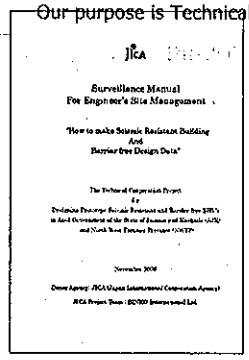
JICA

Technical Transfer of Seismic resistance building and Site management Manual

Technical Transfer Team of Designing prototype Seismic Resistant and Barrier-free Basic Health Units

Site management manual

Our purpose is Technical Transfer,,,,But



- **Making it for Surveillance Engineer**
- **Why such titles manual shall be needed ?**
- **What is necessary for our object of technical transfer now and toward for tomorrow ?**

Object of technical transfer

- Engineers working in Communication & Works of AJK or Works & Services of NWFP (Our counterpart)
- Contractor's engineer who is in charge of those BHU construction
- Participants of Workshop

Then what's Technique they need ?

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The Technical Cooperation Project for Designing Prototype Seismic Resistant and Barrier-free BHUs at Udhgarpur in AJK and at Attar Shisha in NWFP

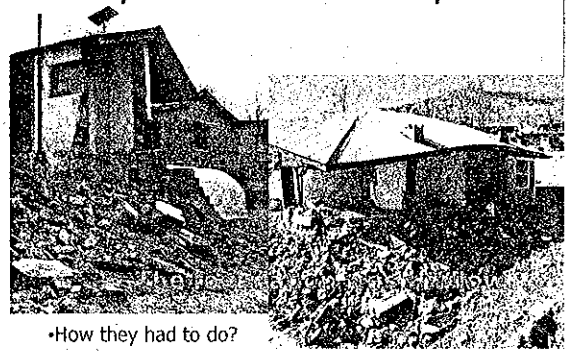
Engineer's technology investigation Teaching material

Curriculum 1 Excerpt

(Brainstorming)

Incident or Accident?

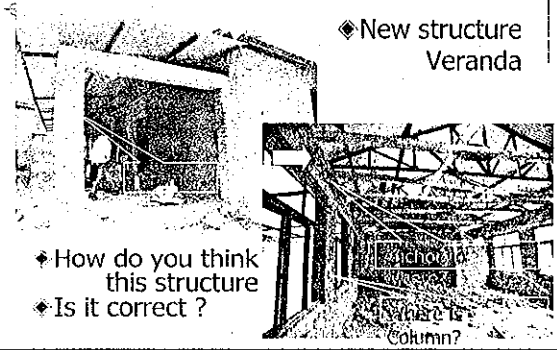
Why was this wall collapsed?



•How they had to do?

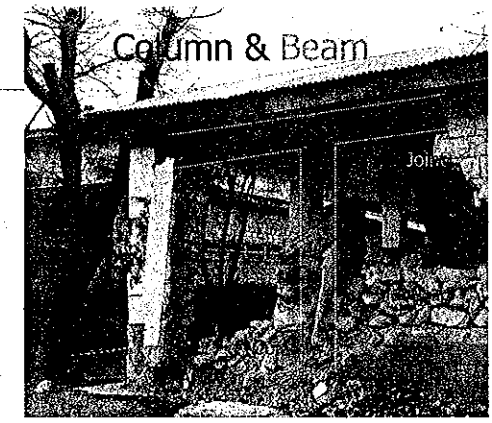
New Construction

- New structure Veranda



- How do you think this structure
- Is it correct ?

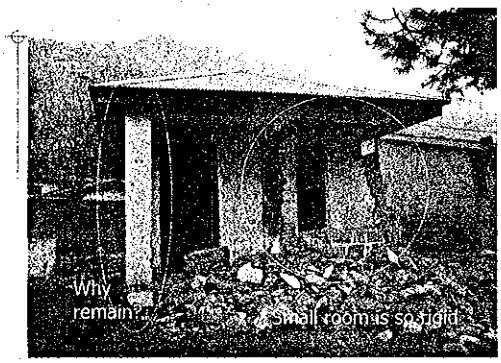
Column & Beam



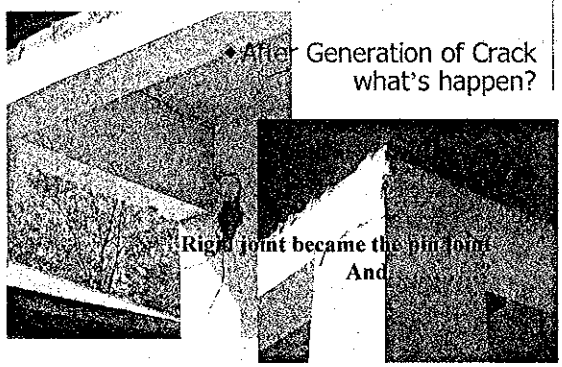
Rigidity / Stiffness

the part of
ess at first

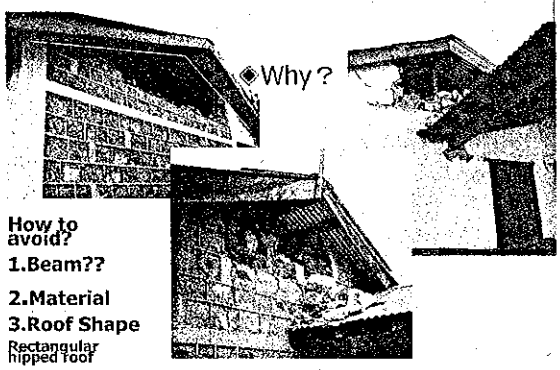
Rigid wall



Limitation of strength



Is gable of saddle roof weak?



How to avoid?

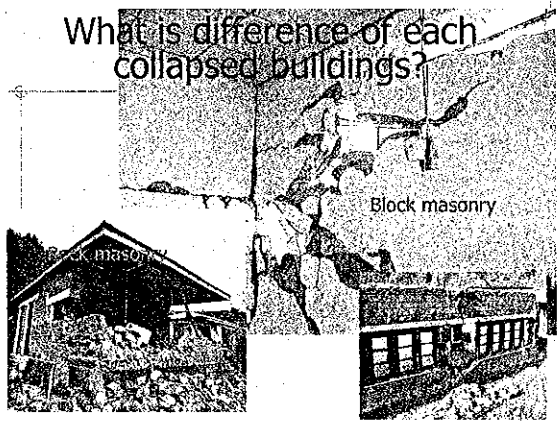
1.Beam??

2.Material

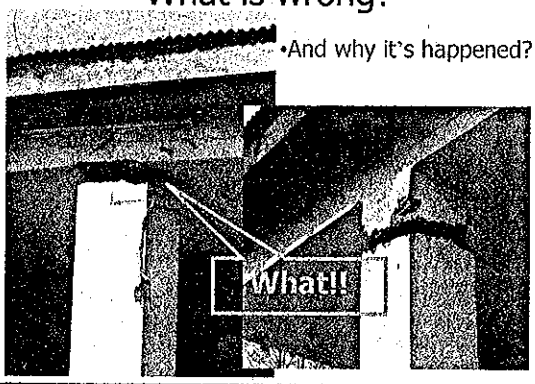
3.Roof Shape

Rectangular
hipped roof

What is difference of each collapsed buildings?

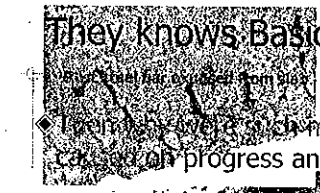


What is wrong?

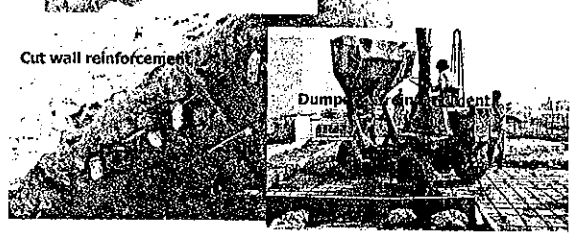


•And why it's happened?

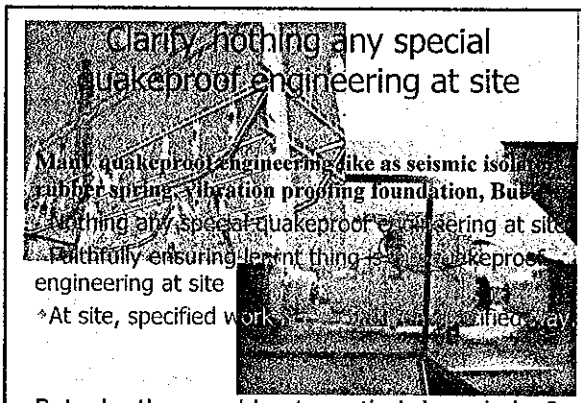
They knows Basic Engineering!



- Do you know why were such mistake or careless conducted on progress and result?



Clarify, nothing any special quakeproof engineering at site



Many quakeproof engineering like as seismic isolation, rubber spring, vibration proofing foundation, But

- Nothing any special quakeproof engineering at site
- Faithfully ensuring learnt thing ... quakeproof engineering at site
- At site, specified work ... specified way

But why they could not use their knowledge?

Engineer's work at the commencement

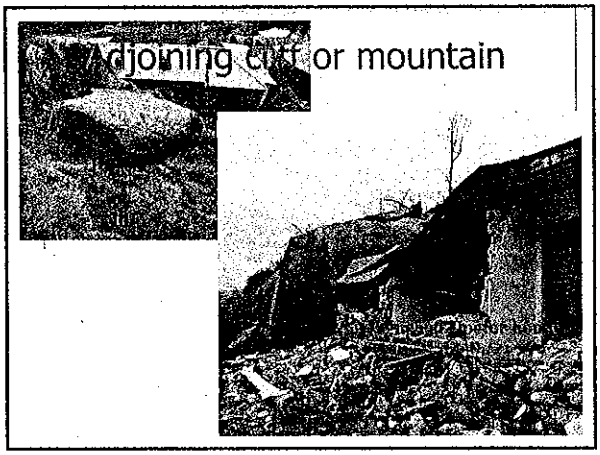
- Grasp of designer design intention
- Grasp of process
- Grasp of construction condition
  - Grasp of situation around the vicinity of site
  - Grasp situation of site
    - **Soil test, Topographic Survey**
- Establishment of system for Surveillance
  - Organization
  - Quality control
  - System of Meeting, Report, etc.
- Etc.

Grasp of situation around the vicinity of site

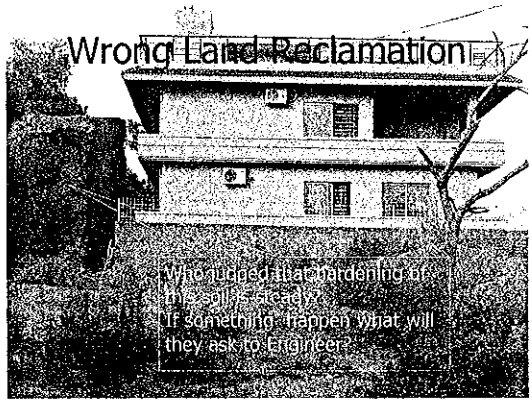
Observation Item

- **Adjoining cliff or mountain**
- **Peripheral nature of soil**
- **Retaining wall**
- **Water flow**
  - **River (Record of flood, The highest water level)**
  - **Flow of water at torrential rains**
  - **Amount of spring water**
- **Slope stability**
- **Trees**

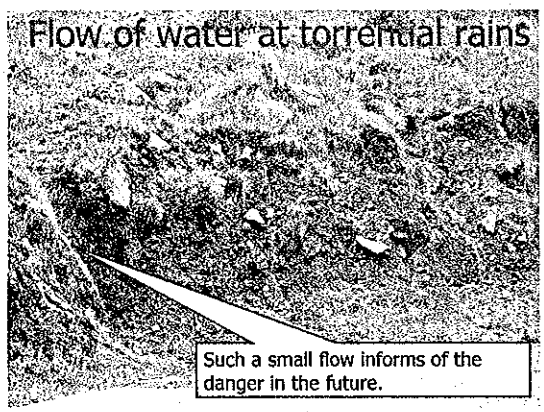
Adjoining cliff or mountain



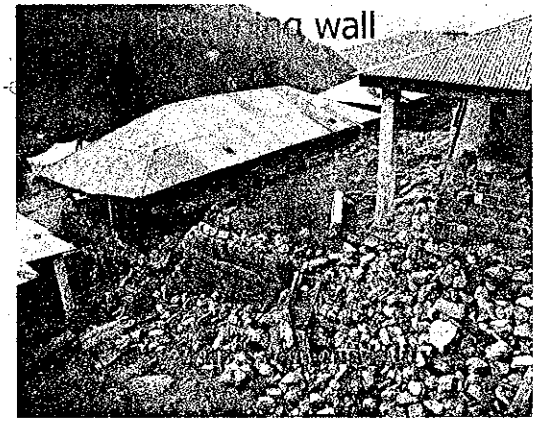
Wrong Land Reclamation



Flow of water at torrential rains



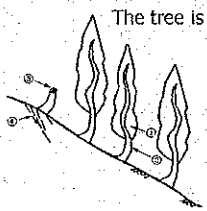
...ng wall



Trees

Signs of the landslide are shown.

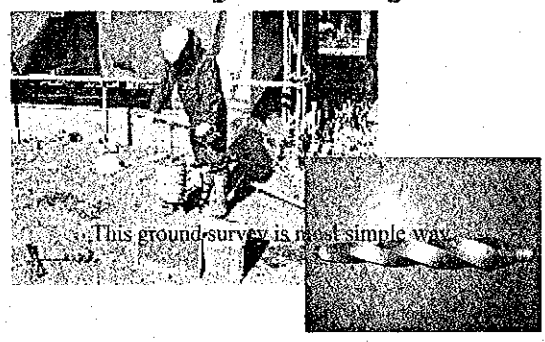
The tree is curved.



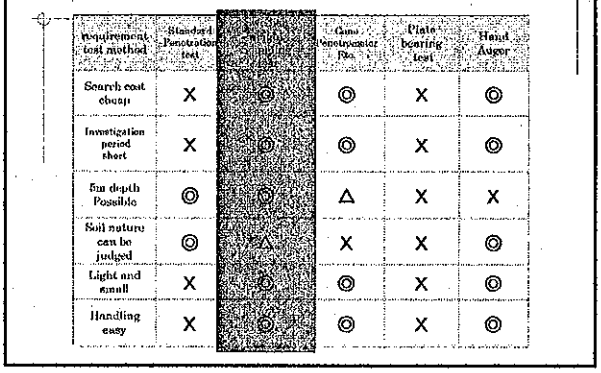
The annual ring of the tree does not become a concentric circle.

※その他、地表クラックや根の異常な張りなど

Swedish weight sounding test



General method of surveying ground and satisfaction rating



requirement / test method	Standard Penetration test	Sounding	Cone penetrometer Rs	Plate bearing test	Hand Auger
Search cost cheap	X	◎	◎	X	◎
Investigation period short	X	◎	◎	X	◎
5m depth Possible	◎	◎	△	X	X
Soil nature can be judged	◎	△	X	X	◎
Light and small	X	◎	◎	X	◎
Handling easy	X	◎	◎	X	◎

Necessary Engineering

- Problems have come up to the surface
  - Lack of the technique of quality control
  - A lot of sites at the same time
  - Lack of Basic information of site management
- Site management engineering
- So what kind of Site management engineering shall be needed for making seismic-resistant building

Management Control Item & New Material

Site management teaching material Excerpt

For seismic resistant Building Material of a less management control item

Role of Surveillance Engineer

- Elements of Site Management
  - Time and Quality
  - **Safety**
- Role of Site Surveillance Engineer
  - Control of Time and Quality
- Final Responsible Person for Quality

Site

Management control item

- Concrete Work
- Reinforcement
- Hollow Block work
- Finishing work
- Steel Structure Work
- ETC.

The management item decreases by going below.

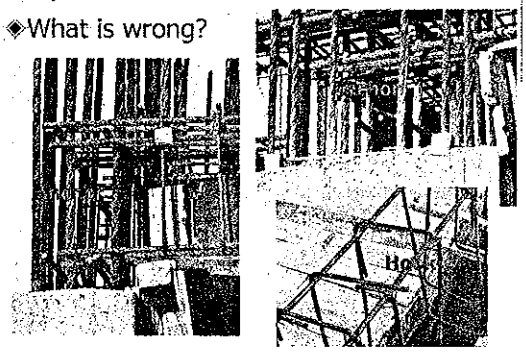
Management control items of Reinforcement

Example

- **Number, Size, Type, Strength (of each part)**
- **Splice (Position, Length, Hook of each part)**
- **Shape of Hook (180° , 135° , 90°)**
- **Compression Splice & Tension Splice**
- **Anchorage (Dowel)**
- **Thickness of Protection cover concrete**
- **Spacer, Bolster, Chair**
- **Etc.**

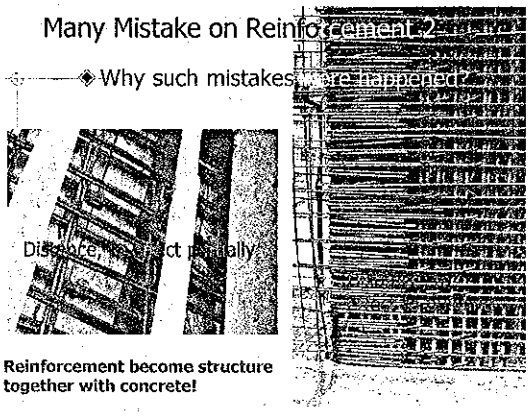
Many Mistake on Reinforcement 1

- What is wrong?



Many Mistake on Reinforcement 2

- Why such mistakes are happened?

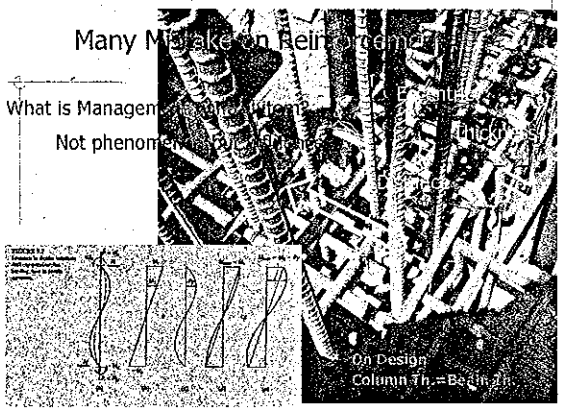


Reinforcement become structure together with concrete!

Many Mistake on Reinforcement

What is Management Items?

Not phenomenon but Principle



Can you control all Management Items?

- You can not control all Management Items on all progress.

How to manage?

Two Solutions

1st Solution

- To find your colleague to support you
  - NO!
  - You have to make collaboration with Contractor's Engineer of Site
  - How to? ⇨ Need New control system

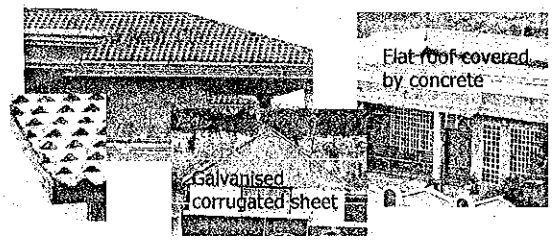
2nd Solution

- To find Material of a Less Management Control Items

2nd solution

Material of a Less Management Control Items

- Which is a Less Management Control Item's Material



6

2nd Solution

Material of a Less Management Control Items

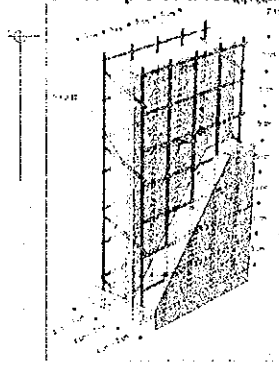
◈Industrial Material

half-finished goods, partially fabricated item
semi manufactured goods

- **Hollow Block**
- Steel Structure
- Prefabrication's building
- Panel Wall
  - Pre-cast concrete Panel
  - **C-Panel Wall**

2nd Solution

As a sample of a less management control items



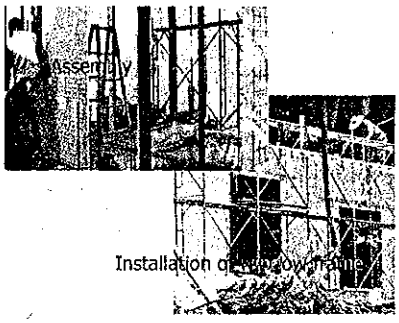
C-Panel Wall

Structural Wall

4cm~7cm styrene board
+ cement mortar

2nd solution

C-Panel Wall construction process 1



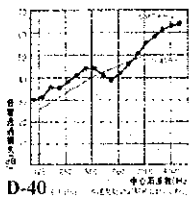
2nd Solution

C-Panel Wall construction process 2

2nd Solution

C-Panel Wall performance assessment

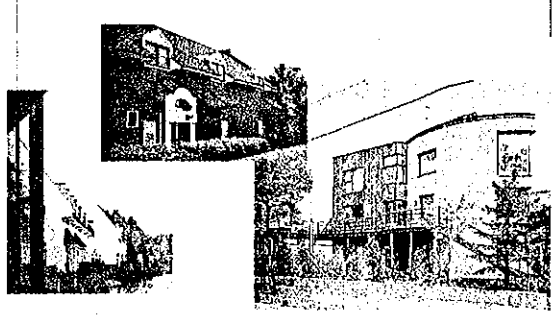
Weight of panel: 4.8kg/m2
Shear strength: 2.5t/m
Thermal insulation performance:
0.62kcal/m2·h·℃
Fire resistance class:
Mortar Th. 2 x 37.5 2 hour fireproof



Classification of sound insulation
More than D-40

2nd Solution

C-Panel Wall Example of construction



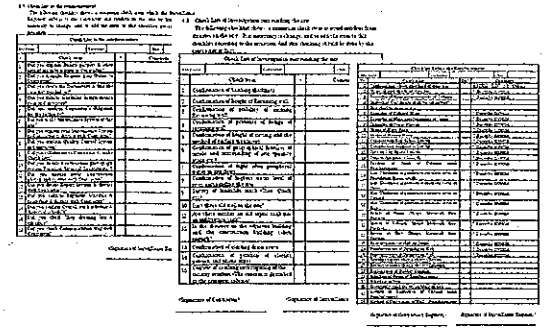
1st Solution

Collaboration with Contractor's Engineer of Site

- How to get the supports
  - Starting from zero is difficult
  - Sample shall be shown
    - Checklist
    - Description of quality control

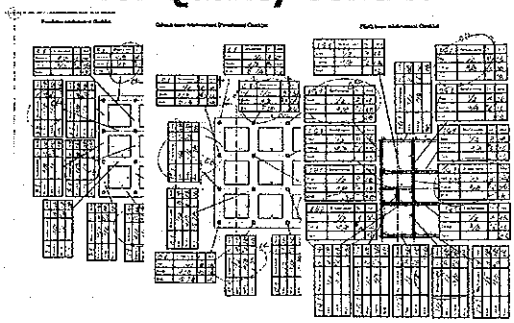
1st Solution

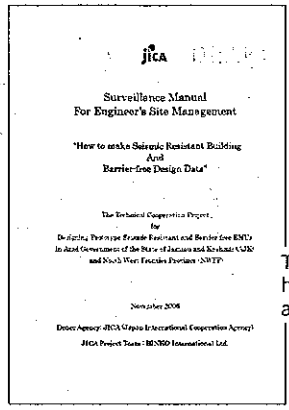
Checklist



1st Solution

Field Note for Quality Control





jica

Surveillance Manual
For Engineer's Site Management

"How to make Seismic Resistant Building
And
Barrier-free Design Data"

November 2006

Surveillance Manual for Engineer's Site Management

This manual describes how to manage the site as Surveillance Engineer

History of Surveillance in Japan

- Japan walked on the same way like Pakistan
  - **Before Surveillance Engineer was surveillant like as jailer**
    - **The quality is bought by the inspection**
    - **All shop drawings are made by Main Contractor's Engineer**
    - **The client expects the role of the surveillant of the omission work to Surveillance Engineer**
  - **While high growth period(1955-1970), Worker and engineer's deficiencies**
  - **Then Quality had been going down**
- Now almost sub-contractor can make construction plan of each work and Quality control
  - **All shop drawings are made by sub-contractor now**
    - **It causes the weakness of the general contractor**

We hope that this manual has given something usefulness to the Surveillance Engineer and effect the improvement of construction management.

END

THANK YOU for your attention

Preparing Sufficient Document and Drawings

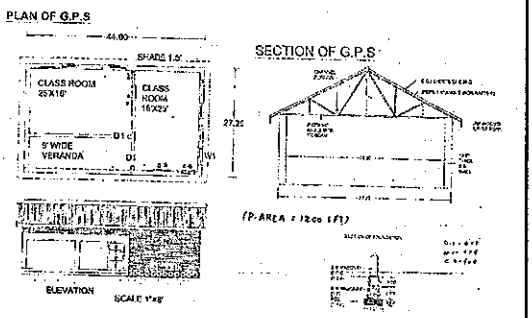
Present Situation of Document and Drawings of NWFP, AJK small project

I asked my counterpart, government engineers, to give me Documents and Drawings of some project.

I received the following Documents and Drawings.

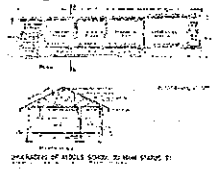
Some big project have enough documents and drawings prepared by consultant (outsourcing).

Drawing sample 1

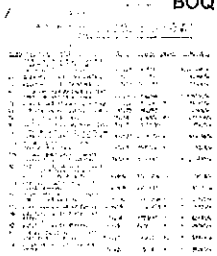


Drawing sample 2-1

Drawings



BOQ



7: RCC (1:2:4) as in F and P.

8: RCC (1:2:4) as in col: beam slab.

9: S/F of mild steel reinforcement i/c cutting bending etc.

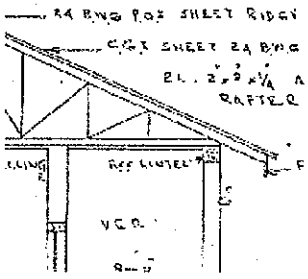
12: S/F of heavy steel work with angle iron tees etc. size 2"x2"x1/4" as specified

13: Erection and staging of steel trusses.

14: Fabrication of small iron work gusset plates.

Drawing sample 2-2

Part of the Drawing

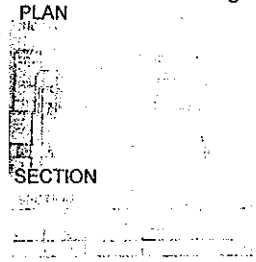


There is no dimensions, any reinforcement for R.C.C. LINTEL.

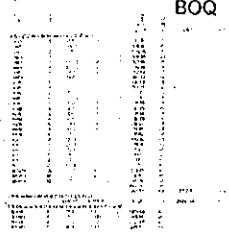
Drawing sample 3-1

PLAN

SECTION



BOQ



06-06-a-03

RCC in roof slab, beam, column, and other structural members, insitu or precast. Type C (1:2:4)

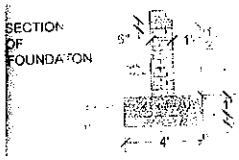
06-07-b

Supply and fabricate M.S. reinforcement for cement concrete (Deformed bars)

1

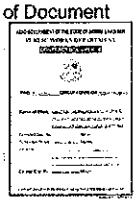
Drawing sample 3-2

- Content of reinforcement is simply expressed.
- There is no steel bars specification.

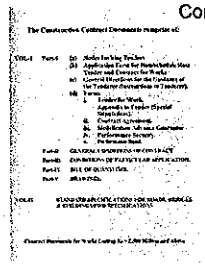


Drawing sample 4

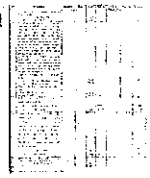
Cover of Document



Content



BOQ



There is no drawing.

There is no technical specification.

Project of Public Works

We need the following documents and drawings.

They are produced from design activities.

- Technical Specification
- Structural Calculation
- Drawings
- Bill Of Quantity (BOQ)
- Shop Drawings

Code and Standard-1

Design is supported by Code and Standard.

- AIJ (Architectural Institute of Japan) Standard for Structural Calculation of Reinforced Concrete Structure.
- Japanese Architectural Standard Specification for Reinforced Concrete work (JASS 5).
- Design Standard for Steel Structure.
- Japanese Architectural Standard Specification for Structural Steelwork Specification for Building Construction (JASS 6).
- Recommendation for Detailing and Placing of Concrete Reinforcement.
- Japanese Industrial Standard (JIS)

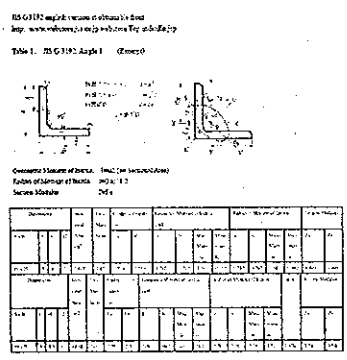
We must know these Code and Standard for supervising the construction or we must know where can we find some items in the code and standard.

We must keep some of them.

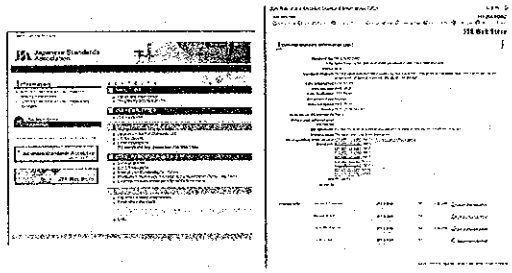
JIS

Example of Standard

Angle



JSA



You can buy (download) the PDF file of the G3192 from the above site.

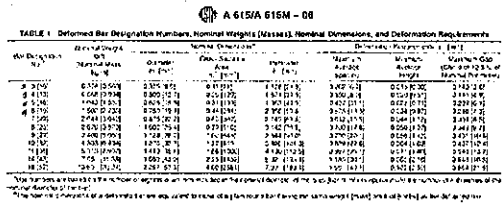
Code and Standard - 2

If you want American or British Standard

- IBC
- UBC (Uniform Building Code)
- ASTM (American Society for Testing and Materials)
- AISC (American Institute of Steel Construction) Specifications for Design, Fabrication and Erection of Structural Steel for Buildings.
- **British Standards**

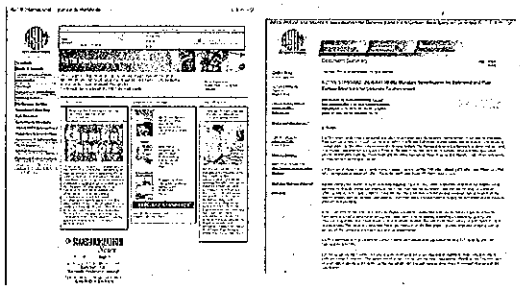
ASTM

Example of Steel Bar



In A615, Tensile strength and Yield strength are showed

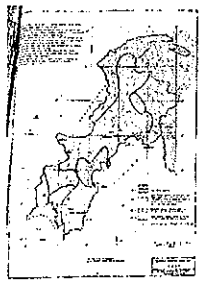
ASTM International



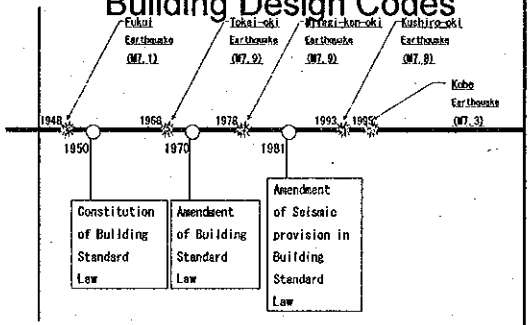
You can buy (download) PDF file of A615 from the above site.

Building Code

- Regulation in Building Code also help to make a seismic resistant building.
- Seismic Loads will be stipulated in the Building Code of Pakistan.



History of Japanese Building Design Codes



Understand the Structural Design

- Reading the structural calculation helps the understanding the structural design.
- Modeling
- How the lintel beam, brick wall are considered in the calculation.

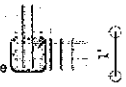
We know what is more important and what is less important on making seismic resistant building.

Shop drawings

- Design drawings are typical drawings.
- Shop drawings (Detail drawings) covering all aspect of building are important for construction.

Shop drawings (Detail drawing) for reinforcement

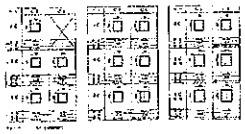
From this drawing we can decide the dimension of stirrup.



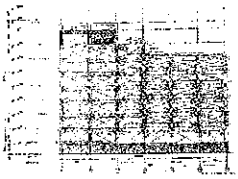
Accumulate the knowledge in print or in disk.

- By making documents and drawings and holding those of many project, we can compare experiences.
  - For example, in the occasion of earthquake, 4 main bars(D13) beam was damaged but 6 main bars(D13) beam was not damaged, from the comparison of these experiences we can make a better building.
- At Hanshin Earthquake, Engineer could study the real cause of the collapse when they had the drawings and structural calculation of the collapsed buildings.

Recommendation to RC Structural Design after Hanshin- Awaji Earthquake Disaster
Architectural Institute of Japan
excerpt



Column List



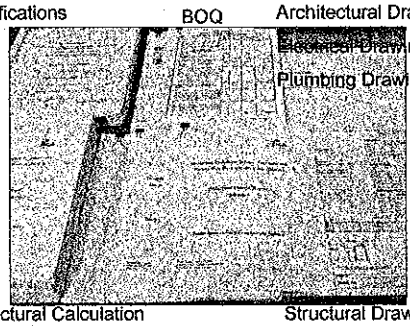
Crack of Framing Etevation

Documents and Drawings for our BHU

Specifications BOQ Architectural Drawings

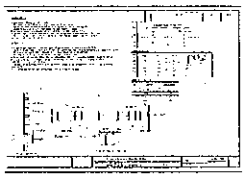
Electrical Drawings

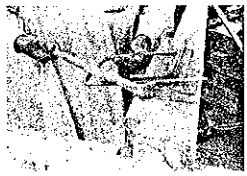
Plumbing Drawings

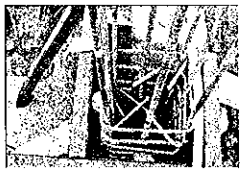


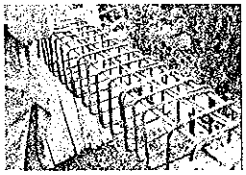
Structural Calculation Structural Drawings

Structural Drawings
General Notes 1

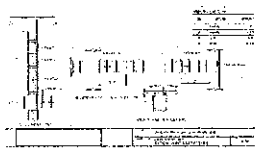




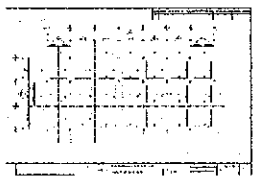




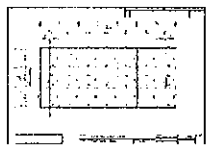
Structural Drawings
General Notes 2



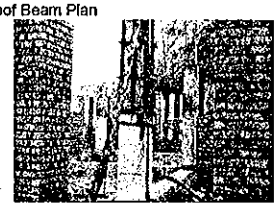
Structural Drawings
Foundation

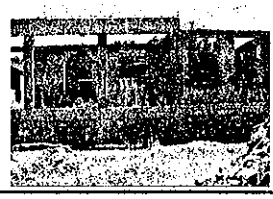


Structural Drawings
Roof Beam Plan



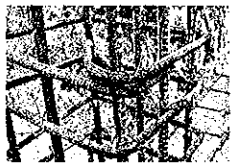
BHU

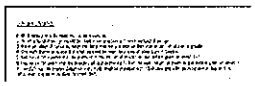


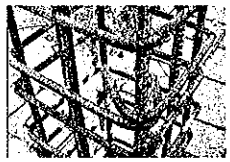


Girls School
near
Attarshisha

Structural Drawings
Column, Beam List

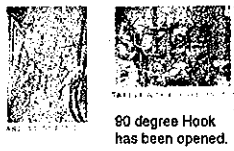






7. Ties/Stirrups in Beams, Column and Lintels shall be provided with 135 degree hooks.

Hoop
Experience of Hanshin Earthquake

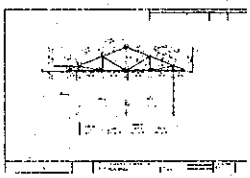


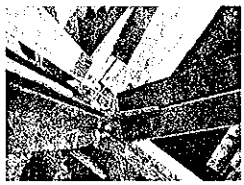
90 degree Hook has been opened.

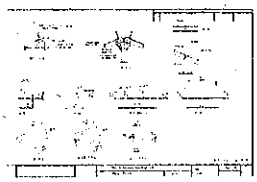
Table2.1.1-7Degree of Hook of Hoop

	Totally collapsed	Collapsed	total
90/90	12	29	41
90/135	6	14	20
135/135	0	1	1
welded	0	1	1
unknown	6	7	13
total	24	52	76

Structural Drawings
Steel Truss







Why document and drawings are not sufficiently prepared ?

- Everybody knows the importance of preparing sufficient document and drawings.
- Little Budget ?
- Little Manpower ?
- Little Time ?
- Little computer, book, office space ?

Remake, Modify and Reuse

- Some of the buildings of health sector are similar each other.
- Some of the building of education sector are very similar.
- So government engineers can remake, modify and reuse the documents and drawings.
- Engineers can save time.

We modify the specification now

- We now modify the specification of concrete, reinforcement and structural steel.

Thanks for listening.