

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

JICA

Surveillance Manual
For Engineer's Site Management

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

The Technical Cooperation Project
for
Disaster Preparedness and Response and Rehabilitation of Basic Health Units
in the Government of the State of Assam and Mizoram (NHU
and SHU) in the District of Assam (NHU)

November 2008

Donor Agency: JICA (Japan International Cooperation Agency)
JICA Project Title: 200303 (Seismic and L)

- ◆ 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
Disaster Preparedness and Response and Rehabilitation of Basic Health Units
in the Government of the State of Assam and Mizoram (NHU
and SHU) in the District of Assam (NHU)

Engineer's technology investigation Teaching material

Curriculum 1 Excerpt

(Brainstorming)
Incident or Accident?


Why was this wall collapsed?



•How they had to do?

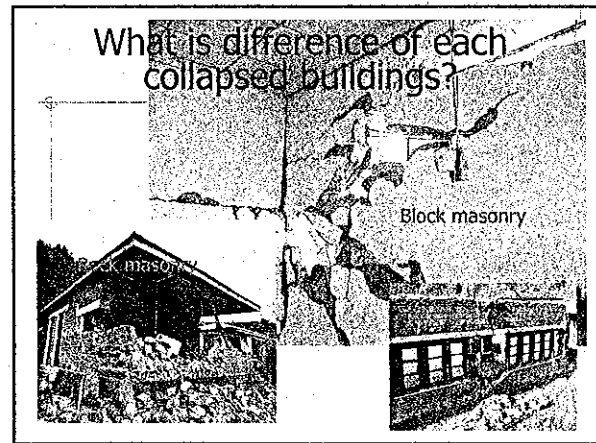
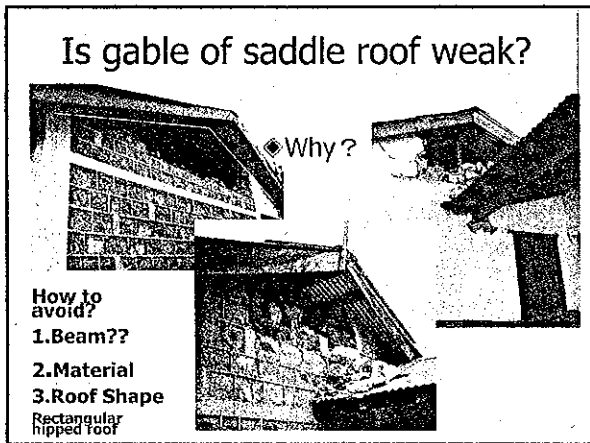
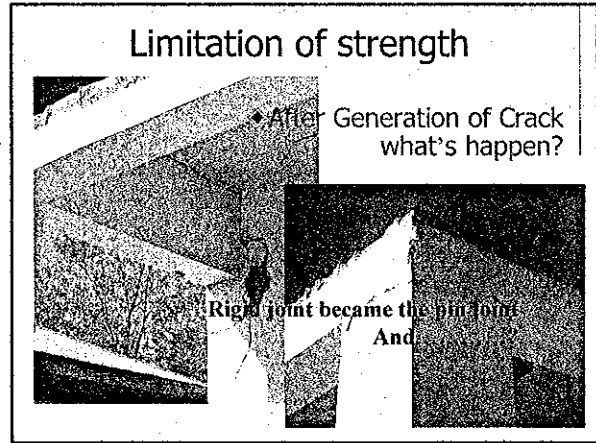
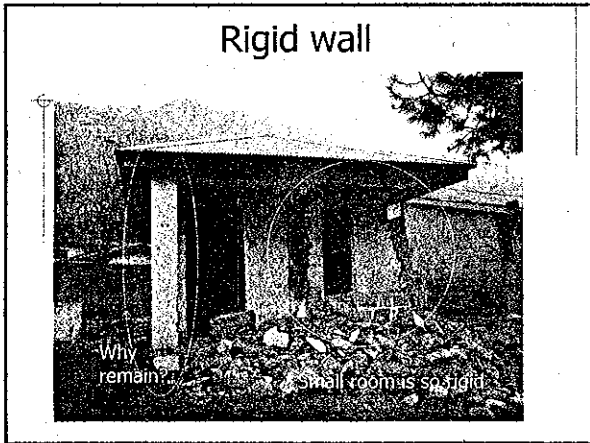
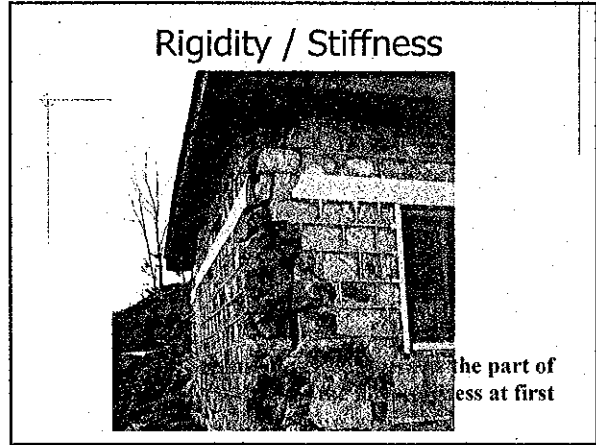
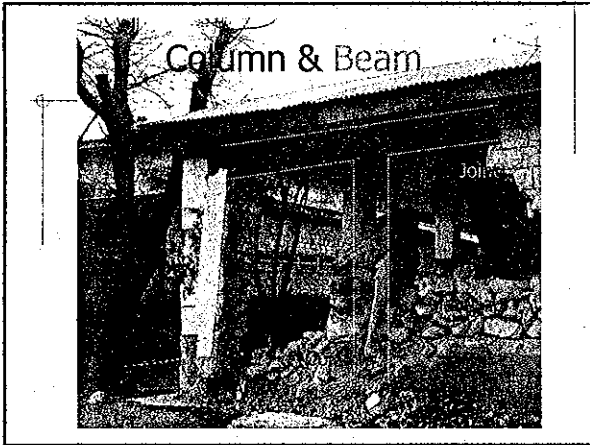
New Construction

◆ New structure Veranda



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

column?



What is wrong?

•And why it's happened?

What!!

They know Basic Engineering!

◆ They know the mistake or careless construction progress and result?

Cut wall reinforcement

Clarify nothing any special earthquakeproof engineering at site

◆ Many earthquake engineering like as seismic isolation, rubber spring, vibration proofing foundation, But nothing any special earthquakeproof engineering at site. Faithfully ensuring different things as earthquakeproof engineering at site.

◆ At site, specified work is done in specified way.

But why they could not use their knowledge?

The Technical Cooperation Project
Design of Prototype Seismic Resistant Reinforced Concrete of Low-Rise in Asia

Lecture
Engineer's role in stability of land

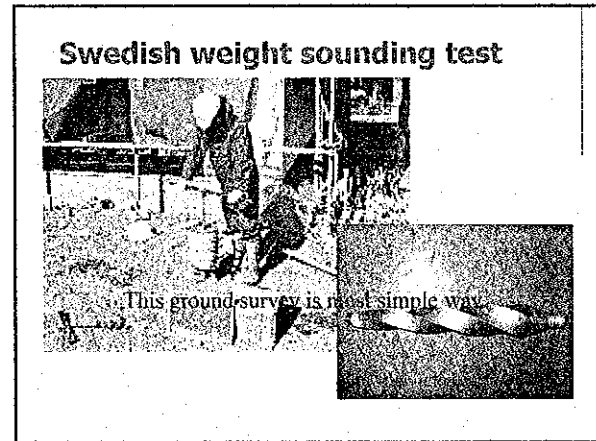
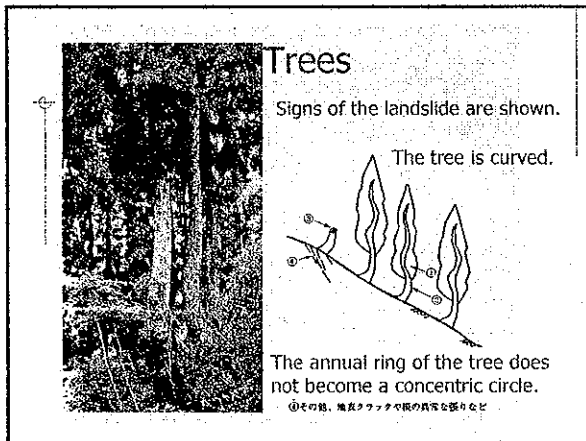
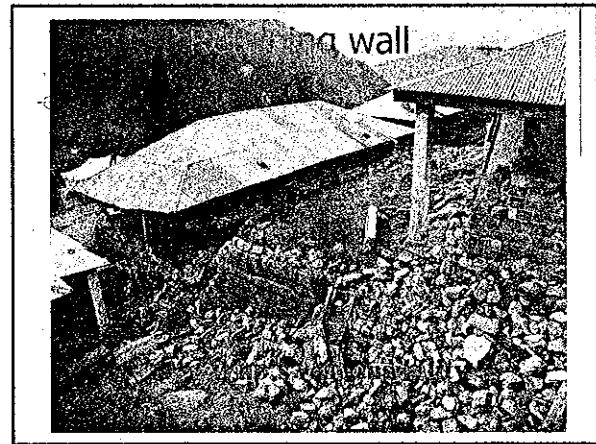
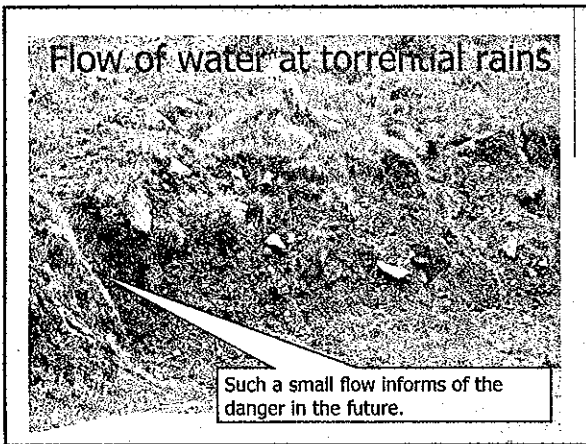
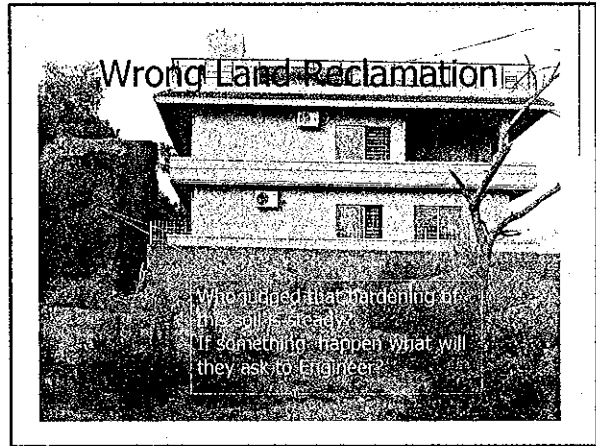
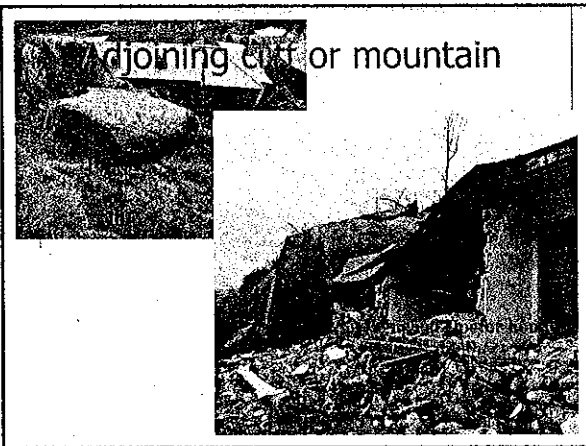
Engineer's work at the commencement

- ◆ 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



General method of surveying ground and satisfaction rating

Requirement and method	Standard Penetration test	Core Penetration Test	Plate bearing test	Hand Auger
Search cost cheap	X	⊙	⊙	X
Investigation period short	X	⊙	⊙	X
So depth Possible	⊙	⊙	△	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 management & 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 were happened?

Displacement locally

Reinforcement become structure together with concrete!

Many Mistake on Reinforcement 3

What is Management? Not phenomenon

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

2nd Solution

Material of a Less Management Control Items

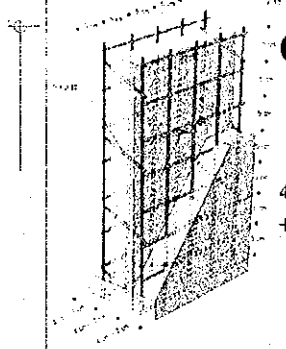
◆ Industrial Material

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



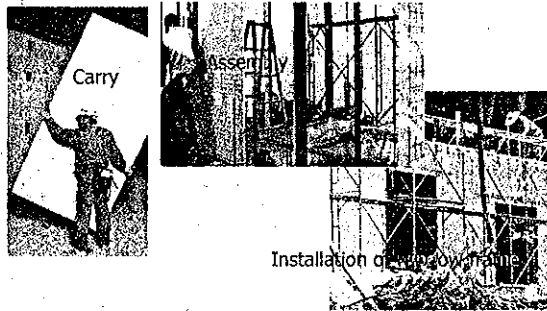
C-Panel Wall

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

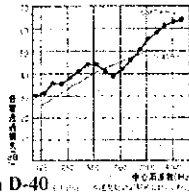
Shear strength: 2.5t/m

Thermal insulation performance:
0.62kcal/m²·h·°C

Fire resistance class:
Mortar Th. 2 x 37.5 2 hour
fireproof

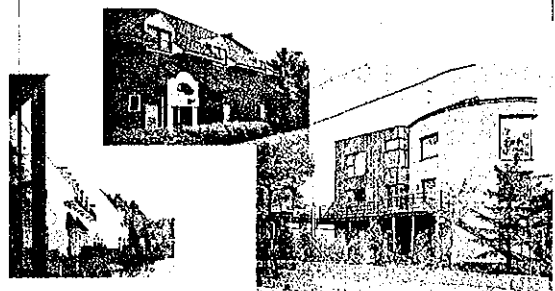
Classification of sound
insulation

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

1.1 Check List of Construction Management Design

1.2 Check List of Construction Management Design

1.3 Check List of Construction Management Design

Item	Check	Remarks
1.1.1		
1.1.2		
1.1.3		
1.1.4		
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1.1.97		
1.1.98		
1.1.99		
1.1.100		

1st Solution

Field Note for Quality Control

The field note consists of a large grid with columns for 'Date', 'Location', 'Item', 'Status', and 'Remarks'. The grid is filled with handwritten entries. To the right of the grid are several technical drawings of a building's structural elements, including floor slabs, columns, and beams, with various annotations and dimensions.

JICA 10000000

Surveillance Manual For Engineer's Site Management

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

The Technical Cooperation Project, for the De-Disaster, Post-quake Damage Reduction and Barrier-free ENDS in Aged Communities of the New Territories and Kowloon and North West Frontier Provinces (NWFP)

November 2008

Donor Agency: JICA (Japan International Cooperation Agency) JICA Project Name: BENSND International Ltd.

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

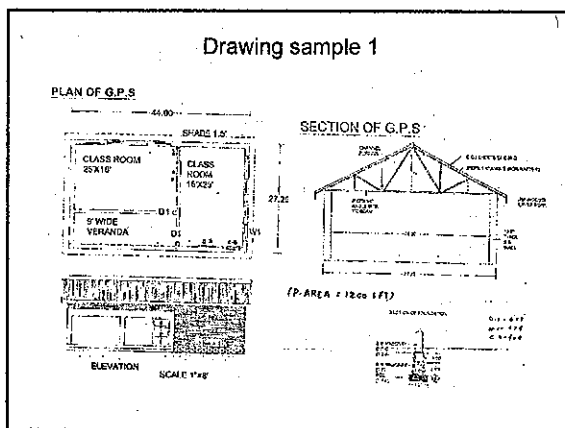
Preparing Sufficient Document and Drawings

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).

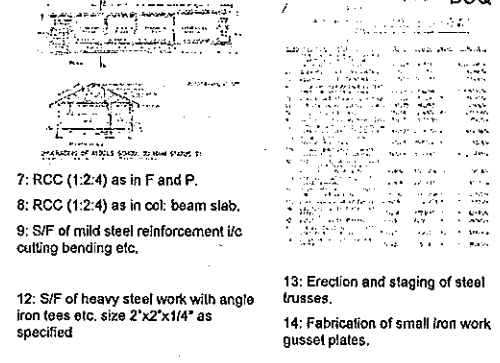
Drawing sample 1



Drawings

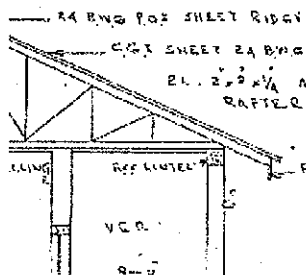
Drawing sample 2-1

BOQ



Drawing sample 2-2

Part of the Drawing

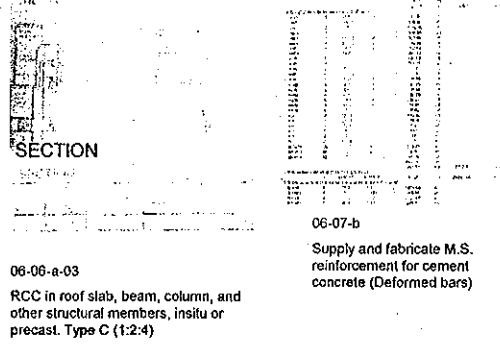


There is no dimensions, any reinforcement for R.C.C. LINTEL.

Drawing sample 3-1

PLAN

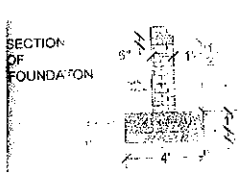
BOQ



Drawing sample 3-2

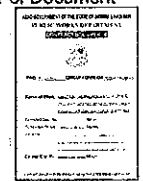
- Content of reinforcement is simply expressed.
- There is no steel bars specification.

SECTION OF FOUNDATION

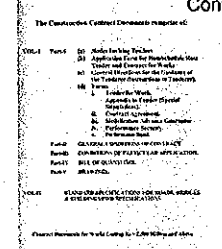


Drawing sample 4


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.

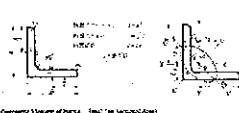
We must keep some of them.

JIS

JIS G3192: 2002 (2005) (JIS G3192: 2002)
http://www.jisweb.com/2002/05/02/jis_g3192_0202.html

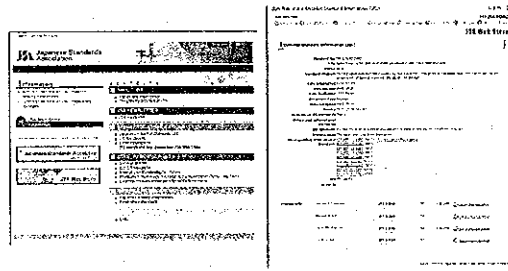
Table 1. JIS G3192: 2002 (2005) (JIS G3192: 2002)

Example of Standard Angle



Specimen	Yield Point (N/mm ²)	Tensile Strength (N/mm ²)	Elongation at Break (%)	Reduction of Area (%)	Impact (J/cm ²)
1	235	410	24	50	27
2	235	410	24	50	27
3	235	410	24	50	27
4	235	410	24	50	27
5	235	410	24	50	27
6	235	410	24	50	27
7	235	410	24	50	27
8	235	410	24	50	27
9	235	410	24	50	27
10	235	410	24	50	27
11	235	410	24	50	27
12	235	410	24	50	27
13	235	410	24	50	27
14	235	410	24	50	27
15	235	410	24	50	27
16	235	410	24	50	27
17	235	410	24	50	27
18	235	410	24	50	27
19	235	410	24	50	27
20	235	410	24	50	27

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

A 615/A 615M - 08

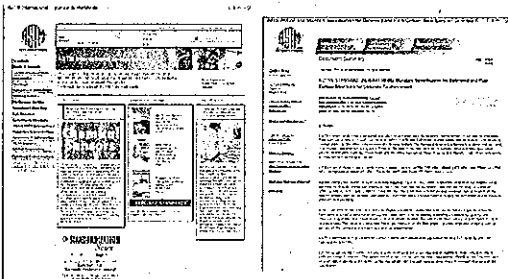
TABLE 1 Deformed Bar Designation Numbers, Nominal Weights (Masses), Nominal Dimensions, and Deformation Requirements

ASTM Designation No.	Nominal Dimensions		Nominal Weights (Masses)		Deformation Requirements		Yield Strength, f_y (MPa)	Tensile Strength, f_u (MPa)
	Bar Size, mm	Bar Size, in.	Weight, kg/m	Weight, lb/ft	Bar Size, mm	Bar Size, in.		
A 615	19	3/4	1.20	0.86	355	14	485	70
A 615	22	7/8	1.98	1.42	355	14	485	70
A 615	25	1	2.87	2.10	355	14	485	70
A 615	28	1 1/8	3.92	2.86	355	14	485	70
A 615	32	1 3/8	5.02	3.67	355	14	485	70
A 615	36	1 5/8	6.18	4.52	355	14	485	70
A 615	40	1 7/8	7.47	5.47	355	14	485	70
A 615	45	2	8.90	6.50	355	14	485	70
A 615	50	2 1/8	10.49	7.69	355	14	485	70
A 615	56	2 3/8	13.30	9.73	355	14	485	70
A 615	63	2 5/8	16.78	12.33	355	14	485	70
A 615	72	3	21.00	15.43	355	14	485	70
A 615	80	3 1/8	25.99	19.00	355	14	485	70
A 615	90	3 5/8	32.90	24.17	355	14	485	70
A 615	100	4	40.83	29.92	355	14	485	70
A 615	113	4 1/2	50.00	36.73	355	14	485	70
A 615	125	5	60.35	44.45	355	14	485	70
A 615	140	5 1/2	73.49	53.92	355	14	485	70
A 615	150	6	87.86	64.30	355	14	485	70
A 615	175	7	132.93	97.24	355	14	485	70
A 615	200	8	197.41	144.10	355	14	485	70

Note: The bars in this table are to be used in accordance with the requirements of the 2005 International Building Code (IBC) and the 2005 International Building Code (IBC) Supplement. The bars in this table are to be used in accordance with the requirements of the 2005 International Building Code (IBC) and the 2005 International Building Code (IBC) Supplement.

In A615, Tensile strength and Yield strength are showed

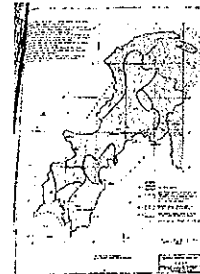
ASTM International



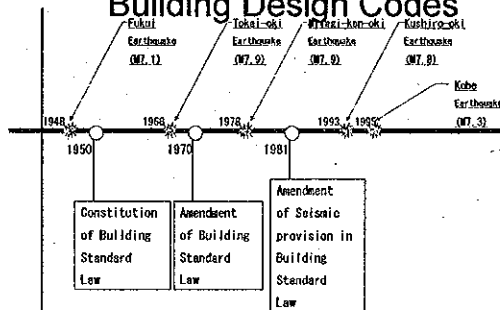
You can buy (download) PDF file of A615 from the above site.

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.

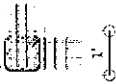
Shop drawings

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



Shop drawings (Detail drawing) for reinforcement

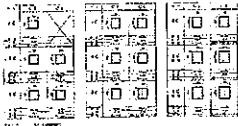
From this drawing we can decide the dimension of stirrup.



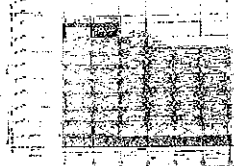
Accumulate the knowledge in print or in disk.

- 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



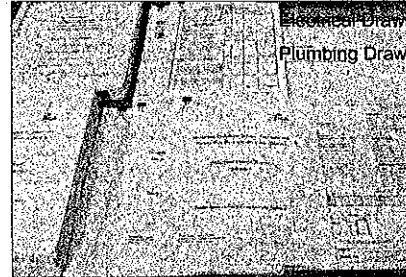
Column List



Crack of Framing Elevation

Documents and Drawings for our BHU

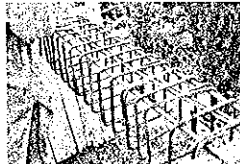
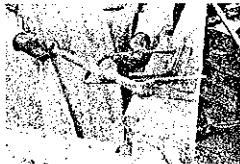
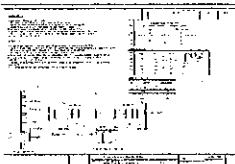
Specifications BOQ Architectural Drawings



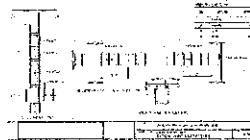
Structural Calculation

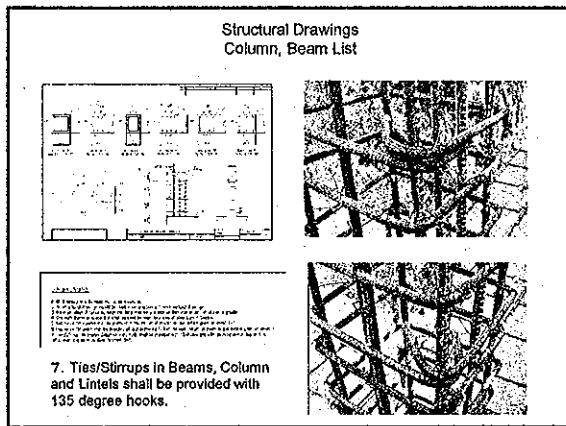
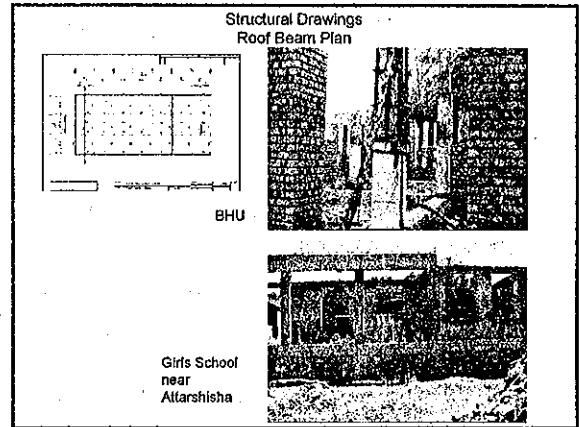
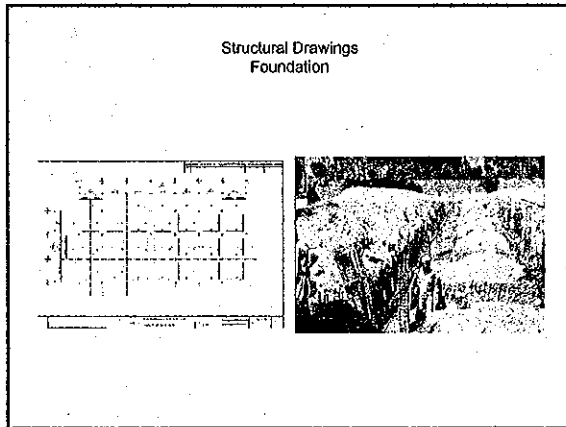
Structural Drawings

Structural Drawings
General Notes 1



Structural Drawings
General Notes 2





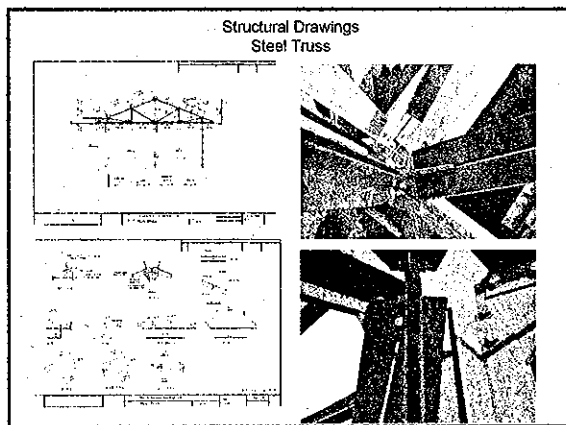
**Hoop
Experience of Hanshin Earthquake**

Table 2.1.1-7 Degree of Hook of Hoop

The image includes two small photographs showing damaged hoops. Below them is a table with the following data:

	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

90 degree Hook has been opened.



- 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.