

သဘာဝဘေးဒဏ်ခံနိုင်ရည်ရှိသောအဆောက်အအုံများ
တည်ဆောက်နိုင်ရန်ဆောက်လုပ်မှုကဏ္ဍဖွံ့ဖြိုးတိုးတက်ရေးနှင့်
စံချိန်စံညွှန်းများတိကျစွာလိုက်နာစေရေး

Engr Thein Zaw



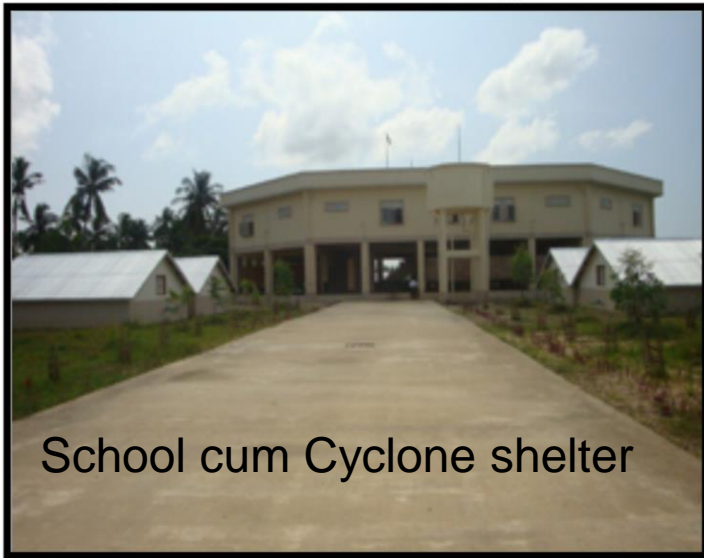
မာတိကာ

1. သတိမူရမည့်ကျရောက်လေ့ရှိသည့်သဘာဝဘေးအန္တရာယ်များ
2. သဘာဝဘေးအန္တရာယ်ကျရောက်ပြီးနောက်ပိုင်းဆောင်ရွက်မှု
3. မြန်မာနိုင်ငံအဆောက်အအုံစံချိန်စံညွှန်းလမ်းညွှန်ချက် MNBC
4. ၂၀၂၅မန္တလေးငလျင်ကြီးအပြီးသုံးသပ်ချက်
5. သဘာဝဘေးအန္တရာယ်စီမံခန့်ခွဲမှု Disaster Management
6. ဂျပန်နိုင်ငံနှင့်တရုတ်နိုင်ငံတို့၏ဆောက်လုပ်ရေးနှင့်ဥပဒေပြဋ္ဌာန်းမှု
7. အင်ဒိုနီးရှားနိုင်ငံအတွေ့အကြုံ
8. ၂၀၂၅မန္တလေးငလျင်ကြီးအပြီးဆောင်ရွက်ချက်
9. ဆောက်လုပ်မှုကဏ္ဍဖွံ့ဖြိုးတိုးတက်ရေး
10. စံချိန်စံညွှန်းများလိုက်နာစေရေး

Presentation title

CYCLONE

Shelter type: School cum cyclone shelter type



School cum Cyclone shelter

Township: Laputta
Area: 18496 sq ft

Village: Pyin Kh)a Yaing
Year of Construction: 2009

10 Nargis. road network



Cyclone Nargis

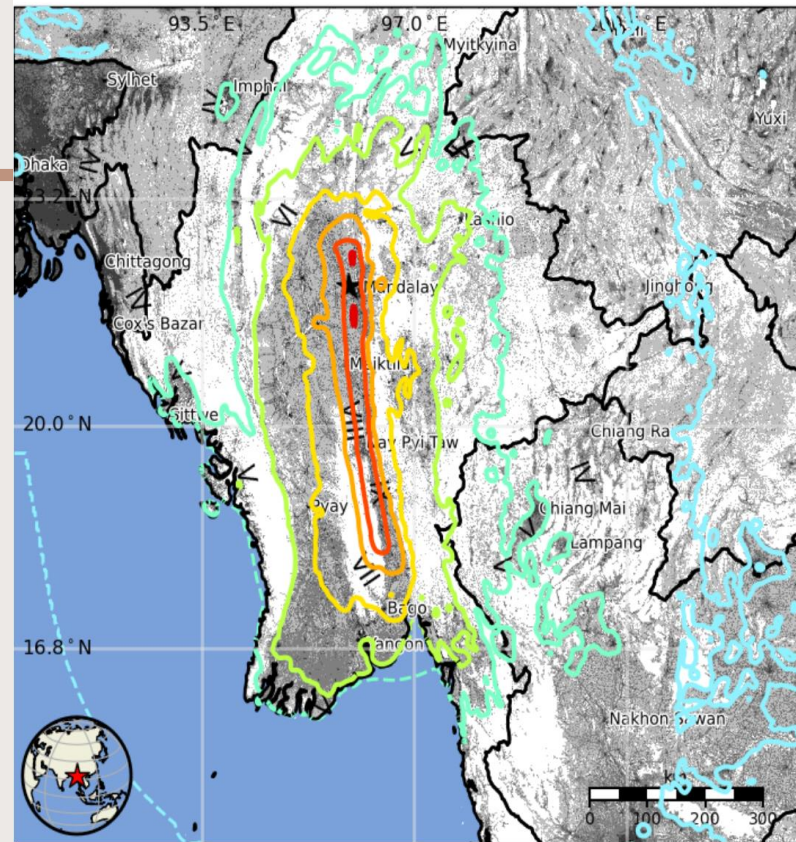
- 2008 may ,Ayeyarwady delta , 120 miles/hr
- Fatalities 84500,Missing 53800
- Damaged 450000 homes, lost many farms and fisheries
- Tsunami flood height 13 feet

Cyclone Mocha

- 2023 May,Sittwe Rakhine, 150 miles/hr
- Fatalities 145
- Damaged 183000 homes, lost fisheries

EARTHQUAKE

Estimated Population Exposure to Earthquake Shaking



Population per ~1 sq. km. from LandScan

INWA (AVA) Earthquake

- 1839 march 23, Mw 7.9-8.3
- Fatalities 300-400
- Kong bong Dynasty , Capital move to Amarapura
- Heavy damaged by liquefaction at Mandalay

BAGO Earthquake (91 yr.after Inwa earthquake)

- 1930 may 15 ,Mw 7
- Fatalities 140, Ruptured 75 miles
- Damaged at Yangon ,Bangkok,Chiangmai
- Threat to Yangon has 31miles seismic gap

MANDALAY Earthquake (95 yr.after Bago earthquake)

- 2025 march 28,Mw 7.7
- Fatalities 3700 ,damaged 50000 homes
- Ruptured 249 miles, super-shear ,boomerang's like
- Within 20 seconds reach epicentre to south
- Effected Sagaing, Mandalay, Naypyitaw, Bangkok

MYANMAR NATIONAL BUILDING CODE

Presentation title

5

1.Administration of planning ,building and built environment

2.Architecture and Urban-design

3.Structural Design

4.Soil and Foundation

5.Building Services

5A.Lighting

5B.Electrical and Allied installations

5C.Installation of Lifts and Escalators

5D.Water Supply, Drainage and Sanitation

5E.Heating,Mechanical ventilation and Air-conditioning Services

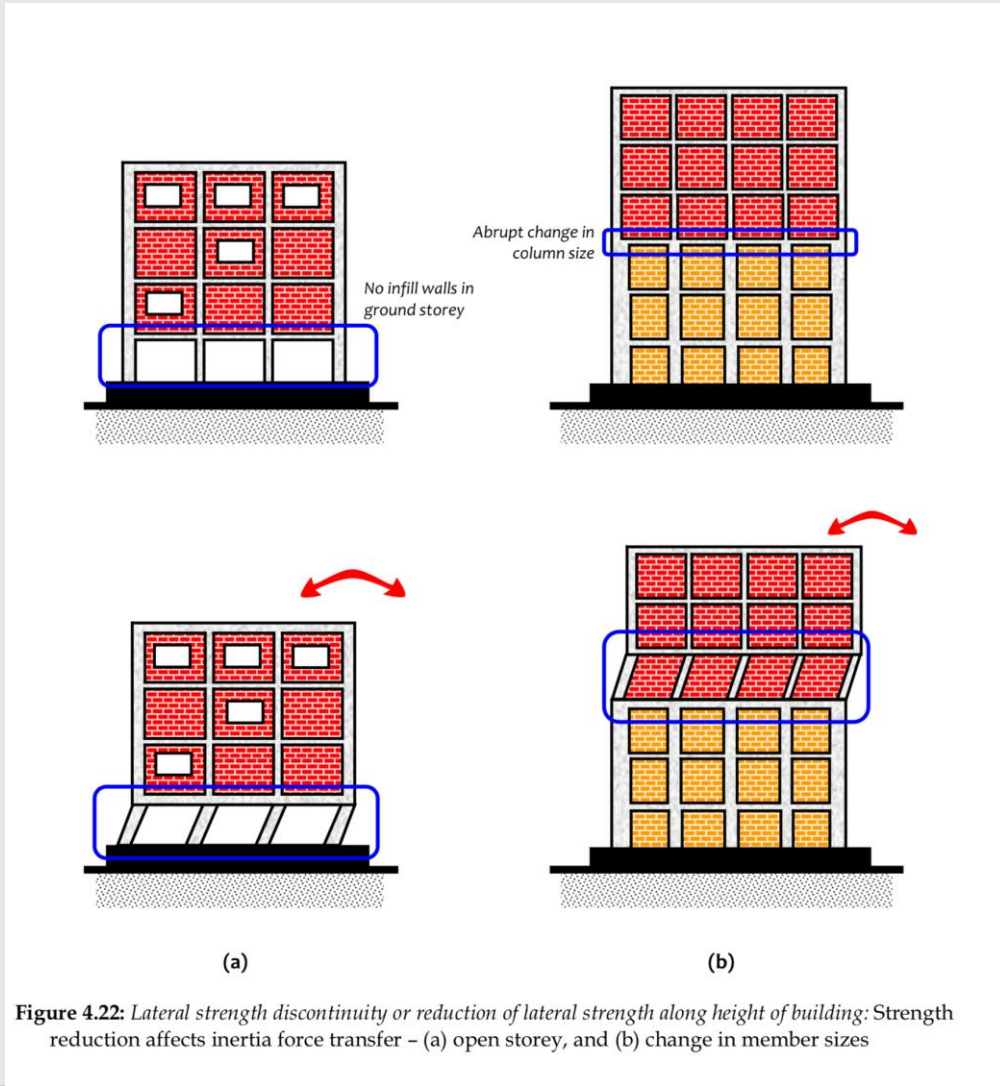
5F.Fire safety,Fire protection system and Means of Escape

6.Building Materials

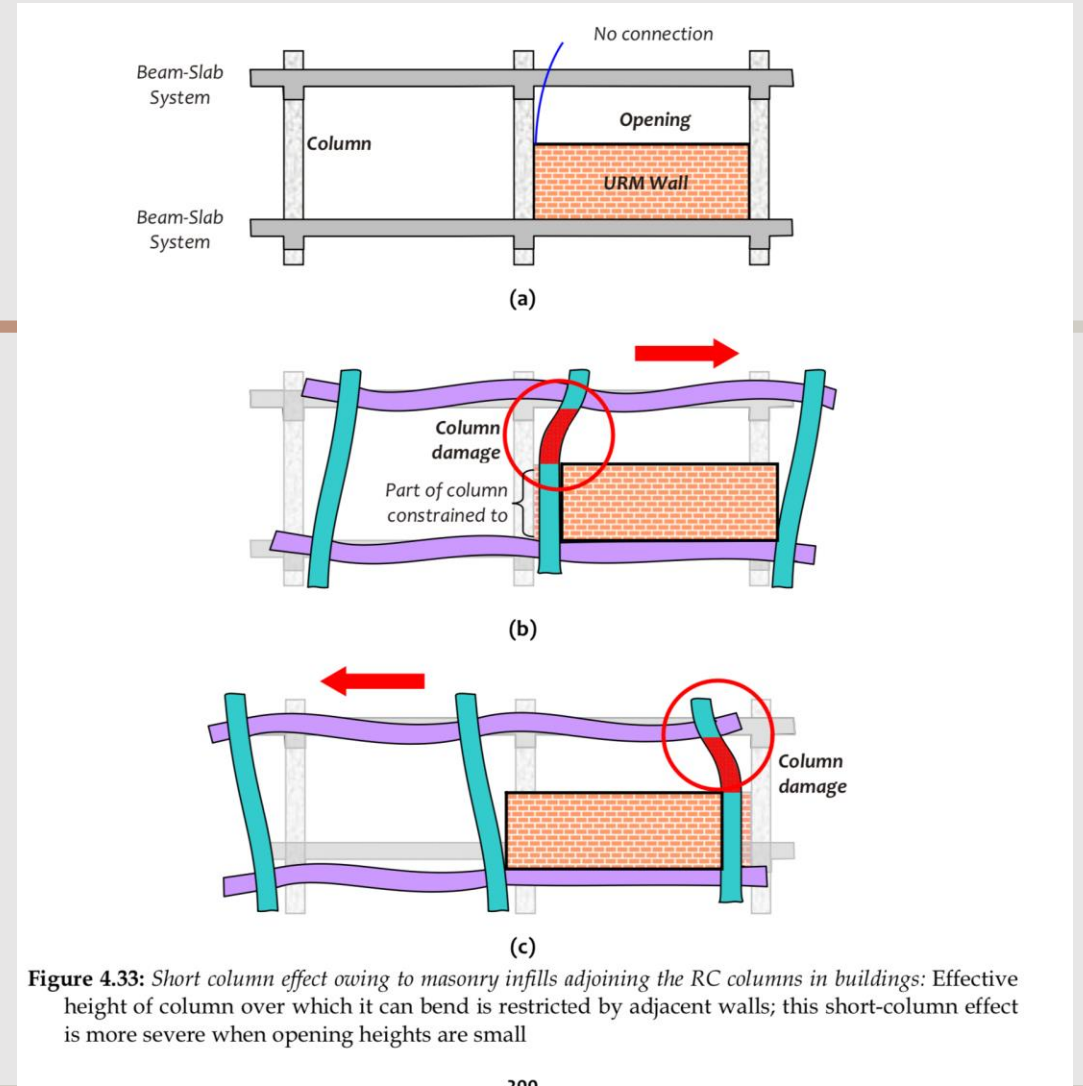
7.Constructional Practices,Safety and Building Maintenance



Review after post earthquake

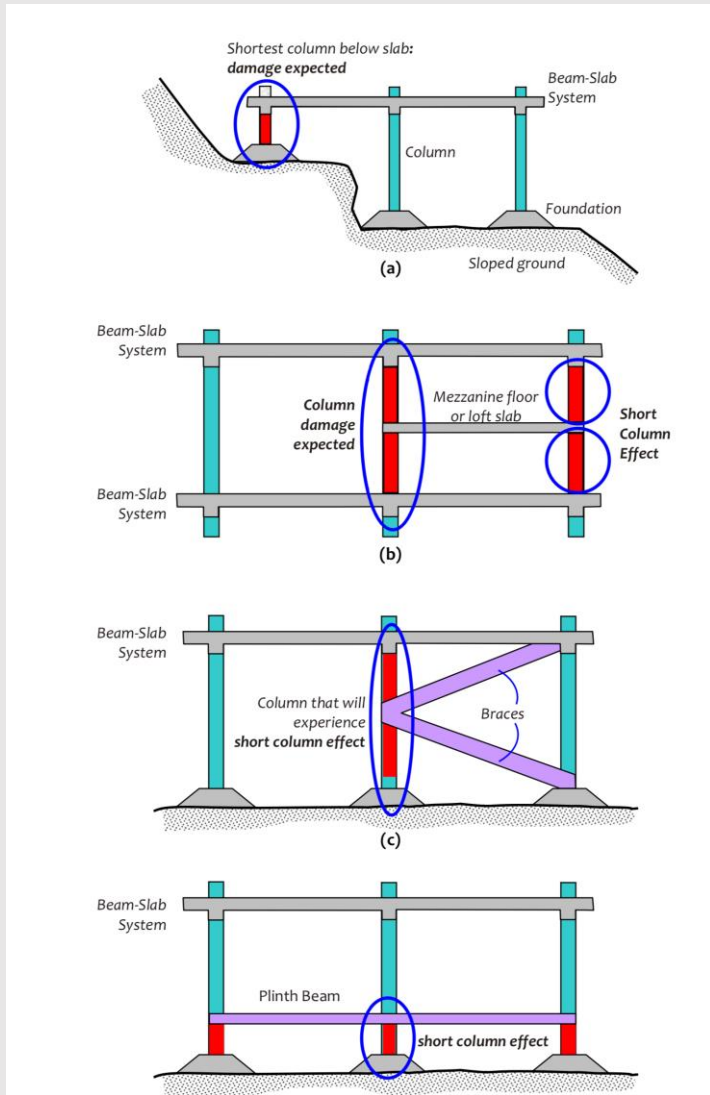


Open storey and change column size



Short column effect

Review after post earthquake



Short column

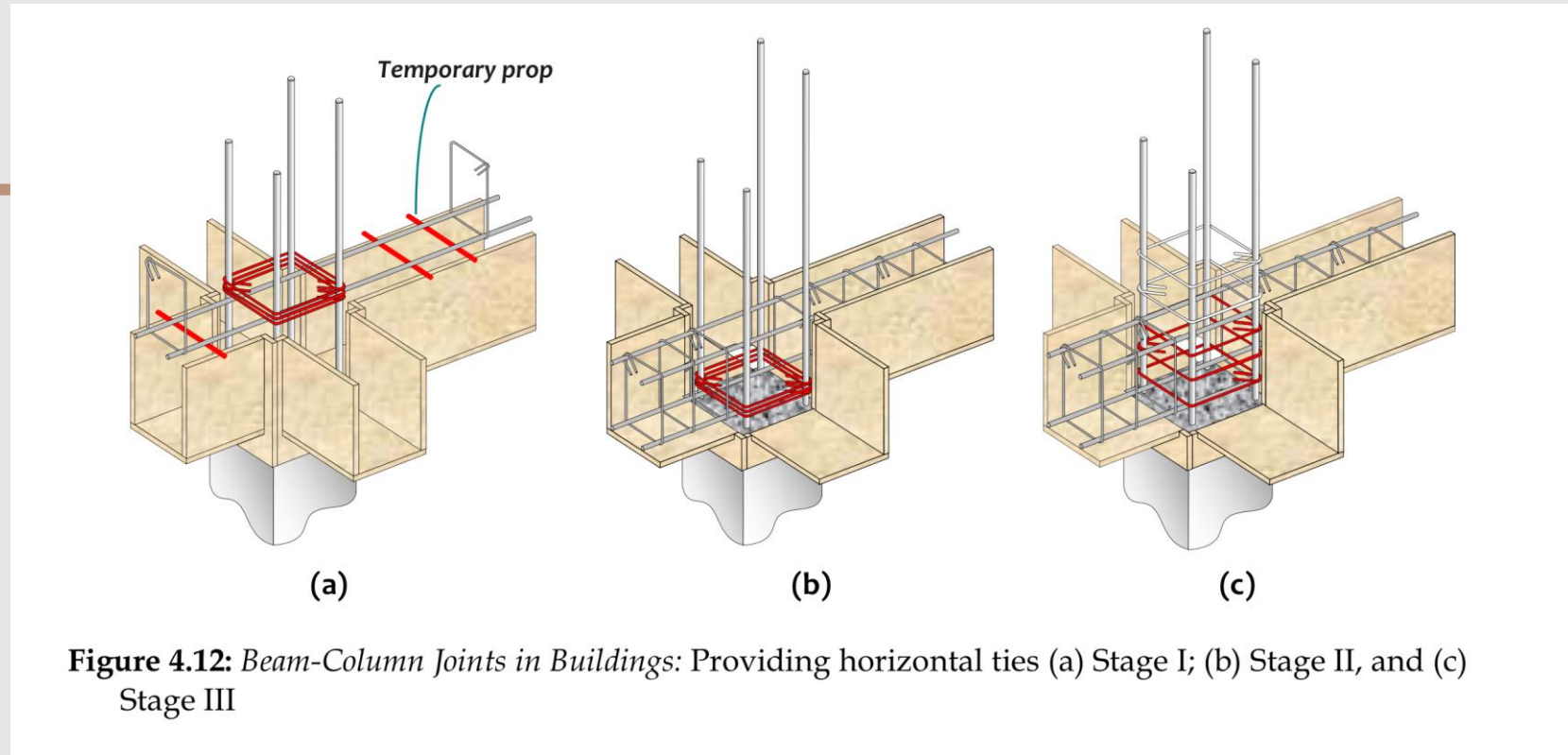


Figure 4.12: Beam-Column Joints in Buildings: Providing horizontal ties (a) Stage I; (b) Stage II, and (c) Stage III

Beam-column joints

DISASTER MANAGEMENT



1. Restoration
2. Reconstruction
3. Capacity Building

Training to Professionals and Skill workers

Awareness to Buildings Control Authorities
Owners, Developers, Contractors
And Public

JAPAN EXPERIENCED



Standards

1. Japanese Industrial Standards (JIS)
2. Enacted Building Standards Act Since 1950
3. Strictly monitoring and enforcement ,collapsed and Damaged buildings were under 1% of total
4. Critical Infrastructure used Base isolators and Dampers
5. Review and updated After post disaster for standards and National Building Code
6. Used high quality ductility strength steel de formed bars
7. Defined the natural disaster day and community have a mindful environment
8. Established Earthquakes and Tsunamis warning system
9. Checked critical Infrastructure (hospitals, bridges, etc.)

Laws and Acts

1. **Building Standards Act**
2. **Building Energy Conservation Law**
3. **Construction Law**
4. **City Planning Law**
5. **Fire Service Law**
6. **Barrier Free Law**
7. **Kenchikushi Law**
8. **Professional Engineer Act**
9. **Construction Business Act**



Earthquake, Standards and Act

1. **Construction Law Enacted 1997 overall covering comply Standards ,Building permit, Building Completion Certificate, Quality Inspection, Bidding, Contract Agreements ,Safety**
2. **2008 Joon Wenchuan. (Sichuan) Earthquake May 12**
3. **Fatalities 69000 ,missing 18000, injured 37000**
4. **Improved National Building Code after post earthquake**
5. **Over the next 3 years rebuild**
6. **Used high ductile strength reinforcement bar**
7. **Encourage for use Base isolators and Dampers**





- **Indonesia exists on Pacific Ring of Fire**
- **1999 enacted construction services Law**
- **2004 Sumatra Andaman Earthquake Mw9.1-9.3**
- **Occurred Tsunami 230000 fatalities, Then earthquake resilience non engineering buildings were revealed in National Building Code**
- **2017 Construction Law replaces previous Law, more modern and comprehensive**
- **2018 Sulawesi Earthquake, Mw 7.5-7.6, Occurred Tsunami Fatalities 4340, 667 missing,**
- **Build – Back – Better. Safer. Slogan was used**
- **Training programs to develop competence engineers**
- **Ina RISK Application easily to know seismic risk and mitigate**

Technology and Challenges

- Up date Seismic hazard mapping by Probabilistic seismic hazard analysis (P.S.H.A)
- Design base on building can deform without collapse
- Calculate performance base design for critical structures and use loading refers from ASCE 7
- Weak enforcement at far from major cities
- Challenges under standards building for before 1998
- Also weakness for some non engineering buildings constructed by weak various small contractors
- Improved the Inspection technique but Quality deficiencies are constrained of abilities and some corruption of local building control Authorities

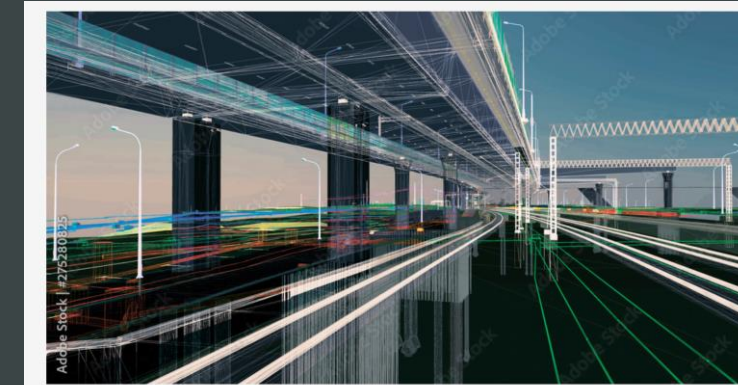
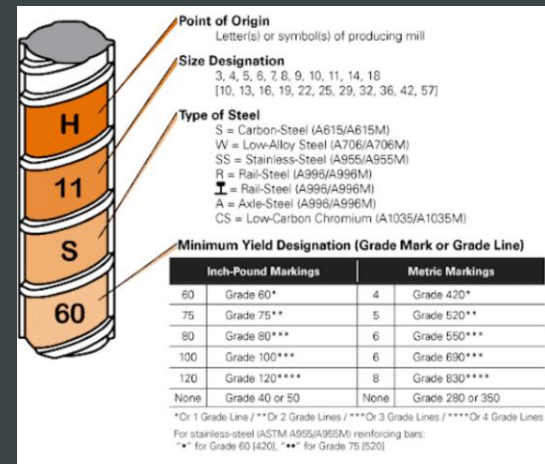


CONSTRUCTION INDUSTRY



Stakeholder performance and Duties

- Ethics and Responsibility are major role of Owners, Developers, Contractors, Inspectors, Professionals, Materials Suppliers, and Buildings Control Authorities
- Competences must have Skill Worker
- Contractor fulfilment for Quality
- Advanced Technology and well Construction Management in. Quality, Cost, Time, Safety
- Standard Inspection system need about as Quality Control, Quality Assurance, Third Party Inspections programs (ISO 17020)
- Complying Standards, rules and regulations



BIM model of transport infrastructure – bridge and highway system visualization

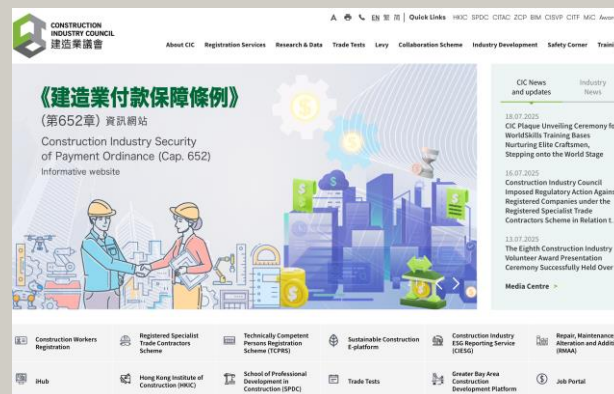
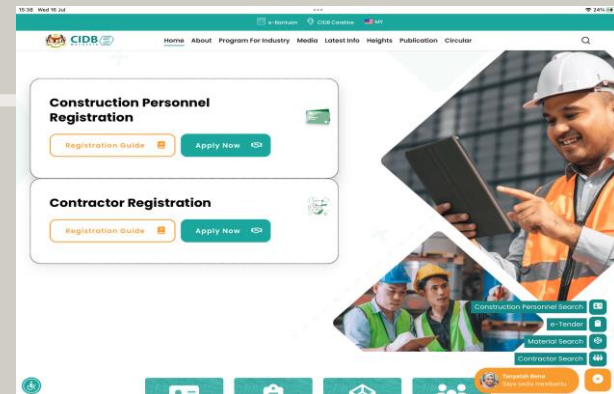
1. **Construction Materials Standards.** (Conformity Assessment Lab ISO17025, Inspection)
2. **Skill Workers Competence.** (Assessment, Training, Registration Competition, **NSSA**)
3. **Contractors capacity improvements** (Registration , Grading, Incentive)
4. **Technology Development** (Building Research Lab, Industrialised construction, Advanced Design techniques, Building Information Modelling)
5. **Bidding Practices** (procurement regulations)
6. **Contract Agreement System**(FIDIC)
7. **Industry Initiative Funding** (Levy.)
8. **Consultant and Consultant Firm Registration** (Technical Transfer, Foreign , local)
9. **Construction Management and Inspection System**
10. **Quantity survey Standards and related subjects**

Organisation and Development Law

- Building and Construction Authority Act, (BCA) , Singapore
- Construction Industry Development Board Act, (CIDB) Malaysia
- Construction Industry Development Board Act , (CIDB) South Africa

Organisation and Order

- Construction Industry Security of Payment Ordinance
- Construction Industry Council (CIC) ,Hong Kong
- Construction Industry Development Council (CIDC), India



COMPLY STANDARDS

Technical Standards

- Myanmar National Building Code 2025

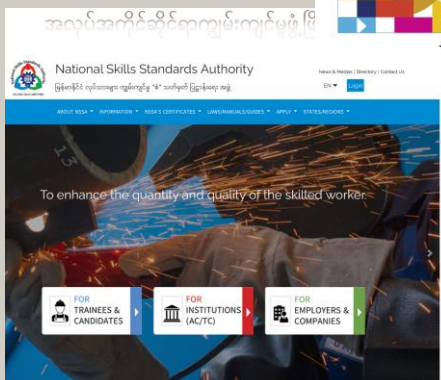
Materials Standards

- Myanmar Standards, MMS

Skill Labours Standards

- National Skills Standards (NSSA)

Voluntary to Mandatory The Concern ministry develop rule and regulations



THANK YOU

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