify the facts that does are … as a problem		Human	Material	Manegerial	Breach of discipline	Dangerous action	Personal factor	Action in collaborative work	Unsafe location or posture	Unsuitable work clothing	Other	Defect in object	Defect in safe-guarding measures	Defect in protective equipment ect	Defect in workplace	Defect in working environment	Defect in production process	Other	Defect in education and guidance	Defect in management of vehicles, machines	Defect in work management	Defect in inspection	Other	
			P. S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S

III—VII Analyze the causes of the accident. (Determine the causes of the accident from fundamental problems)

(No.) 1. ……………………
2. ……………………
3. ……………………

(No.) 4. ……………………
5. ……………………
6. ……………………

Fundamental Problems

1. **Human**
2. **Material**
3. **Managerial**

Step 2 and Step 3

Identification of Problems and Narrowing down to fundamental problems

(Method by Cause and Effect Diagram)

(Format 3)

Fact No.	Ⅲ—Ⅰ Identification of Problems (What facts were there?)	Ⅲ—Ⅱ Background of Problems (Why did it happen?)	Ⅲ—Ⅲ Determination of fundamental problems	Ⅲ—Ⅳ—Ⅰ Human defects (A)							Ⅲ—Ⅳ—Ⅱ Material defects (B)							Ⅲ—Ⅳ—Ⅲ Managerial defects (C)					Ⅲ—Ⅴ Narrowing down to fundamental problems
				A1	A2 action	A3 Personal factor	A4 Action in collaborative work	A5 Unsafe location or posture	A6 Unsuitable work clothing	A7 Other	B1 Defect in object	B2 Defect in safe-guarding measures	B3 Defect in protective equipment act	B4 Defect in workplace	B5 Defect in working environment	B6 Defect in production process	B7 Other	C1 Defect in education and guidance	C2 Defect in management of vehicles, machines	C3 Defect in work management	C4 Defect in inspection	C5 Other	
	1. Identify the facts that does are outside the norms as a problem			P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S

Ⅲ—Ⅷ Analyze the causes of the accident. (Determine the causes of the accident from fundamental problems)

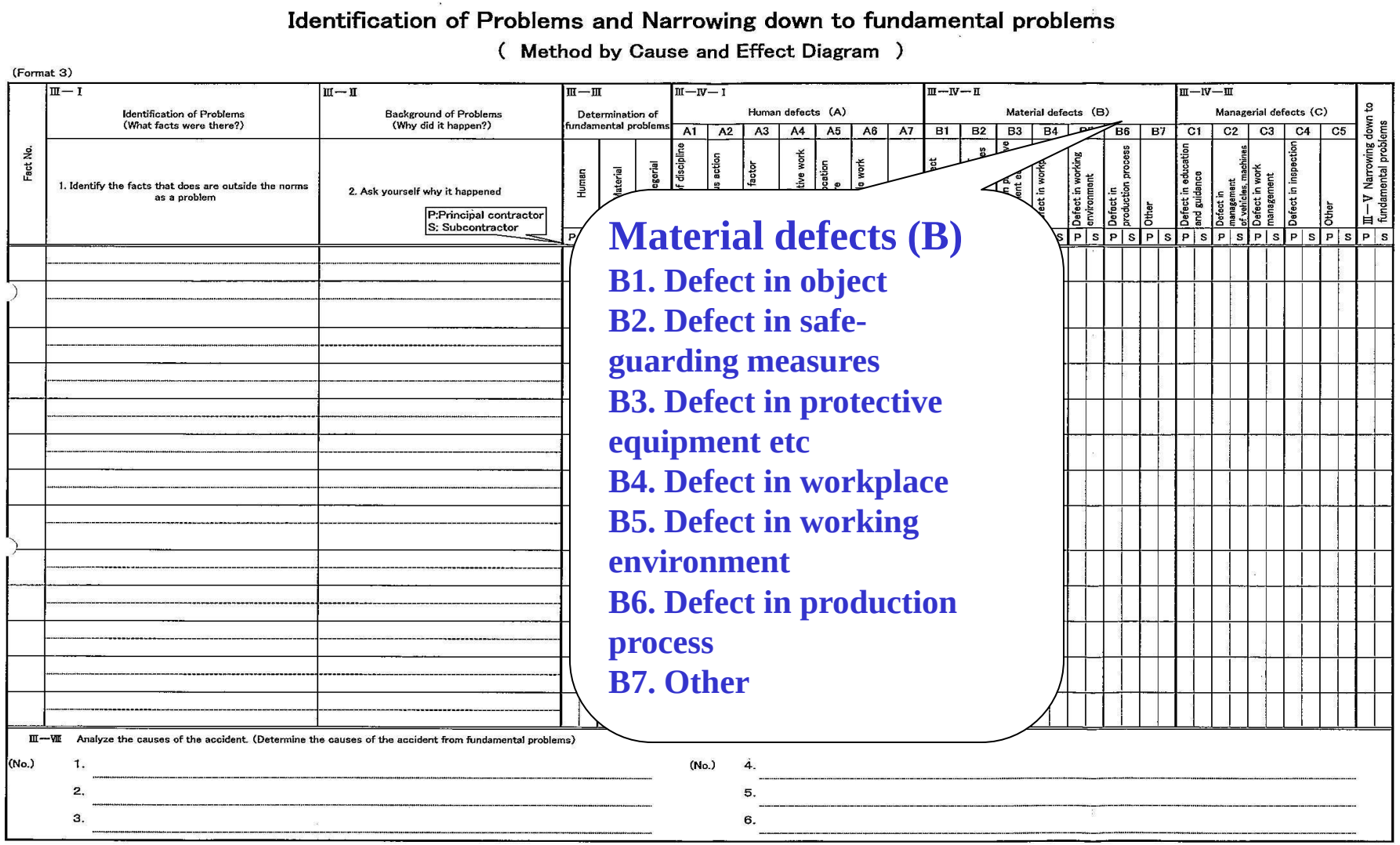
(No.) 1. _____ 2. _____ 3. _____

(No.) 4. _____ 5. _____ 6. _____

Human defects (A)

A1. Breach of discipline
A2. Dangerous action
A3.Personal factor
A4. Action in collaboration work
A5. Unsafe location or posture
A6. Unsuitable work clothing
A7. Other

Step 2 and Step 3



Identification of Problems and Narrowing down to fundamental problems

(Method by Cause and Effect Diagram)

(Format 3)

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	1. Identify the facts that does are outside the norms as a problem	2. Ask yourself why it happened P:Principal contractor S: Subcontractor	Human / Material / Managerial	A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	C5	
															Defect in working environment	Defect in production process	Other	Defect in education and guidance	Defect in management of vehicles, machines	Defect in work management	Defect in inspection	Other	
			P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S

Material defects (B)

- B1. Defect in object
- B2. Defect in safe-guarding measures
- B3. Defect in protective equipment etc
- B4. Defect in workplace
- B5. Defect in working environment
- B6. Defect in production process
- B7. Other

Ⅲ—Ⅷ Analyze the causes of the accident. (Determine the causes of the accident from fundamental problems)

(No.) 1. _____ 2. _____ 3. _____

(No.) 4. _____ 5. _____ 6. _____

Step 2 and Step 3

Identification of Problems and Narrowing down to fundamental problems

(Method by Cause and Effect Diagram)

(Format 3)

Fact No.	Ⅲ—Ⅰ Identification of Problems (What facts were there?)	Ⅲ—Ⅱ Background of Problems (Why did it happen?)	Ⅲ—Ⅲ Determination of fundamental problems			Ⅲ—Ⅳ—Ⅰ Human defects (A)							Ⅲ—Ⅳ—Ⅱ Material defects (B)							Ⅲ—Ⅳ—Ⅲ Managerial defects (C)					Ⅲ—Ⅴ Narrowing down to fundamental problems
	1. Identify the facts that does are outside the norms as a problem	2. Ask yourself why it happened P:Principal contractor S: Subcontractor	Human	Material	Managerial	A1 Breach of discipline	A2 Dangerous action	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	C1 Defect in education and guidance	C2 Defect in management of vehicles, machines	C3 Defect in work management	C4 Defect in inspection	C5 Other	
			P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S	P S

Managerial defects (C)

C1.Defect in education and guidance

C2. Defect in management of vehicles, machines

C3. Defect in work management

C4. Defect in inspection

C5. Other

Ⅲ—Ⅷ Analyze the causes of the accident. (Determine the causes of the accident from fundamental problems)

(No.) 1. _____ (No.) 4. _____

2. _____ 5. _____

3. _____ 6. _____

Step 4.

Establishment of countermeasures

(Format-4)

Fundamental Problem No.	Ⅳ—1 Prevention measures against the accident	Implementation Plan						Employer Classification P: Principal contractor S: Subcontractor	
		By when	Who	To whom	Where	What	How	S	P
	1.								
	2.								
	3.								
	4.								
	5.								

Safety Work Cycle

Ⅳ— Ⅱ Points to note when developing Safety Work Cycle

1. Control system (Direction and command system) 2. Execution scheme・Execution procedure 3. Operation procedure 4. Education (When newly empoyed・when newly joined) 5. Safety morning meeting
6. Safety meeting 7. Effective posting of workers 8. KY activities (including KY conducted at the site) 9. Safety & health inspection 10. Guidance/supervision under operation
11. Meeting of safety process (Liaison & coordination) 12. Measures taken on change of work

Principal Contractor

1.
2.
3
4

Subcontractor

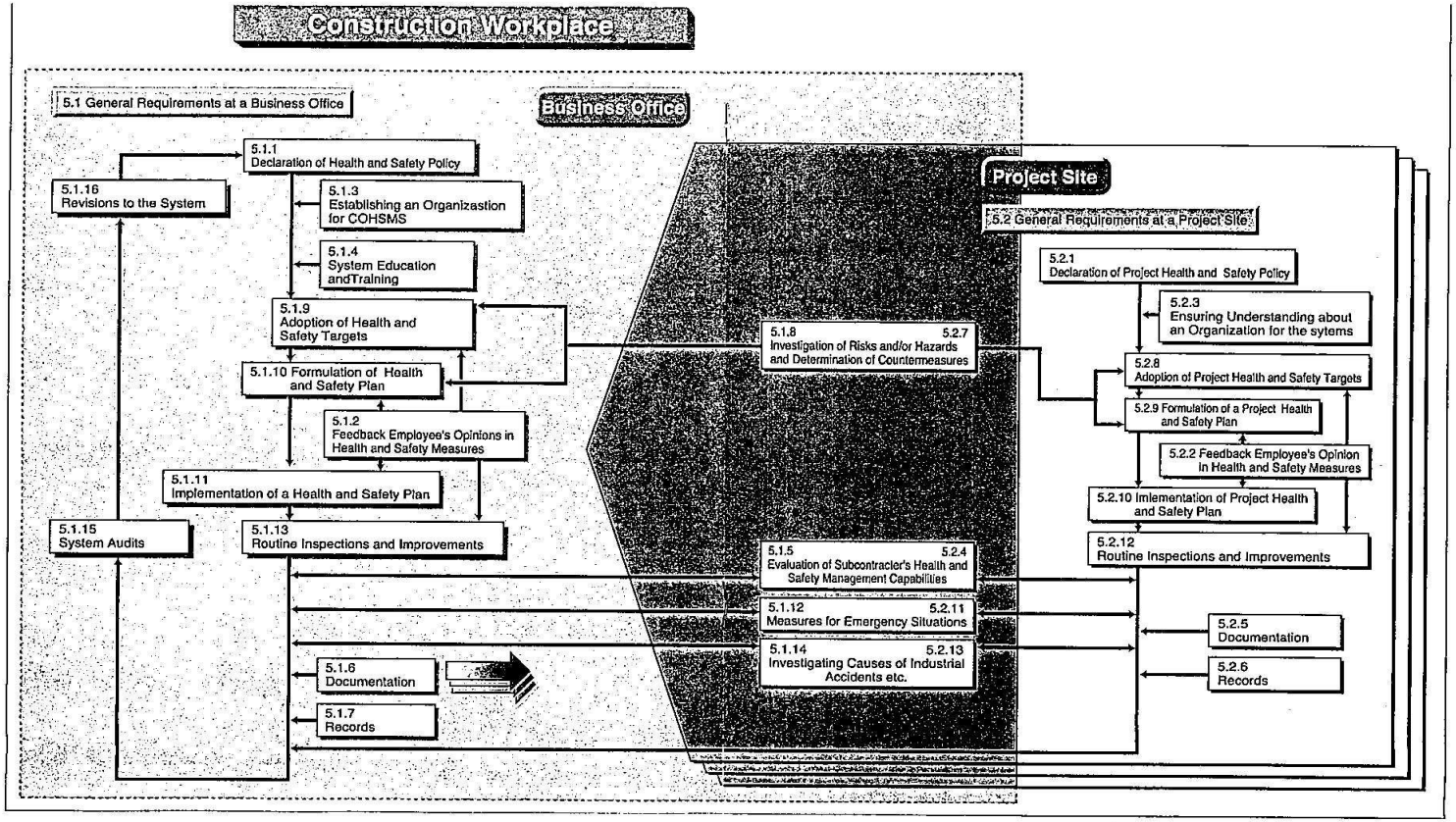
1.
2.
3
4

Prevention Measures for similar accidents (Generalization ・ Standardization)

	Ⅳ—Ⅲ Prevention Measures for similar accidents and the issues to be considered (Generalizaion・Standardization)		
Principal Constractor	1. 2. 3.	Subcontractor	1. 2. 3.

5. Safety Management

Flow Diagram of COHSMS Guidelines



6. Benchmarking site visits

1. Haneda Airport東京國際空港D走路建設
2. Foundation Construction site of Minami-Shinagawa Ventilation南品川換氣所

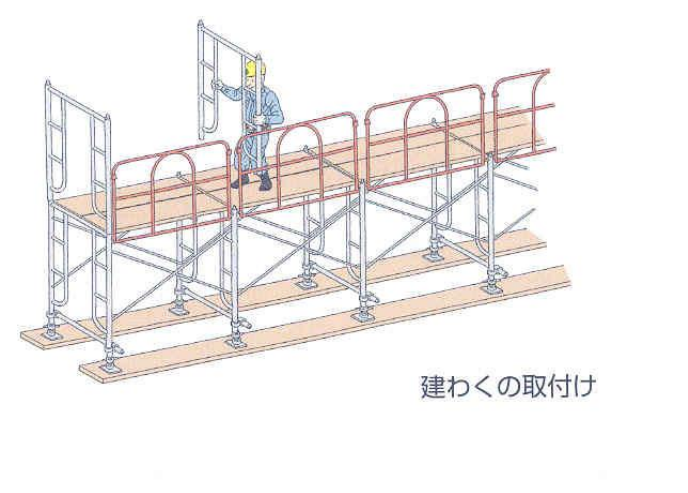
Benchmarking site visits

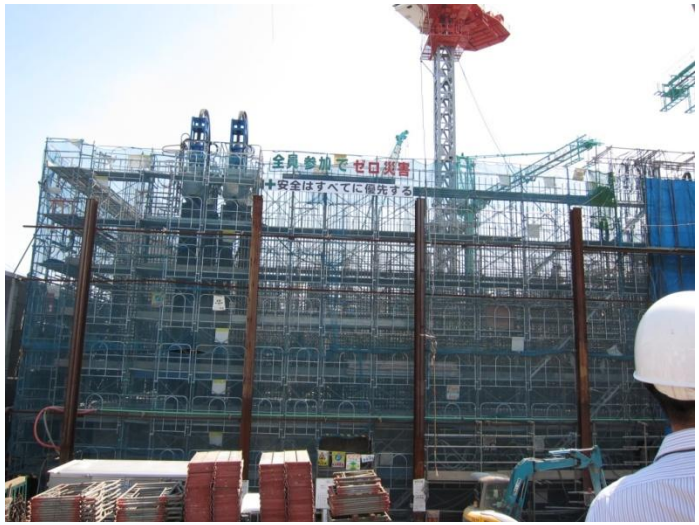
1. Good site housekeeping

Benchmarking site visits

2. Fence off working areas

Benchmarking site visits



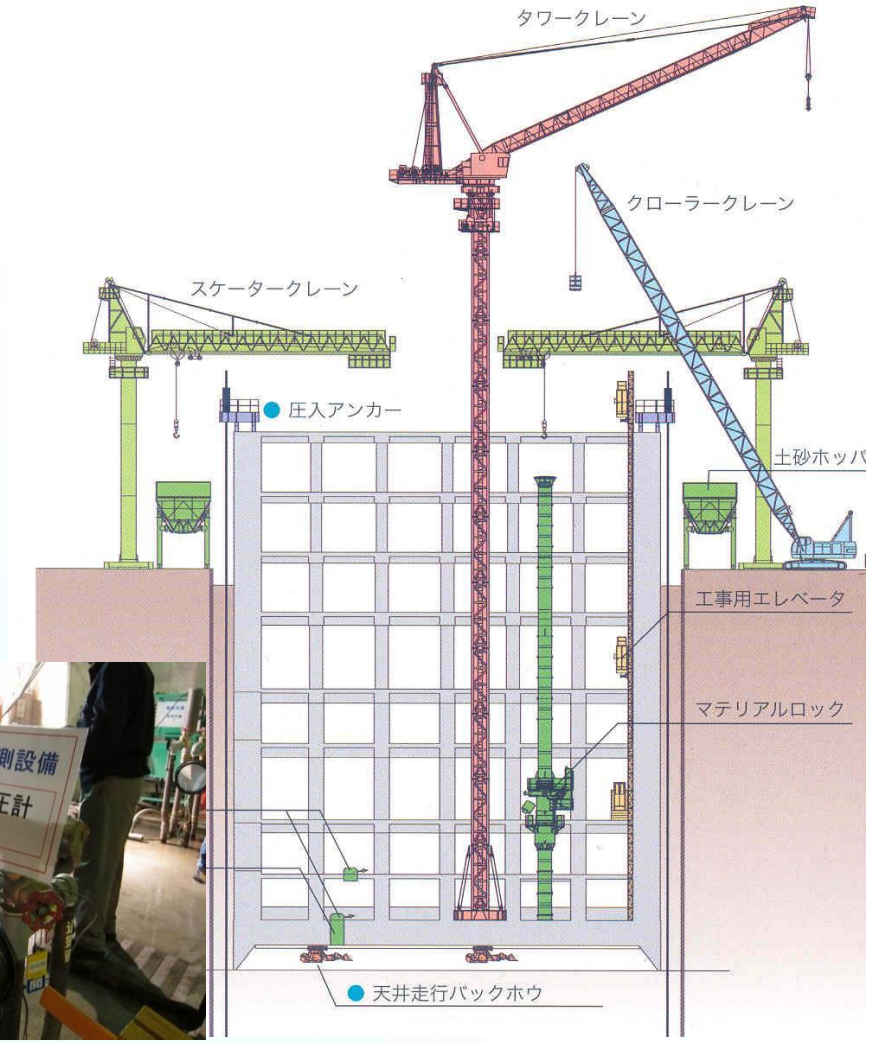


3.”Hand-rail first” working platform

Benchmarking site visits

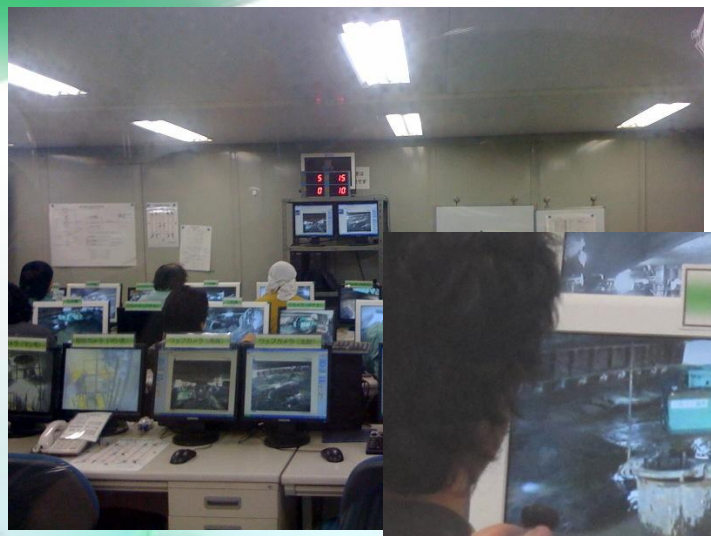
4.Sharp objects/edges protection

Benchmarking site visits



5. New Construction Technologies

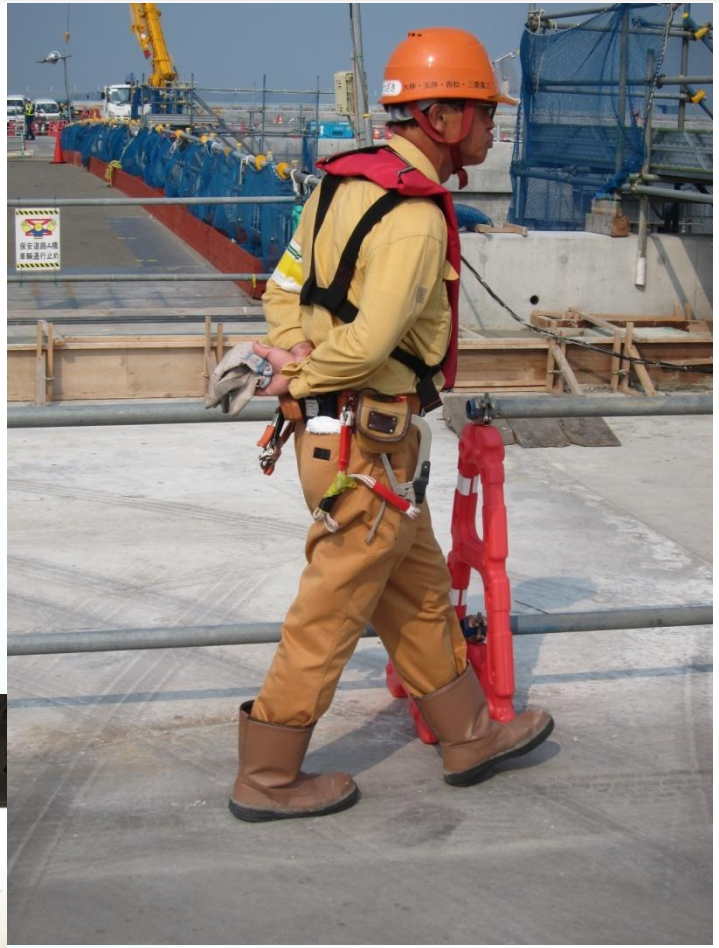
Benchmarking site visits



Robot Excavators operated by using joystick and TV

Compress air material lock

Benchmarking site visits



6. PPE and uniform

7. Others

Tabi-shoes

Construction workers, often wear a type of tabi called jika-tabi (地下足袋, ***tabi*** *that contact the ground*[?]). Made of heavier, tougher material and often having rubber soles, jika-tabi resemble boots and are outer footwear rather than socks. Wearing Tabi makes it easy to sense the ground condition for construction workers. In addition to this, they dry easily and are very light. These days, there are even safety Tabi-shoes: with steel toe caps!

Tobi Trousers

- Tobi trousers: this shape is just amazing! (In fact many Japanese people identify Tobi workers by these special trousers.)
- There are various theories *why* the lower part under the knee is pumped up like a balloon. The main reason, however, seems to be a simple one: the baggy pants make it easy to move, easy to bend, stretch and stride.

Build up good image

Thank you

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