SESSION: 1

Quality Assurance and Quality Control (QA/QC)

Organized by:

Construction Development Board, CDB

College of Science and Technology, CST

Karma Tempa

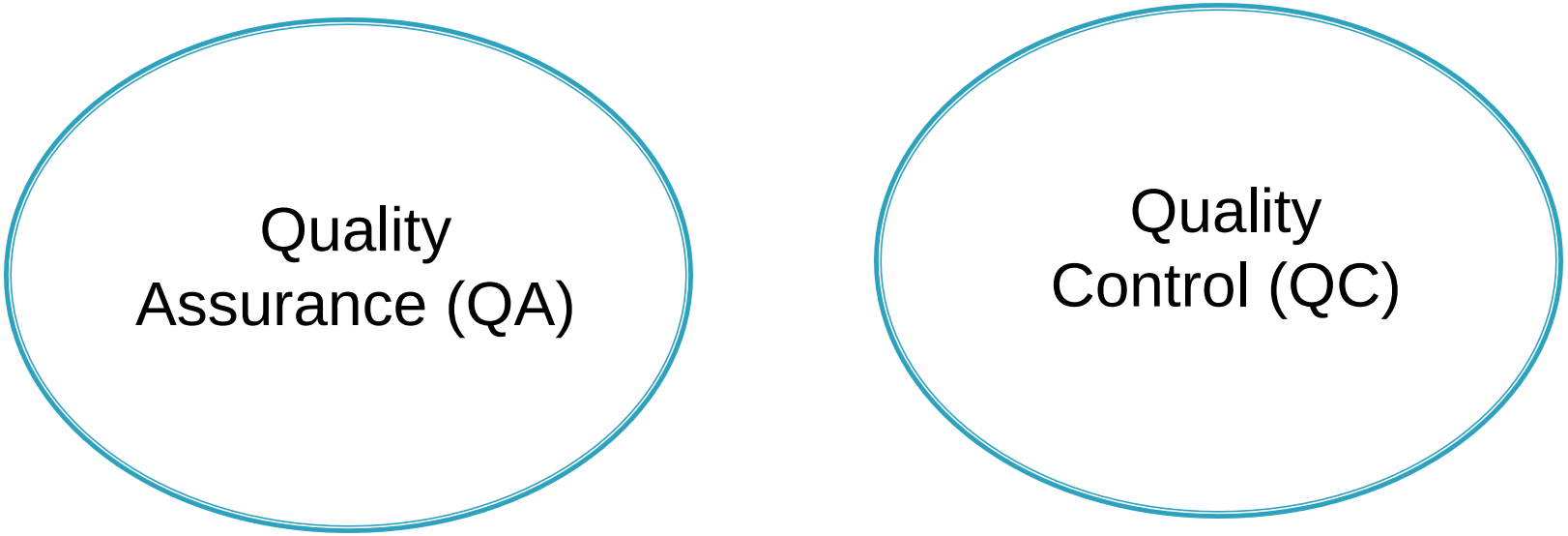
Quality?

What, Why and Who?

What we need?
Quality Control Process

What we need?

Construction Quality Control Process



Construction Quality Control Process

Quality: A degree or grade of excellence or worth.

Assurance: The act of giving confidence, the state of being certain or the act of making certain.

Quality Assurance: The planned and systematic activities implemented in a quality system so that quality requirements for a product or service will be fulfilled.

Control: An evaluation to indicate needed corrective responses; the act of guiding a process in which variability is attributed.

The observation techniques and activities used to fulfil requirements for quality.

Construction Quality Control Process

Who?

Quality Control (QC)

Quality Assurance (QA)

Usually the CONTRACTOR (or a third party) is responsible for performing Quality Control (QC) making sure that the standards are meet for production.

Usually the GOVERNMENT or outside third party is responsible for performing Quality Assurance (QA). QA is spot checking of contract compliance, test results, and ultimately making sure that the quality control process is working.

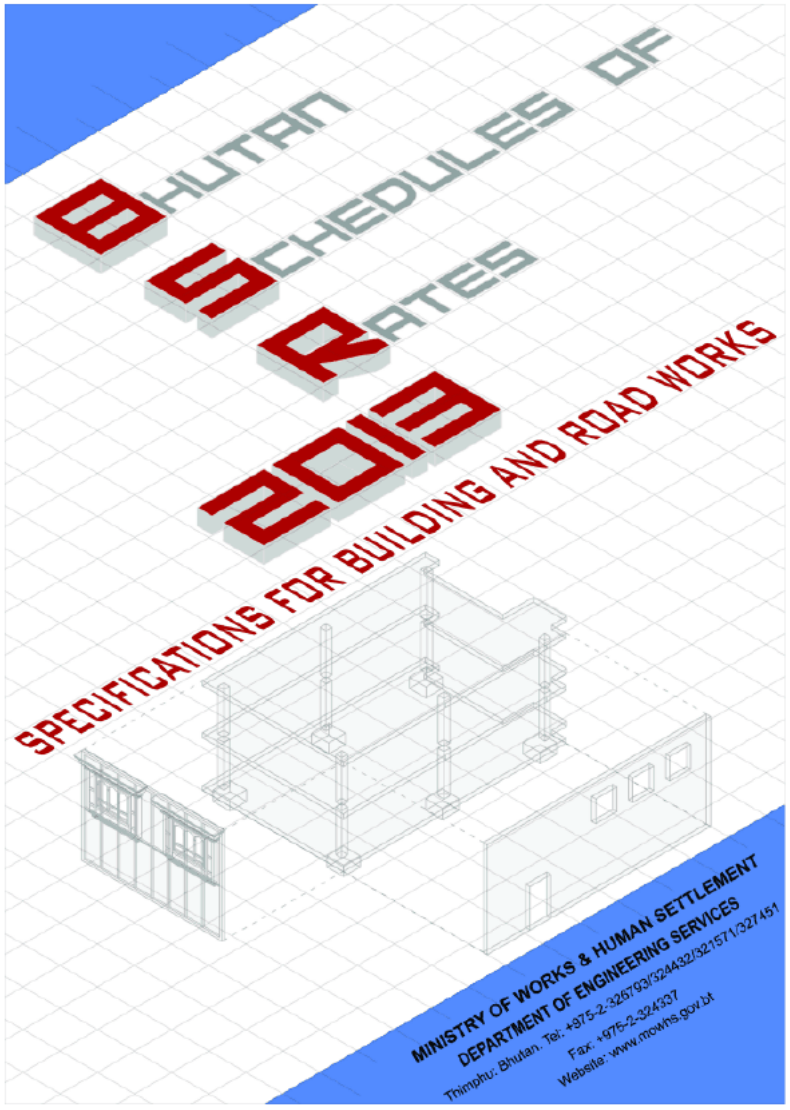
Construction Quality Control Process

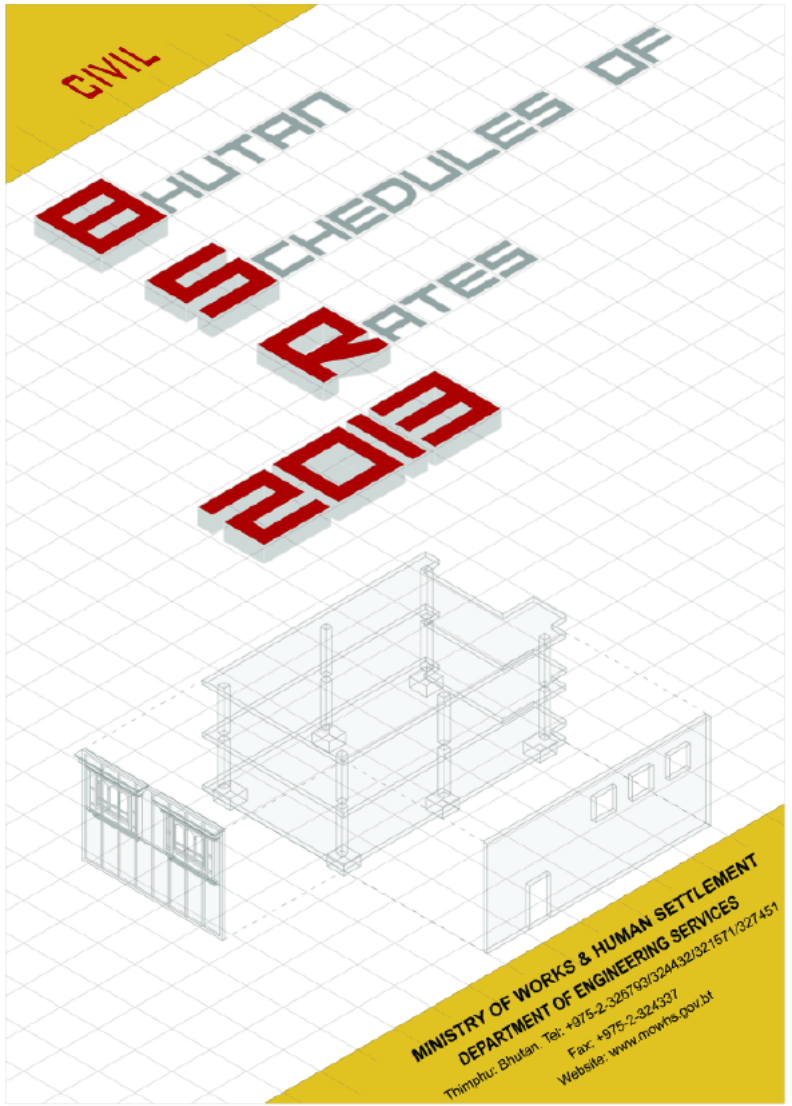
Quality Assurance (QA)

A government organizations/clients like BSB, MoWHS or any executing agencies will have very clear guidance on what is required per contract as far as the QA/QC is concerned.

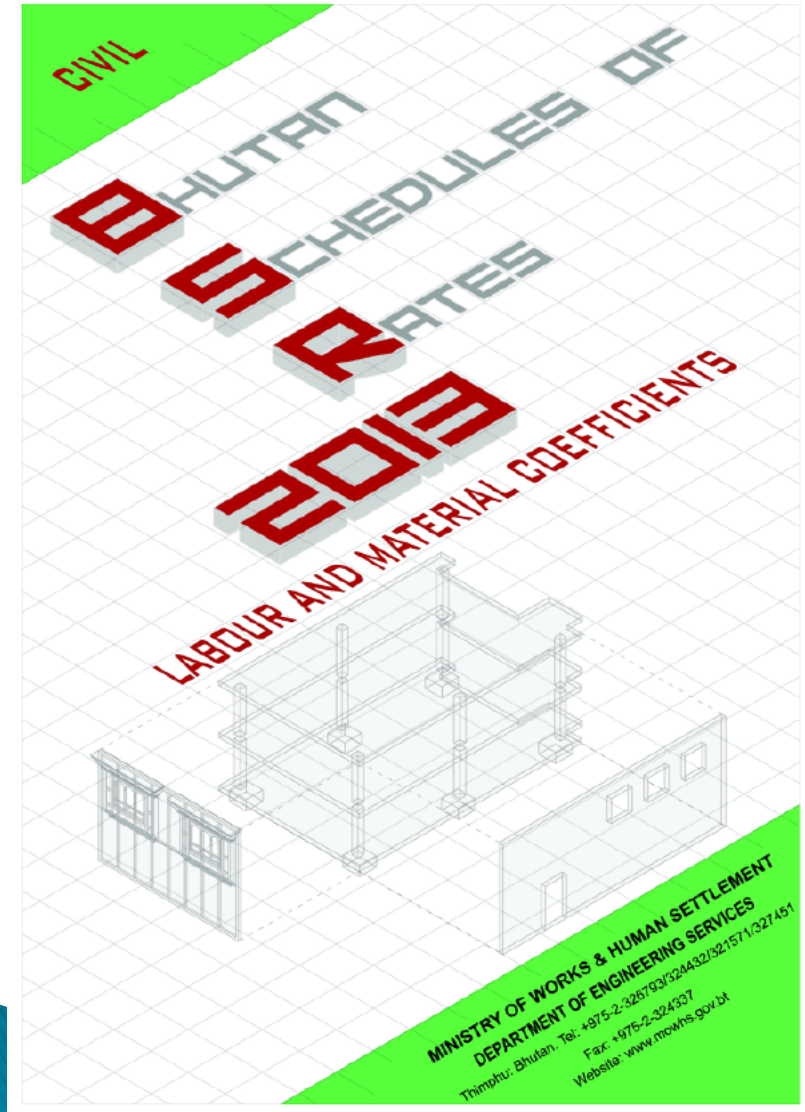
- ✓ Policy and Guidelines
- ✓ Standards and Specifications
- ✓ Rules and Regulations
- ✓ Terms and conditions of the contract

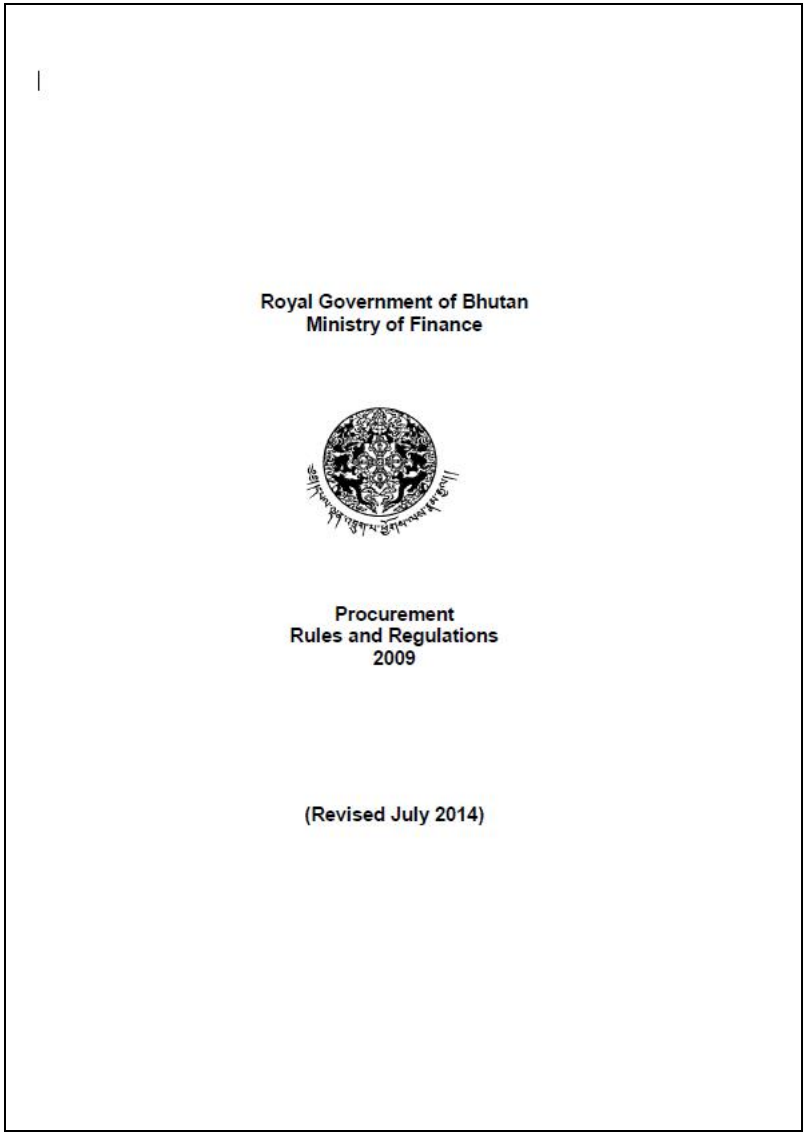
Construction Quality Control Process





Construction Quality Control Process




Royal Government of Bhutan
Ministry of Finance

Procurement
Rules and Regulations
2009

(Revised July 2014)

Construction Quality Control Process

Procurement Guidelines

Ministry of Finance
Public Procurement Policy Division (PPPD)

July 2012

1

Evaluation Guidelines

for

Procurement of Works

(Above Nu. 4 million)

Royal Government of Bhutan

Ministry of Finance

April 2011

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Construction Quality Control Process

STANDARD BIDDING DOCUMENT

Procurement of Works

Royal Government of Bhutan
Ministry of Finance

2009

ROYAL GOVERNMENT OF BHUTAN

BHUTAN BUILDING RULES 2002

Department of Urban Development & Housing
Ministry of Communications

Construction Quality Control Process

Quality Assurance (QA): Responsibility??

Involves REGULAR BUT RANDOM TESTING OF MATERIALS and workmanship (time-based or work-based intervals)

Prevent, identify, and correct quality-related problems

During the construction process, QA instructors mostly provide guidance and leadership to the construction people

Construction Quality Control Process

Quality Control (QC)

- The Construction contract defines the quality standards and the quality control testing requirements.

- The contractor must prepare a detailed quality control plan for each definable feature of work detailing on how the quality standard will be achieved. (Do we apply?)

- The quality control plan must be approved before the start of the particular work.

- The contract requires that the QC testing lab be validated by the approved source (Institutions, consultant, competent testing house /firm or agency..etc).

Construction Quality Control Process

Quality Control vs. Quality Assurance: What's the Difference?

Analogy: You Driving on a Freeway

- **Quality Assurance-:** "Do it right the first time"--Preventive Quality checks.

- **Quality Control:** Fix it when ever it goes or is going wrong.

- In recent years, QA is defined to include QC

Construction Quality Control Process

Quality Control vs. Quality Assurance: What's the Difference?

Analogy: You Driving on a Freeway

Driving Quality Assurance
Before Driving: adjust seats, mirrors, temp, etc.

During Driving:
Occasional glances at:
- speed gage to ensure speed is not excessive
- side mirror before changing lane
- road sides to read road signs, etc.

No distractive activities (reading, eating, etc.)

These are preventive measures

Construction Quality Control Process

Quality Control vs. Quality Assurance: What's the Difference?

Analogy: You Driving on a Freeway

Driving Quality Control

- ✓Swerving to avoid deer crossing the highway
- ✓Steering to right if car is straying into left lane
- ✓Braking to avoid hitting slowed car in front

These are corrective measures

Construction Quality Control Process

When?

Contract formulation: <u>Quality Assurance</u>

Specifications for Building and Road Works

Project Specific Specifications

Concrete Mix Design (Grade) or Job Mix formula (Usually concrete mix design for RCC structures and JMF for road design).

Construction Phase: <u>Quality Control</u>

Planning and setting of site amenities

Construction process

Supervision, inspection and monitoring

Material testing and verification

Construction Quality Control Process

Where?

Infrastructure development projects

1. Building construction
2. Road construction
3. Bridge construction

Details will be discussed in training session-2 and session 3.

Construction Quality Plan

Construction quality plan is that procuring agency want to know **how** you are going to control the quality on their projects.

So, when you write your plan, make it clear how you will control all areas of the project that affect quality – **not just what inspections and tests** you'll perform.

For example, **controlling materials, personnel, subcontractors, and work procedures** also play an important role in ensuring quality results.

So how you propose quality plan !!

Construction Quality Plan

1. Project personnel
2. Quality Communication
3. Quality assurance surveillance
4. Subcontractors and suppliers.
5. Project quality specifications
6. Inspections and tests.
7. Control of non-conformances
8. Project completion inspections.

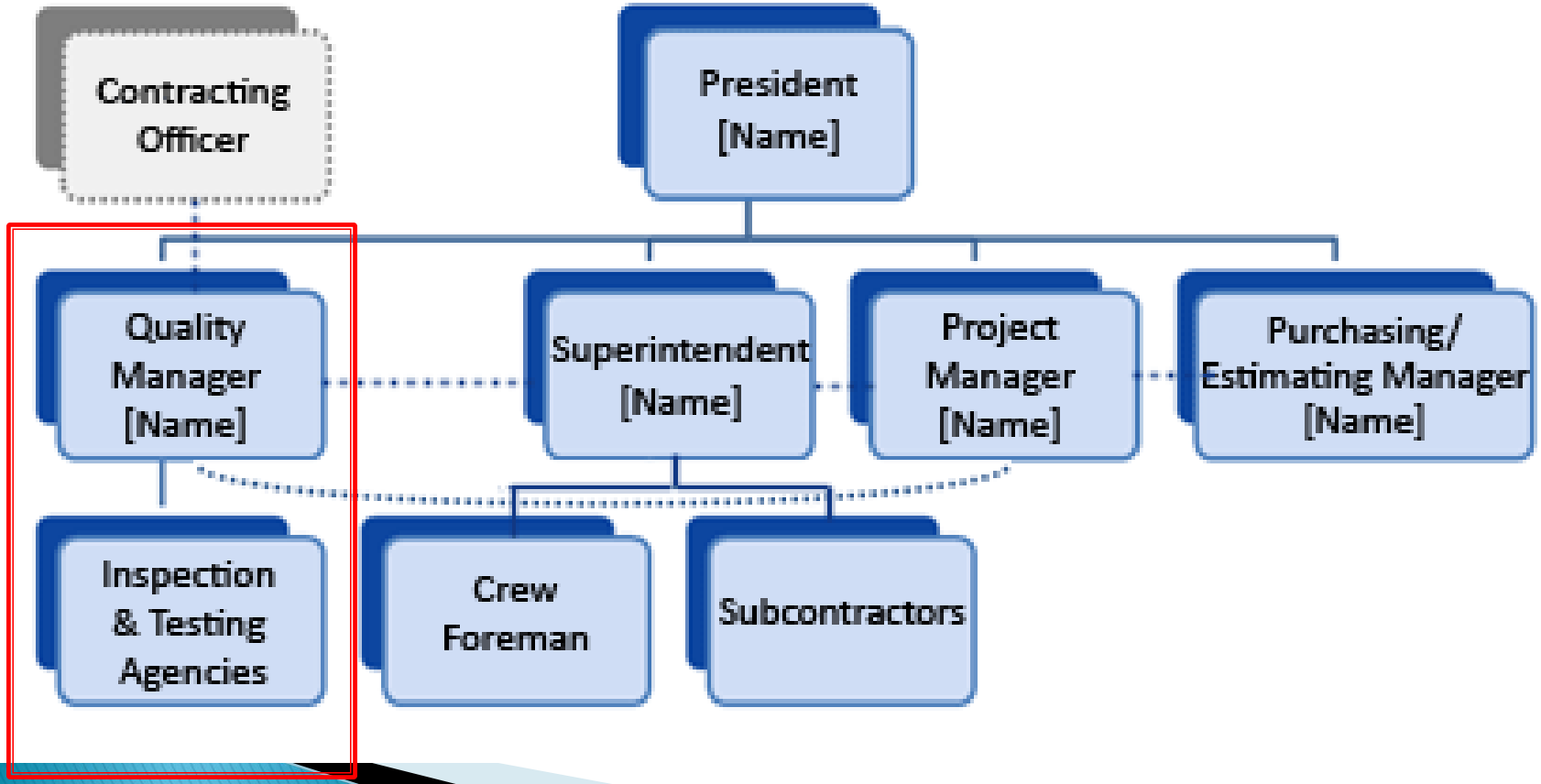
Construction Quality Plan

Construction Quality Control Plans

Inspection & Test Plans

Construction Quality Plan

Project Quality Control Organization Chart



Construction Quality Plan

Inspection and Test Plans (ITP)

INSPECTION TEST PLAN AND LOG

CONTRACT NUMBER	PROJECT NAME	CONTRACTOR
EXAMPLE	EXAMPLE	EXAMPLE

Item	Spec #	Specifications Section	Subsection	Test Required	Frequency	Test By (All tests verified by Superintendent and/or QC Manager)	Date Completed	Date Forwarded To Contr. Off.	Remarks
1.	033000	Cast-in-Place Concrete	2.12	Mixing and Delivery	Each Truck	Concrete Redimix Supplier			
2.	033000	Cast-in-Place Concrete	3.12	Concrete – three cylinders, slump, air, temperature	1 composite per truck load delivered	Third party inspector			
3.	074113	Metal Roof Panels	1.4A	Installer Qualifications	Prior to commencement of work	Superintendent			
4.	221100	Water Distribution Systems	3.2N	HDPE Pipe - Bent Strap Test	Once Daily	Plumbing subcontractor			
5.	221100	Water Distribution Systems	3.5A	Hydrostatic Testing of Water System	See Spec.	Plumbing subcontractor			
6.	221100	Water Distribution Systems	3.5B	Pressure and Leakage Test – Water Line	See Spec.	Plumbing subcontractor			
7.	221100	Water Distribution Systems	3.6A	Bacteriological Examination	After disinfection, before use	Plumbing subcontractor			
8.	221120	Water Distribution Systems	3.4A	Mechanical and Electrical Testing (Pump System)	See Spec.	Plumbing subcontractor			
9.	221200	Water Distribution Systems	3.12A	Leak Test	Until Passing	Plumbing subcontractor			
10.	221200	Water Distribution Systems	3.12B	Air Test	See Spec.	Plumbing subcontractor			
11.	221200	Water Distribution Systems	3.12C	Pressure Test	Until Passing	Plumbing subcontractor			

Project completion inspections.

Project handing – taking: Committee

-Detail measurements
-Check for defects
-Uncompleted works as per the contract
-Additional works
-Finishing
-Etc……

Most common problems observed and what can be done

Problems	What can be done
Design, drawings, specifications not clear, not complete	Documents should undergo scrutiny by equally competent persons (human errors are natural)
No drawings at site	Always carry drawings, you cannot remember everything
Site engineers do not read the documents	• Read, read & read to understand what you are supposed to do • Ask the seniors, architects, designers if you do not understand

Most common problems observed and what can be done

Problems	What can be done
No site engineer at site	• Contractor is responsible for day to day supervision • Make it mandatory in the contract document to post a qualified site engineer • Government engineers check on contractor's engineer and monitor important quality aspects

Most common problems observed and what can be done

Problems	What can be done
Even physical parameters of works and materials not checked	Checking of size, shape, slope, length, breath, depth, weight, volume, diameter, etc..etc.. is possible….please do it !!!
Everything is not possible to be detailed in the documents	Make best use of the engineering knowledge. Above all, use common sense to solve practical problems

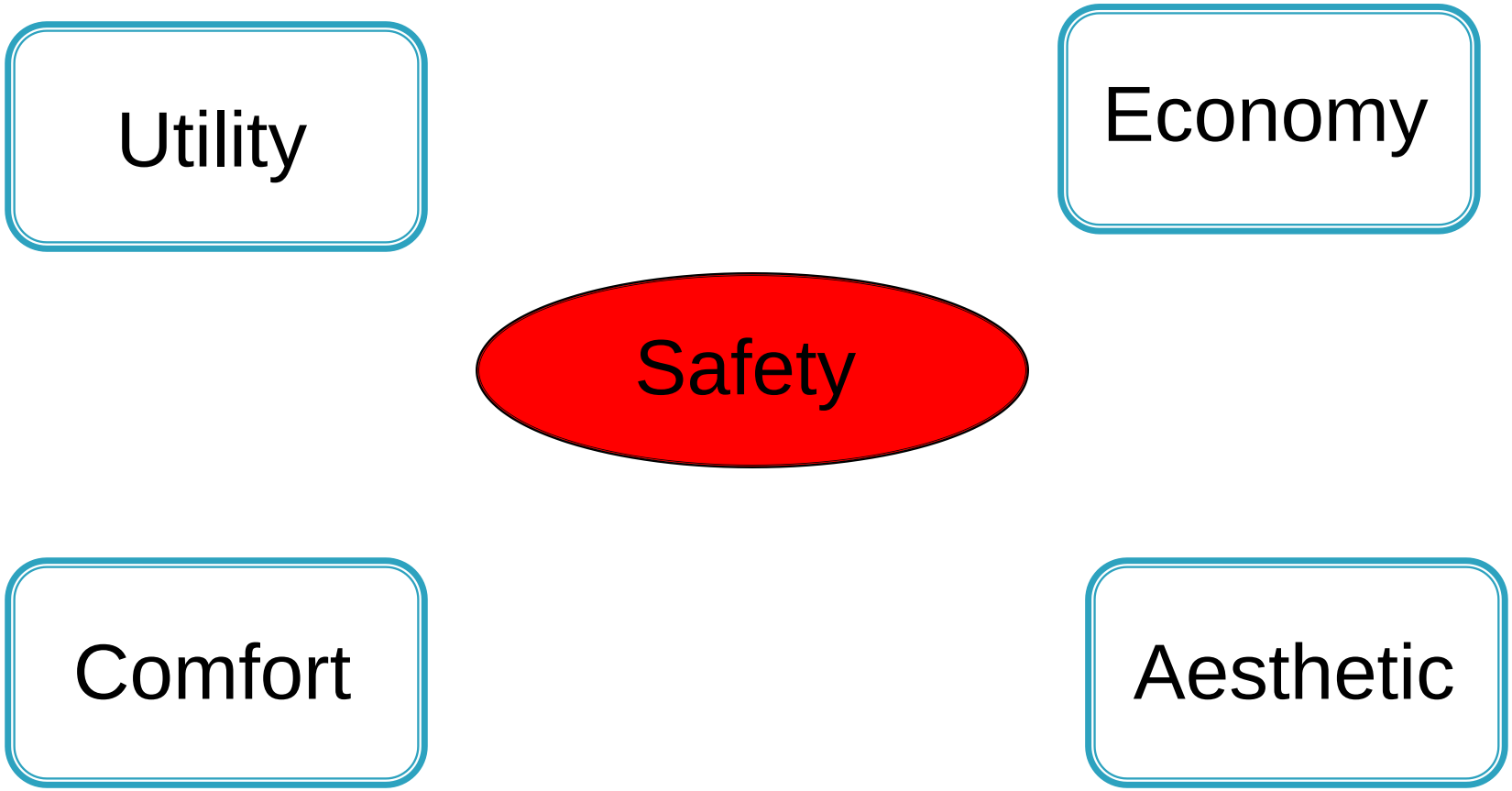
Most common problems observed and what can be done

Problems	What can be done
Poorly or no records maintained	Records are important for many reasons, for accountability, for future reference, for improvement, keep proper records
Inadequate communication with the contractor	Conduct regular meetings to review progress, to resolve problems, to understand each other better

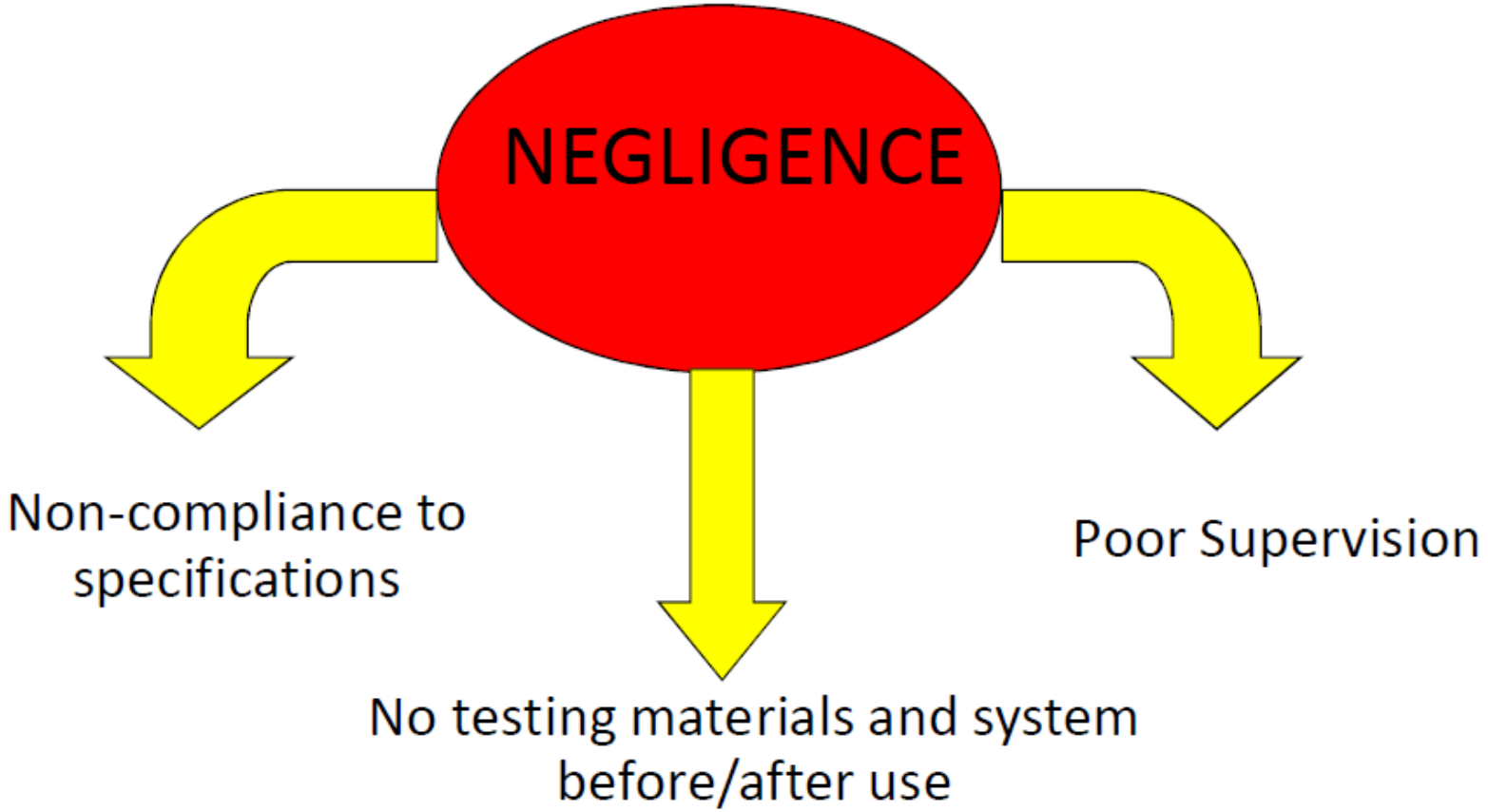
Most common problems observed and what can be done

Problems	What can be done
Poor or no management at the work site (safety for the workers & general public)	• Site management is equally important for safety & public convenience • Need little extra efforts to guide the contractor's site engineers & workers on storage of materials, equipment, tools & cleaning up of site after a day's work

Why Quality?



The Root of all Evils



QUALITY ???
WHO'S RESPONSIBILITY

Indication of:
Overall Structural Failure

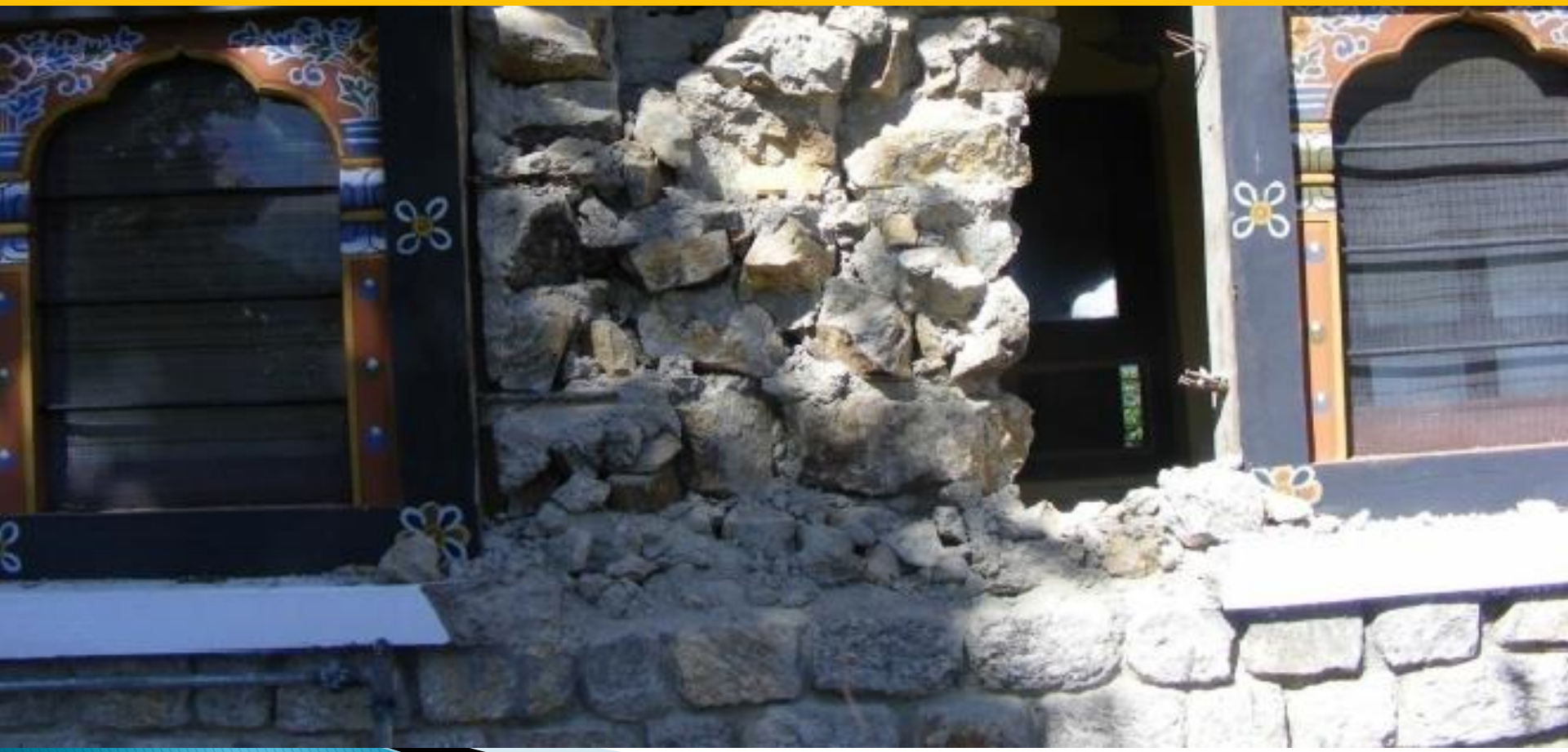
QUALITY ???
WHO'S RESPONSIBILITY

Indication of:

- Bonding failure
- Application of inappropriate cement motor ratios
- Improper placement of masonry course
- Weak connections

Indication of:

- Bonding failure
- Application of inappropriate cement motor ratios
- Wrong placement of masonry course
- Weak connections

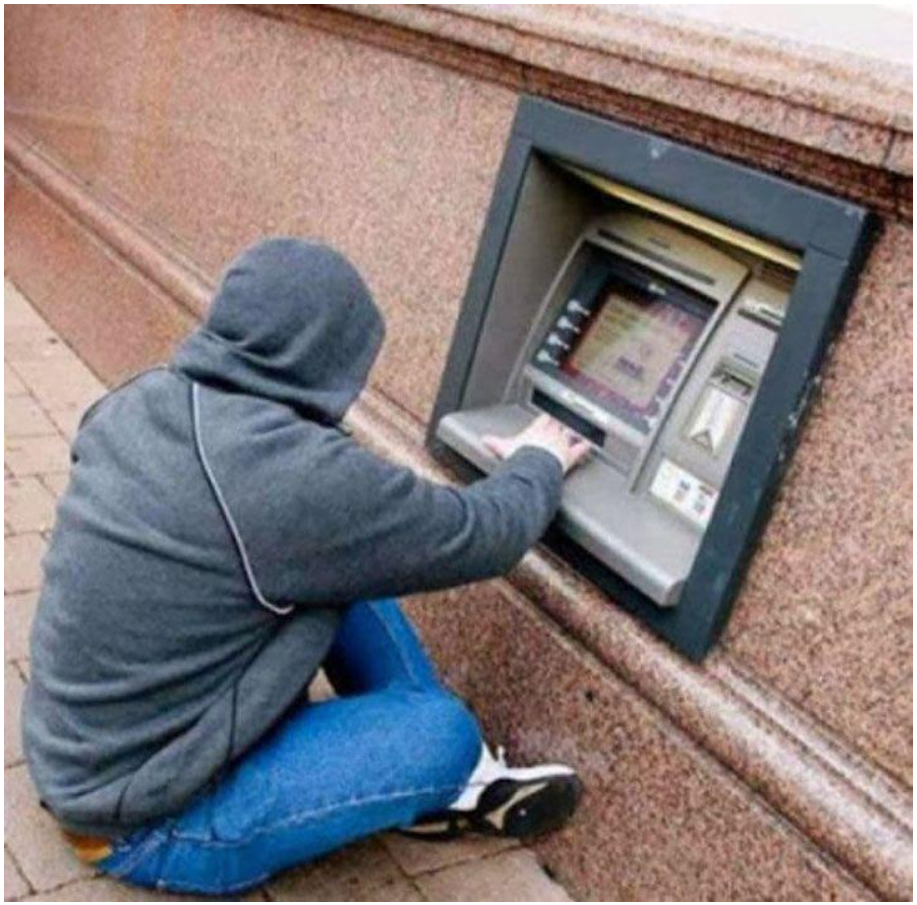


QUALITY ???
WHO'S RESPONSIBILITY

Indication of:

- Bonding failure
- Application of inappropriate cement motor ratios
- Mistake in placement of masonry course

QUALITY ???
WHO'S RESPONSIBILITY

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Important Notes on Construction Quality

- Quality is not separate from construction; it is an integral part
- Quality is not only on the end product after completion; it is in the process during construction
- Ensuring quality is everyone's responsibility; the surveyor, designer, suppliers and supervisors,
- BUT IT IS MOSTLY IN THE HANDS OF THE BUILDER/CONTRACTOR

End of Session-01

Thank you