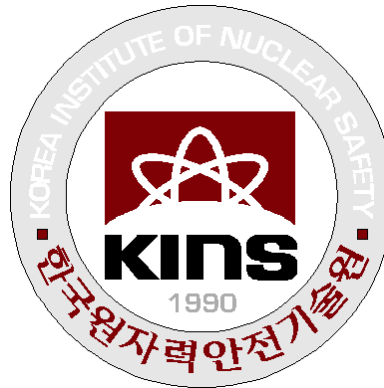


**Identification and Control of Items;
Control of Measuring and Test Equipment;
Handling, Storage, and Shipping; & Inspection,
Test and Operating Status**



Chang kyoo, PARK

Korea Institute of Nuclear Safety

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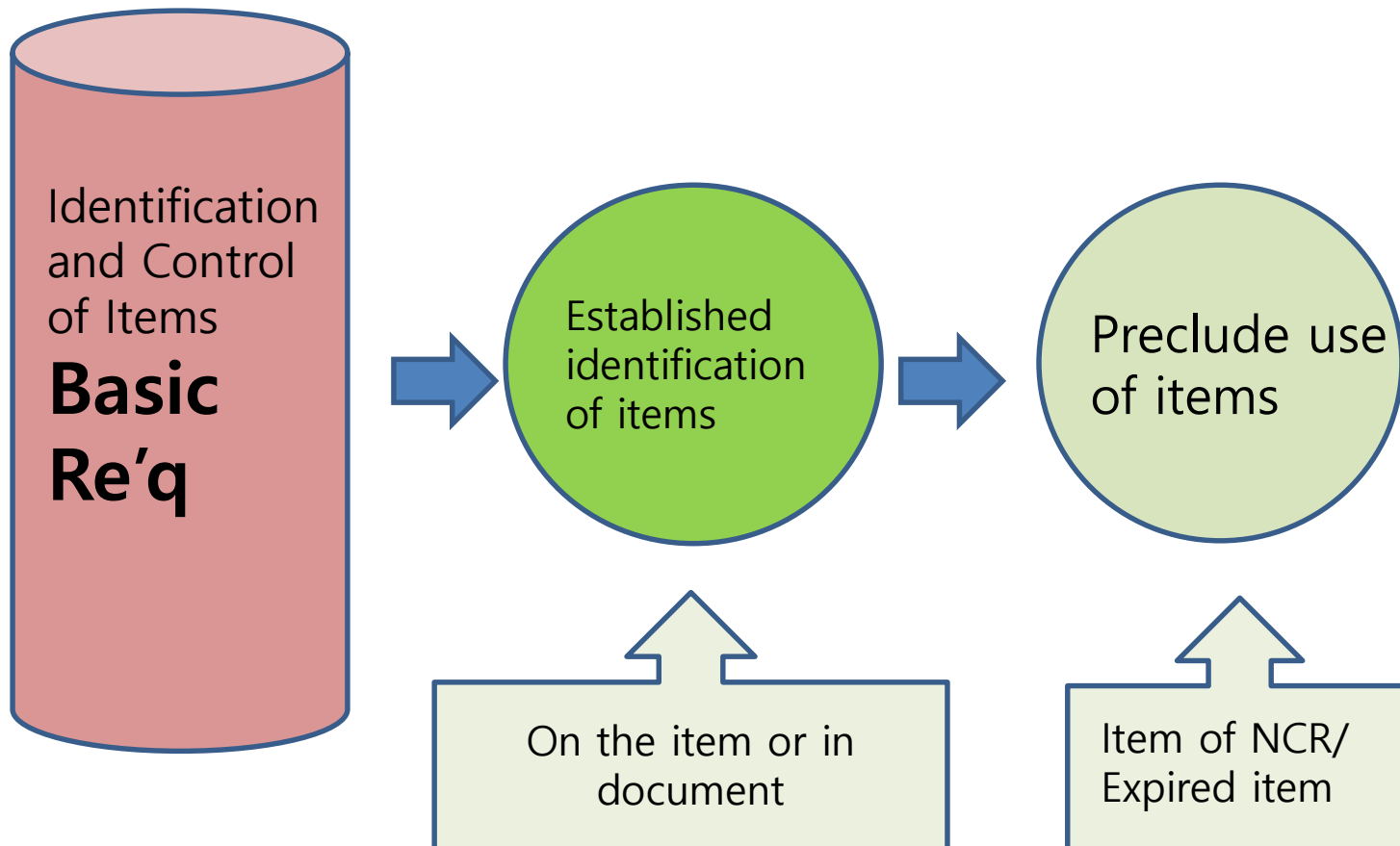
IDENTIFICATION AND CONTROL OF ITEMS



...

I. AREA OF REVIEW

8. IDENTIFICATION AND CONTROL OF ITEMS



8. IDENTIFICATION AND CONTROL OF ITEMS

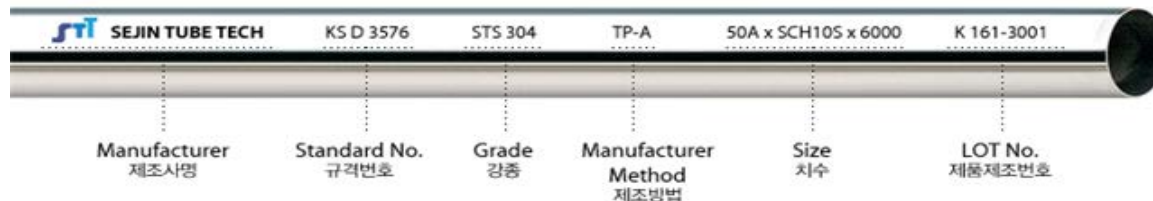
Area of Review

- The basic requirement 8 provides for measures to assure that identification is maintained either directly on the item or within traceable records.

8. IDENTIFICATION AND CONTROL OF ITEMS

100 BASIC REQUIREMENT

- Establish controls to assure that **only correct and accepted items are used.**
- Maintain identification:
 - on the items
 - in documents traceable to the items,
 - or other way to maintain identification



8. IDENTIFICATION AND CONTROL OF ITEMS

200 IDENTIFICATION METHODS

201 Item Identification

- Identification and traceability from the initial receipt, through fabrication to installation and use.
- Identification typically uses a batch, lot, component, or part.
- Identification relates an item to the design or other specification.

8. IDENTIFICATION AND CONTROL OF ITEMS

202 Physical Identification

- Use physical identification to the maximum extent possible.
 - labels, tags, engraving, paint
- If physical identification is impractical or insufficient, other appropriate means shall be employed.
 - physical separation, or procedural control
- Using materials and methods that are clear, legible, and do not degrade
- Maintain markings as items are processed
 - transfer markings when subdivided
 - Maintain(do not obliterated or hidden) when surface treatment, coating, or other processes cause a loss of original markings

8. IDENTIFICATION AND CONTROL OF ITEMS

300 SPECIFIC REQUIREMENTS

301 Identification and Traceability of Items

- When codes, standards, or specifications include specific identification or traceability requirements (such as identification or traceability of the item to applicable specification and grade of material; heat, batch, lot, part, or serial number; or specified inspection, test, or other records), the program shall provide such identification and traceability control.
- ✓ Appropriate documents such as drawings, specifications, purchase order, inspection & test reports shall be traceable.

8. IDENTIFICATION AND CONTROL OF ITEMS

<Example>

Project Numbering System

7|. Drawing and Document Numbering System

- General Drawing

1-311-P190-001

Unit-----
PBS-----
OBS-----

Serial
FBS

- L/B piping Isometric Drawing

9-311-P193-CV-001

Unit-----
PBS-----
OBS-----

Line No.
System
FBS

8. IDENTIFICATION AND CONTROL OF ITEMS

<Example>

Project Numbering System

└. Component Numbering System

- Equipment No.

1-542-M- PP01A

Unit-----	-----	Multi. Character
PBS-----	-----	Equip. Serial No.
Equip. Category-----	-----	Equip. Type

- Valve No.

1-571-V- 0009A

Unit-----	-----	Multi. Character
PBS-----	-----	
Equip. Category-----	-----	Valve. Serial No.

8. IDENTIFICATION AND CONTROL OF ITEMS

Drawing & Document Numbering	Component Numbering	Activity Numbering	Special Numbering
General Drawing	Equipment	Engineering Activity	Purchase Order No.
L/B piping Isometric Drawing	Valve	NSSS & T/G Engineering Activity	
S/B piping Isometric Drawing	Piping Spool	S/U Activity No.	
Specification	Terminal Box		
BOP Draw/Document No.	Pipeline		
NSSS, T/G Draw/Document No.	Hanger & Support		
Construction & S/U Document No.	Cable Tray		
	Instrument		
	Cable & jumper, HVAC		

8. IDENTIFICATION AND CONTROL OF ITEMS

302 Limited Life Items

- Items or materials with expiration dates or limited operating life/cycles **shall be identified and controlled** to preclude use of items whose shelf life or operating life has expired.

8. IDENTIFICATION AND CONTROL OF ITEMS

303 Maintaining Identification of Stored Items

- Control item identification consistent with duration of storage
 - 1) Provisions for maintenance or replacement of markings and identification records due to damage during handling or aging
 - 2) Protection of identifications on items subject to excessive deterioration due to environmental exposure
 - 3) Provisions for updating existing plant records

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III. Verification Practice

8. IDENTIFICATION AND CONTROL OF ITEMS

- Have a system in place to uniquely identify each item
- Prevent use of incorrect or defective material, parts or components.
- Shelf life program

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IV. Case of Deviation

Case of Deviation

- Section 8 of QA Manual requires that items found with missing or illegible identification should be documented on a NCR (Non Conformance Report).


Contrary to this above, a safety related valve with missing the name plate for identification was not documented on a NCR.

- ASME NQA-1 Requirements 8 requires that limited life items shall be identified and controlled.

Contrary to the above, the limited shelf life of the items such as rubber gasket, welding flux, paint, etc. are not identified the specific duration of storage respectively.

Case of Deviation

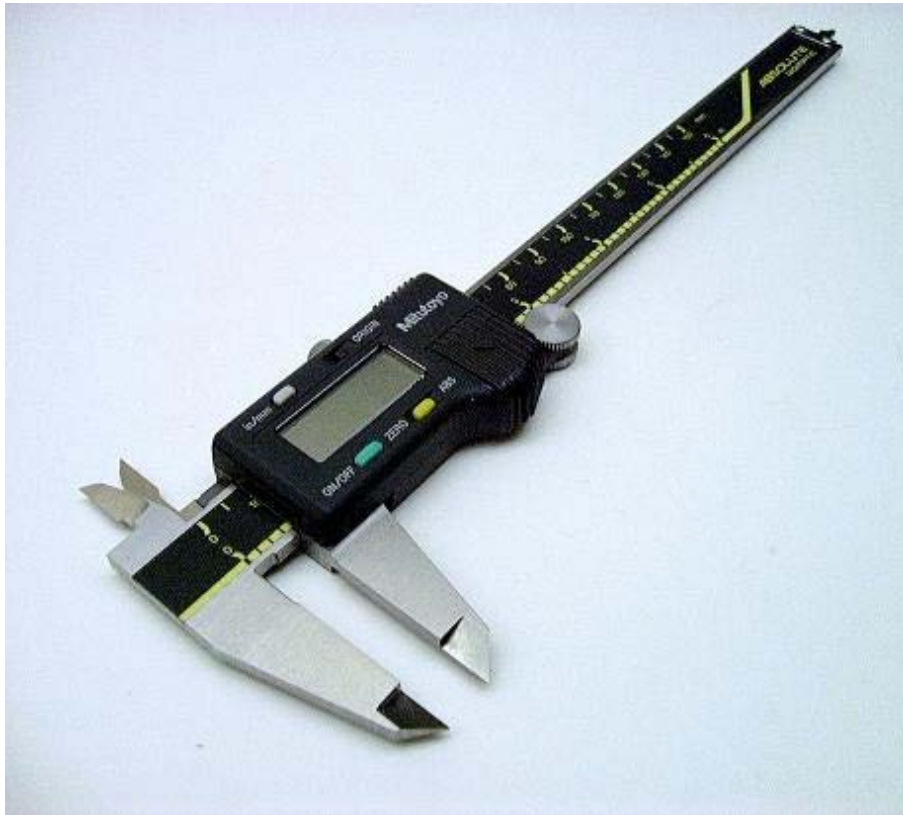
- Limited life items

 KEPIC QAP Supplementary Requirements 8S-1, Paragraph 3.2 requires that limited calendar life items shall be identified and controlled.

Contrary to this requirement, the limited shelf life items such as rubber gaskets and paints are not identified and controlled in the warehouse.

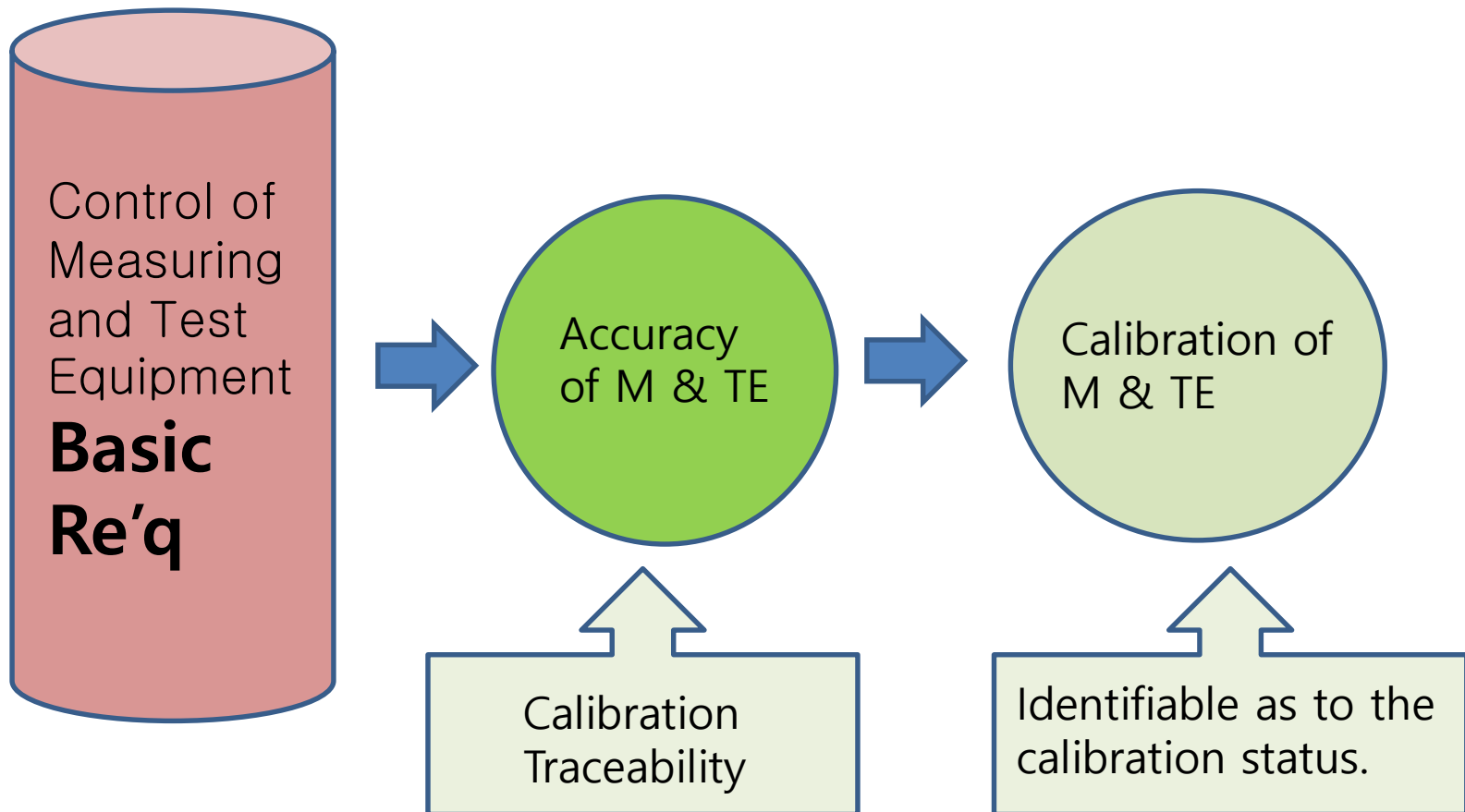
Requirement 12

CONTROL OF MEASURING AND TEST EQUIPMENT



...

I. AREA OF REVIEW



Area of Review

- The basic requirements 12 provides for calibration system to control the accuracy of measuring and test equipment.

...

II. REQUIREMENTS

12. CONTROL OF MEASURING AND TEST EQUIPMENT

100 BASIC REQUIREMENT

- Tools, gages, instruments, and other measuring and test equipment used for activities affecting quality shall be
 - controlled
 - calibrated at specific periods
 - Adjusted, and
 - maintained to required accuracy limits.
- Measuring and test Equipment may be abbreviated as **M&TE**.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

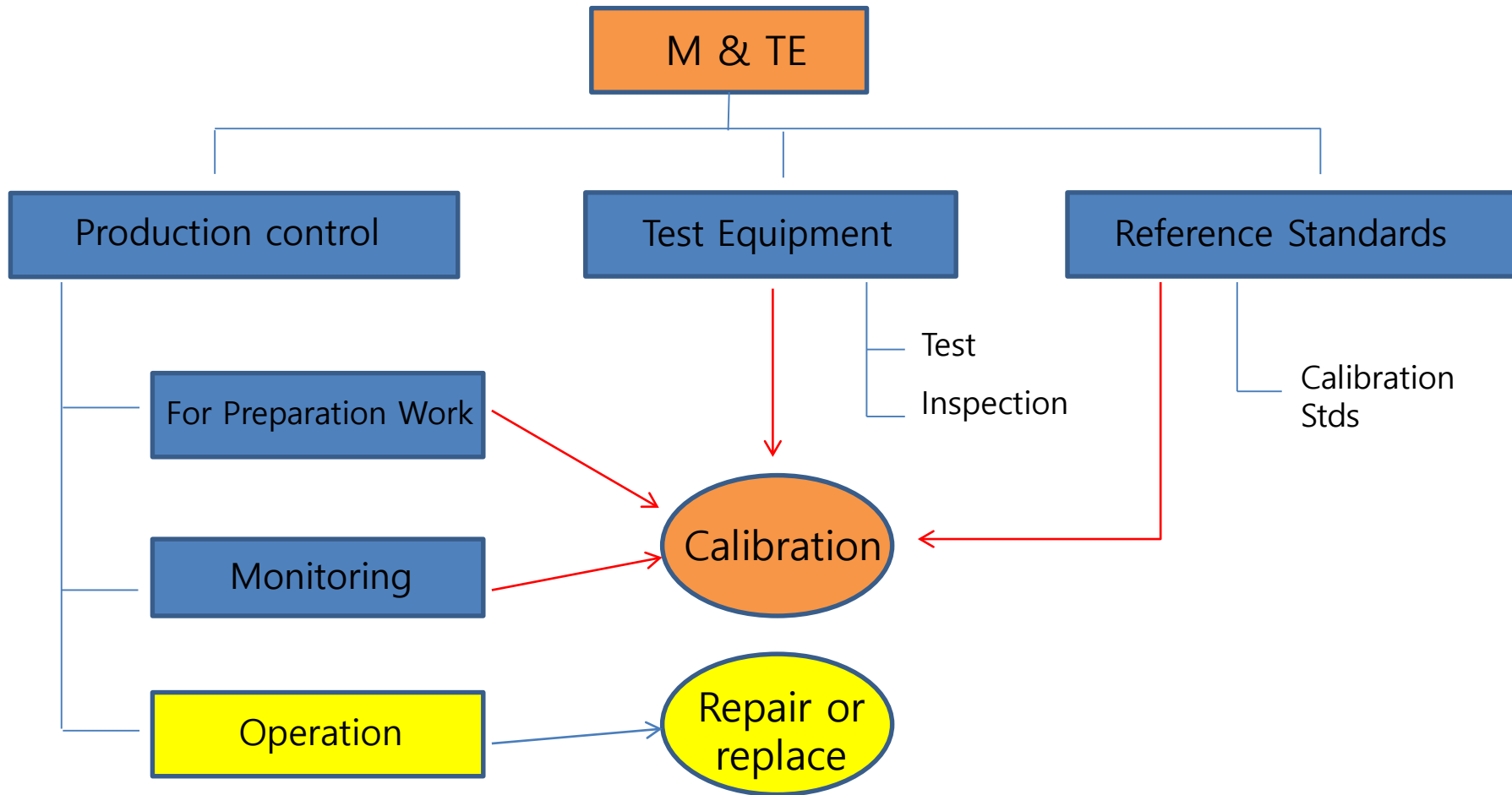
200 SELECTION

Equipment selection based on:

- **Type**(Digital or Analogue) – method of taking the measurement (calipers, mics, height gage, etc.)
- **Range**(1.5 ~4 times) – calibration over the range of use (or noted as limited)
- **Accuracy**($\pm 2\%$ of test Pre.) and Tolerance – engineering requirements (drawings, specifications, etc.)

12. CONTROL OF MEASURING AND TEST EQUIPMENT

Calibration Equipment



12. CONTROL OF MEASURING AND TEST EQUIPMENT

300 CALIBRATION AND CONTROL

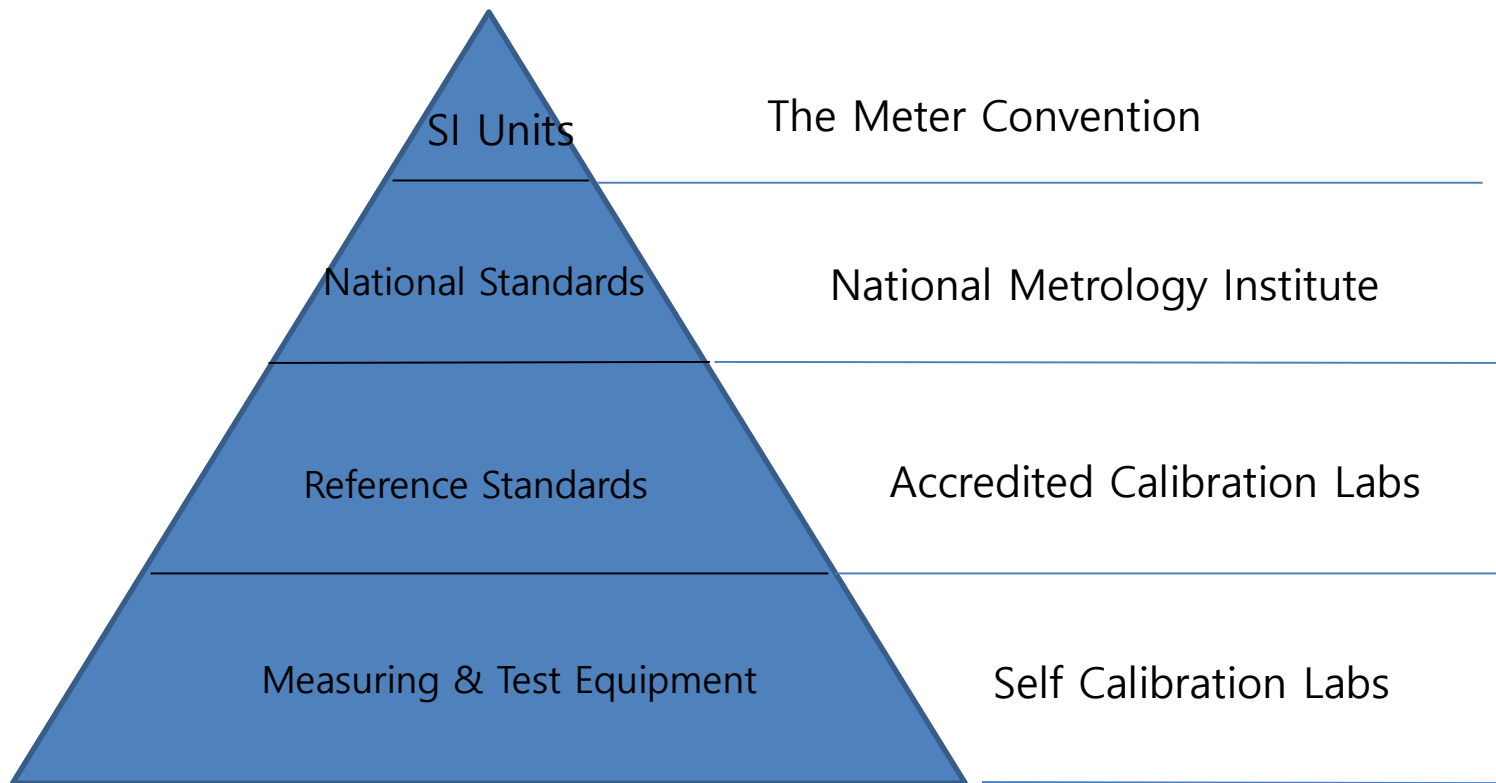
301 Calibration

- Calibrated at prescribed times or intervals and whenever the accuracy is suspect.
- **Calibration traceable** to nationally or internationally recognized standards.
- Where no such standards exist, the basis for calibration shall be defined.(Ex: Underground water level Equipment)

"Calibration Traceability" - All uncertainty is through comparison which clearly described and clearly linked to the standard value and/or the characteristics of measuring results.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

Calibration [Traceability](#) Structure



SI Unit(7) : Meter, Kilogram, Second, Ampere, Kelvin, mol, cd

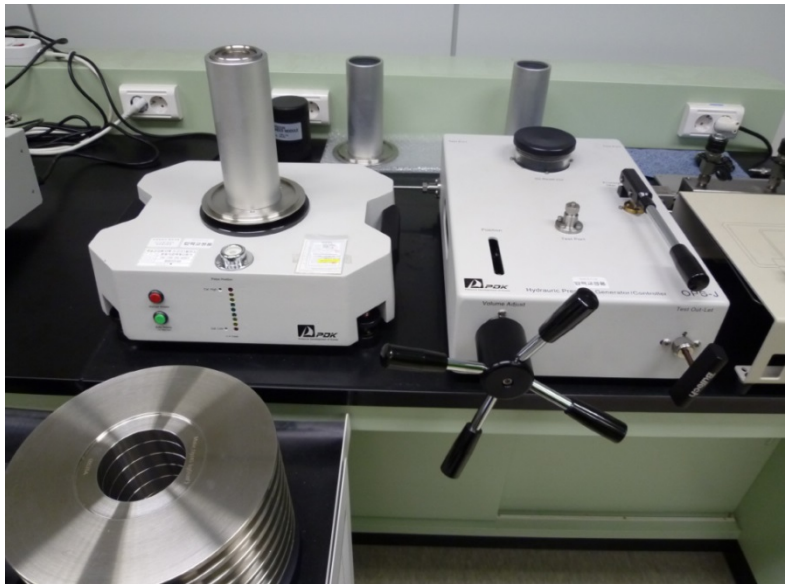
12. CONTROL OF MEASURING AND TEST EQUIPMENT

302 Reference Standards

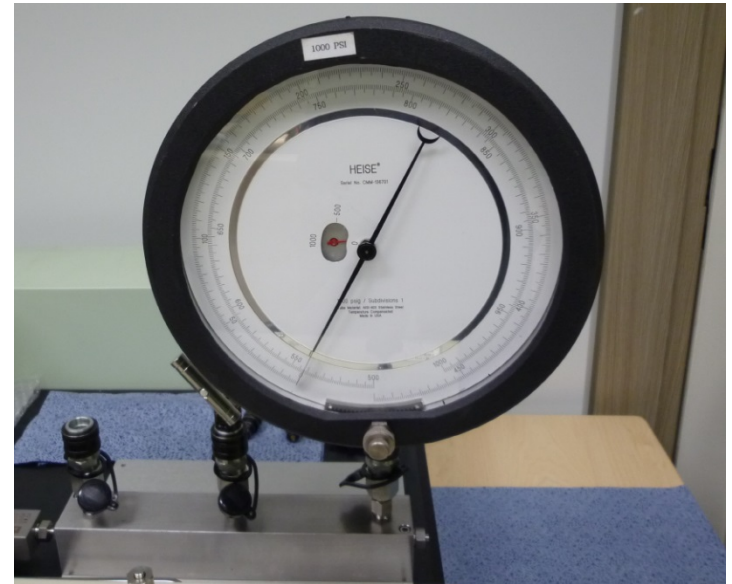
- Reference standards four times greater accuracy than that of the measuring and test equipment being calibrated.
- Referred to as the "4:1 ratio"
- If not reasonably achievable, then technically justification must be determined.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

302 Reference Standards



- Dead Weight Tester -
Reference Standards(Accuracy : 0.0062%)



Pressure Gauge(Accuracy : 0.1%)

- Reference standards **sixteen times** accuracy than that of the working standard equipment be calibrated.(Ref. Shin-kori NPP #1,2)

12. CONTROL OF MEASURING AND TEST EQUIPMENT

303 Control

- Calibration procedures must include the
 - accuracy – allowable deviation from
 - methods – how to perform calibration
 - frequency – interval, prior to use
- Calibration interval based on the
 - equipment's history and stability
 - required accuracy
 - intended use
- **Remove** overdue or out-of-calibration from use by tagging or segregation.
- **Repair or replace** equipment consistently found to be out-of-calibration.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

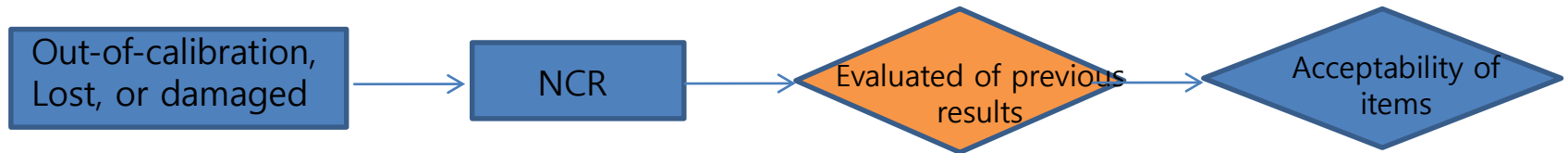
303.1 Application

- Measuring and test equipment shall be traceable to its application and use.
 - Equipment Usage Log/ Calibration certificate
 - Identify on Inspection / Test Reports

12. CONTROL OF MEASURING AND TEST EQUIPMENT

303.2 Corrective Action.

- If equipment is lost, damaged, or found to be out-of-calibration, then validity of previous results shall be evaluated.
 - Must address the acceptability of items inspected or tested
 - Must review to the last acceptable calibration
 - Take into account intermediate checks



- Resulting actions shall be commensurate with the significance of the condition.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

303.3 Handling and Storage

- Handled and stored to maintain accuracy
 - ✓ Employee training on usage
 - ✓ Cases or boxes to protect

303.4 Environmental Controls

- Control environments to ensure accuracy and precision are maintained.
 - ✓ Temperature / Humidity controls

303.5 Pre-calibration Checks

- Equipment and standards checked and the results recorded before any required adjustments or repairs are made
 - ✓ Report the "As-Found" Condition

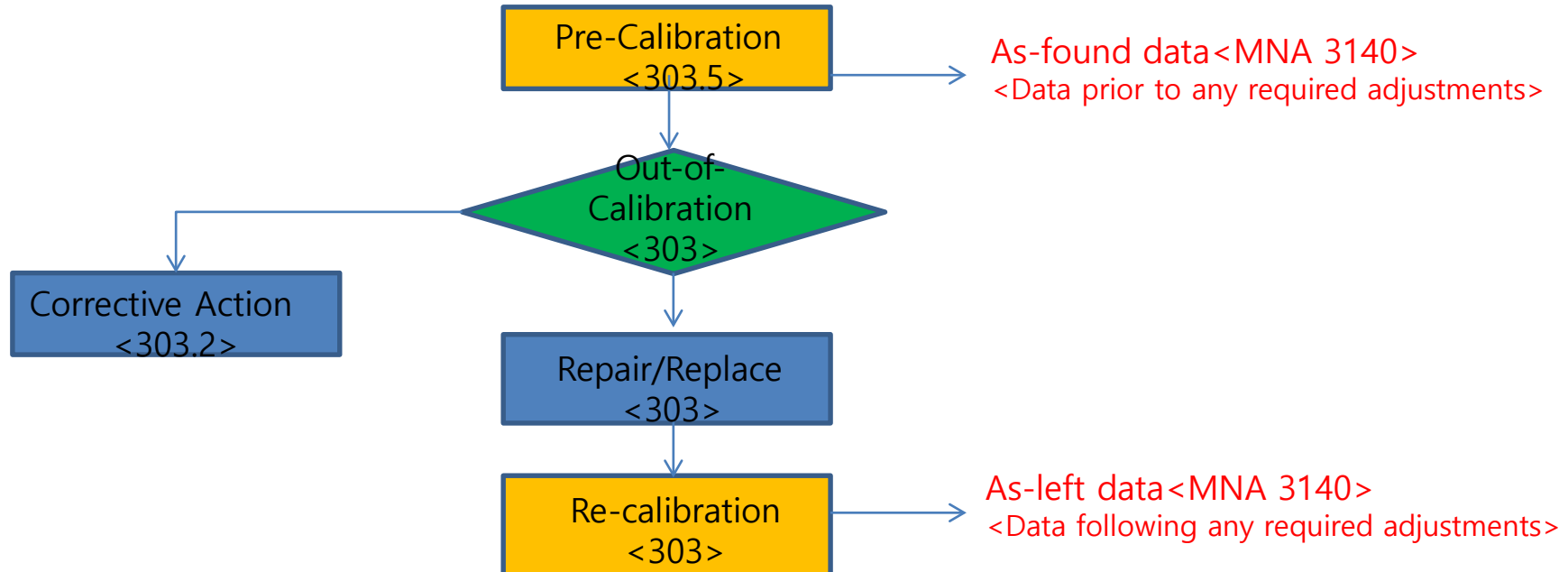
12. CONTROL OF MEASURING AND TEST EQUIPMENT

MNA(NCA) 3140 ;

SUBCONTRACTED CALIBRATION AND DESTRUCTIVE TESTING SERVICES

(C) The Certificate Holder or Material Organization shall specify through [procurement documents](#) that the [calibration certificate/report](#) shall include identification of the laboratory equipment/standards used and shall include [as-found](#) and [as-left](#) data.

Calibration Process



12. CONTROL OF MEASURING AND TEST EQUIPMENT

303.6 Status Indication

- Identifiable as to the calibration status.
 - Marked, tagged, labeled, or otherwise
 - Stickers, logbooks

304 Commercial Devices

- No calibration required for commercial equipment such as rulers, tape measures, levels, etc.,

12. CONTROL OF MEASURING AND TEST EQUIPMENT

400 RECORDS

401 General

- Records to indicate calibration status and the capability of M&TE to satisfactorily perform its intended function.

402 Reports and Certificates

- Reports and certificates shall include the information and data necessary for interpretation of the calibration results and verification of conformance to applicable requirements.

Case study of Nonconformance

Requirement 12

- ❑ The pressure gage used in pressure test of a class 1 component was identified to have maximum scale 150Kg/cm², and to have been calibrated one month ago. The design pressure of tested component was 100Kg/cm².

👉 Is it nonconformance?

KEPIC MNB-6412 'Range of indicating Pressure Gages' requires that analog pressure gages used in testing shall be graduated over a range not less than 1 ½ times nor more than 4 times the test pressure.

KEPIC MNB-6413 'Calibration of Pressure Test Gages' requires that the test gages shall be calibrated prior to each test or within a period not exceeding 2 weeks.

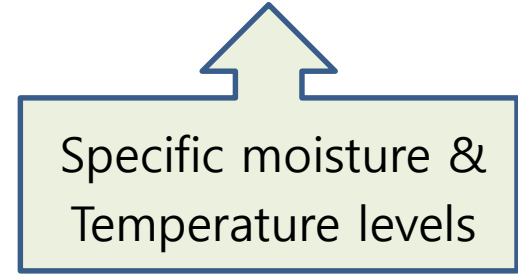
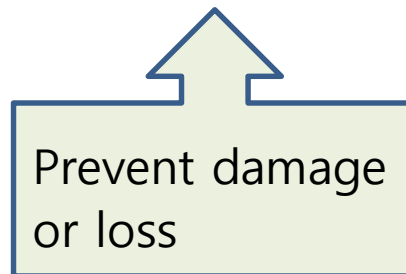
Requirement 13

HANDLING, STORAGE AND SHIPPING



...

I. AREA OF REVIEW



Area of Review

- The basic requirements 13 provides for control system of handling, storage and shipping of items.
- Handling, storage, and shipping of items shall be controlled;
 - To prevent damage or loss
 - To minimize deterioration.

...

II. REQUIRMENT

13. HANDLING, STORAGE AND SHIPPING

100 BASIC REQUIREMENT

- Required controls for handling, storage, cleaning, packaging, shipping, and preservation of items.
- Purpose: Ensure prevention of damage, loss, or deterioration.
- These activities shall be conducted in accordance with :
 - Established work and inspection instructions,
 - drawings,
 - specifications,
 - shipment instructions

13. HANDLING, STORAGE AND SHIPPING

200 SPECIAL REQUIREMENTS

Considerations include:

- Special equipment
 - Containers
 - shock absorbers, and
 - Accelerometers
- Special protective environments
 - Inert gas atmosphere
 - Specific moisture content levels
 - temperature levels

13. HANDLING, STORAGE AND SHIPPING

300 PROCEDURES

- Procedures required for critical, sensitive, perishable, or high-value items.
- Must address handling, storage, packaging, shipping, and preservation.

13. HANDLING, STORAGE AND SHIPPING

400 TOOLS AND EQUIPMENT

Special handling tools and equipment:

- Utilized and controlled where necessary to ensure safe and adequate handling.
- Inspected and tested in accordance with procedures at specified time intervals or prior to use.

13. HANDLING, STORAGE AND SHIPPING

500 OPERATORS

- Operators of special handling and lifting equipment shall be experienced or trained in the use of the equipment.
- Training on equipment operation must address protection of the product.

13. HANDLING, STORAGE AND SHIPPING

600 MARKING OR LABELING



- Use marking or labeling used to adequately maintain and preserve the item.
- Labeling should include requirements for special environments or the need for special controls.

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2(Supplements the requirements of QAP-1)

Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Facilities

- Not mandatory, must be invoked by contract

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

201 Classification of Items

- Four levels of measures (A, B, C, and D) to prevent damage, deterioration, or contamination of the items based upon the important physical characteristics.

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Level A

- Exceptionally sensitive to environmental conditions
- Need to take into account
 - temperatures outside required limits;
 - sudden temperature changes;
 - humidity and vapors;
 - accelerating forces;
 - physical damage;
 - airborne contamination (e.g., rain, snow, dust, dirt, salt spray, fumes).

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Examples of Level A Items:

- special electronic/electrical equipment and instrumentation
- special materials, such as chemicals, that are sensitive to environmental conditions
- special nuclear material and sources

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Level B

- Sensitive to environmental conditions like Level A but do not require special protection

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Examples of Level B Items:

- electronic equipment and instrumentation
- electrical equipment
- batteries
- **welding electrode** and wire (outside sealed containers)
- control rod drives
- motor control centers, switchgear, and control panels
- motors and generators
- precision machine parts
- gaskets, O-rings
- air-handling filters
- computers

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Level C

- Require protection from exposure to the environment, airborne contamination, acceleration forces, and physical damage.
- Protection from water vapor and condensation is not as important as for Level B items.

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Examples of Level C Items:

- pumps
- valves
- fluid filters
- reactor internals
- compressors
- auxiliary turbines
- instrument cable (unjacketed)
- refueling equipment
- thermal insulation
- fans and blowers
- cement
- fabricated fuel rods and assemblies

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Level D

- Less sensitive to the environment than Level C.
- Require protection weather, acceleration forces, airborne contamination, and physical damage.

13. HANDLING, STORAGE AND SHIPPING

SUBPART 2.2

Examples of Level D Items:

- tanks
- heat exchangers and parts
- accumulators
- demineralizers
- reactor vessel
- evaporators
- steam generators
- pressurizers
- piping
- electrical cable (jacketed) / *instrument cable (unjacketed) : Level C*
- structural items
- reinforcing steel
- Aggregates(骨材)

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III. Verification Practice

- Results based requirement very much dependent upon the conditions involved for the particular product.
 - Management needs to make a detailed assessment of potential hazards
 - Create procedures to control all activities
 - Train operators and implement requirements

...

IV. Case of Deviation

Case of Deviation(1)

- ❑ Accident during heavy component handling and transportation(2007.12)
 - Case in Korea: In December 2007 during lifting of a steam generator to prepare HT at vendor's nuclear shop, a base metal not inspected except welding line of lifting beam of wall crane was ruptured abruptly and the S/G of 529 ton in weight fell down to turning and fit-up fixtures to be placed below the component. The S/G was dropped at maximum, 1.9 meter onto the workshop fixtures.
 - Inspection :
 - Steam generator Primary & Secondary Shell
 - Steam generator U-Tube
 - The final disposition was that the S/G was suitable for service due to the minimal S/G damage found.
 - The S/G was shipped from vendor and installed at construction site.

Case of Deviation

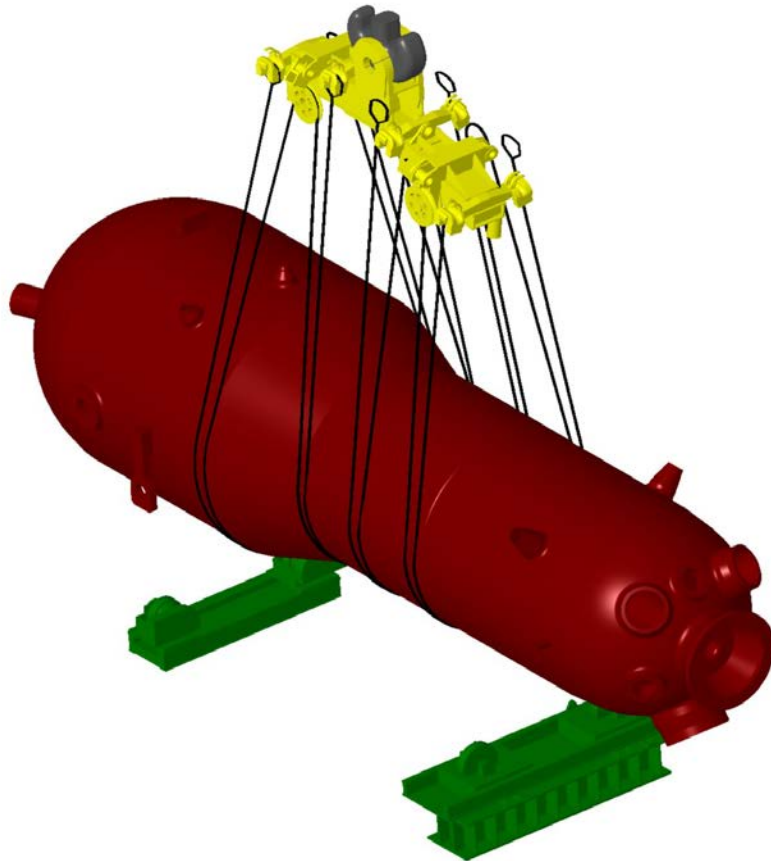
Requirement 13



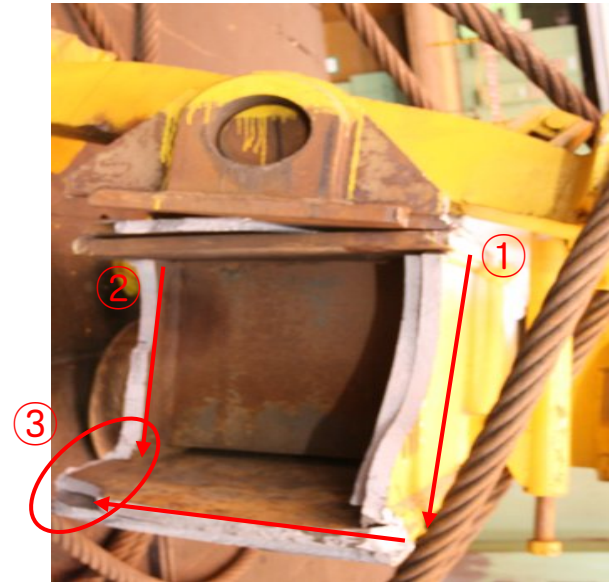
Case of Deviation

Requirement 13

Fracture of Lifting Beam



Fracture sequence ① ② ③



Broken Section of MSB

Case of Deviation(2)

- ❑ Welding electrodes were classified in the welding material control procedure to the storage **level C**.

 Is it nonconformance?

Welding electrodes are classified to Level B in KEPIC QAP-2, Subpart II.2. Items classified to Level B are those that are sensitive to environmental conditions and require measures for protection from the effects of temperature extremes, humidity and vapors, etc.

Welding electrodes humidity sealed in metal containers may be stored under conditions described for **Level C** (Protection from water vapor and condensation is not as important as for Level B items)

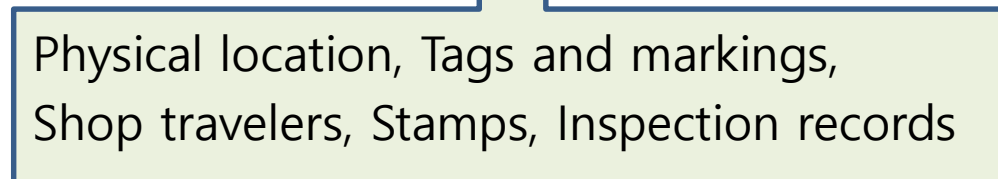
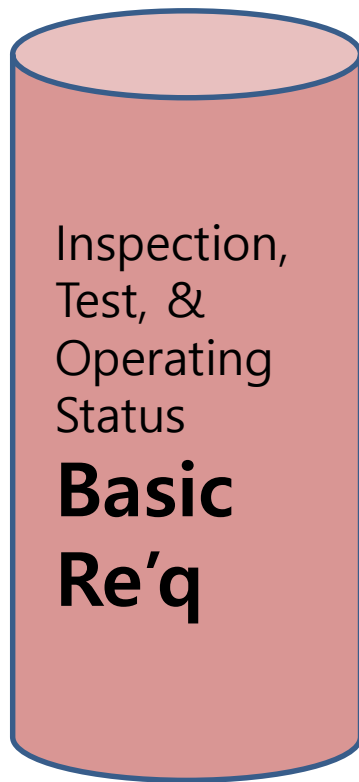
Requirement 14

INSPECTION, TEST AND OPERATING STATUS



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I. AREA OF REVIEW



Area of Review

The requirement 14 provides for the following measures

- To ensure that required inspections, examinations and tests are performed
- To assure that items are not inadvertently installed or used.

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II. REQUIRMENTS

14. INSPECTION, TEST, AND OPERATING STATUS

100 BASIC

Identification of inspection and test status:

- on the items
- in documents **traceable** to the items

System must ensure that:

- required inspections and tests are performed
- Items that have not passed are not inadvertently used.

* System effectiveness is the most important.

14. INSPECTION, TEST, AND OPERATING STATUS

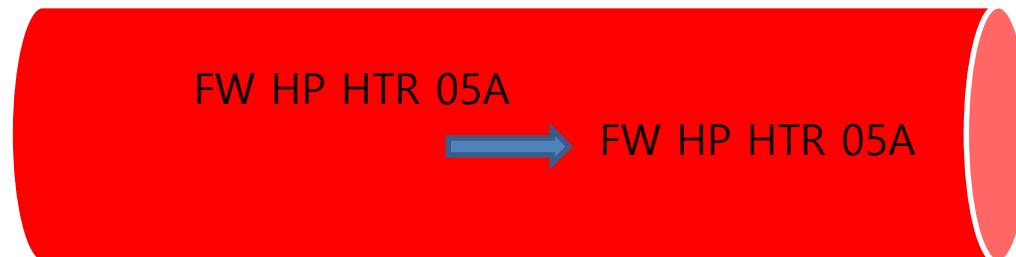
- Methods of maintaining status include:
 - Physical location
 - Tags and markings
 - Shop travelers
 - Stamps
 - Inspection records, or
 - other suitable means.
- Controls must identify authority for application and removal of tags, markings, labels, and stamps.
- Identify the operating status of systems and components such as by tagging valves and switches, to prevent inadvertent operation.

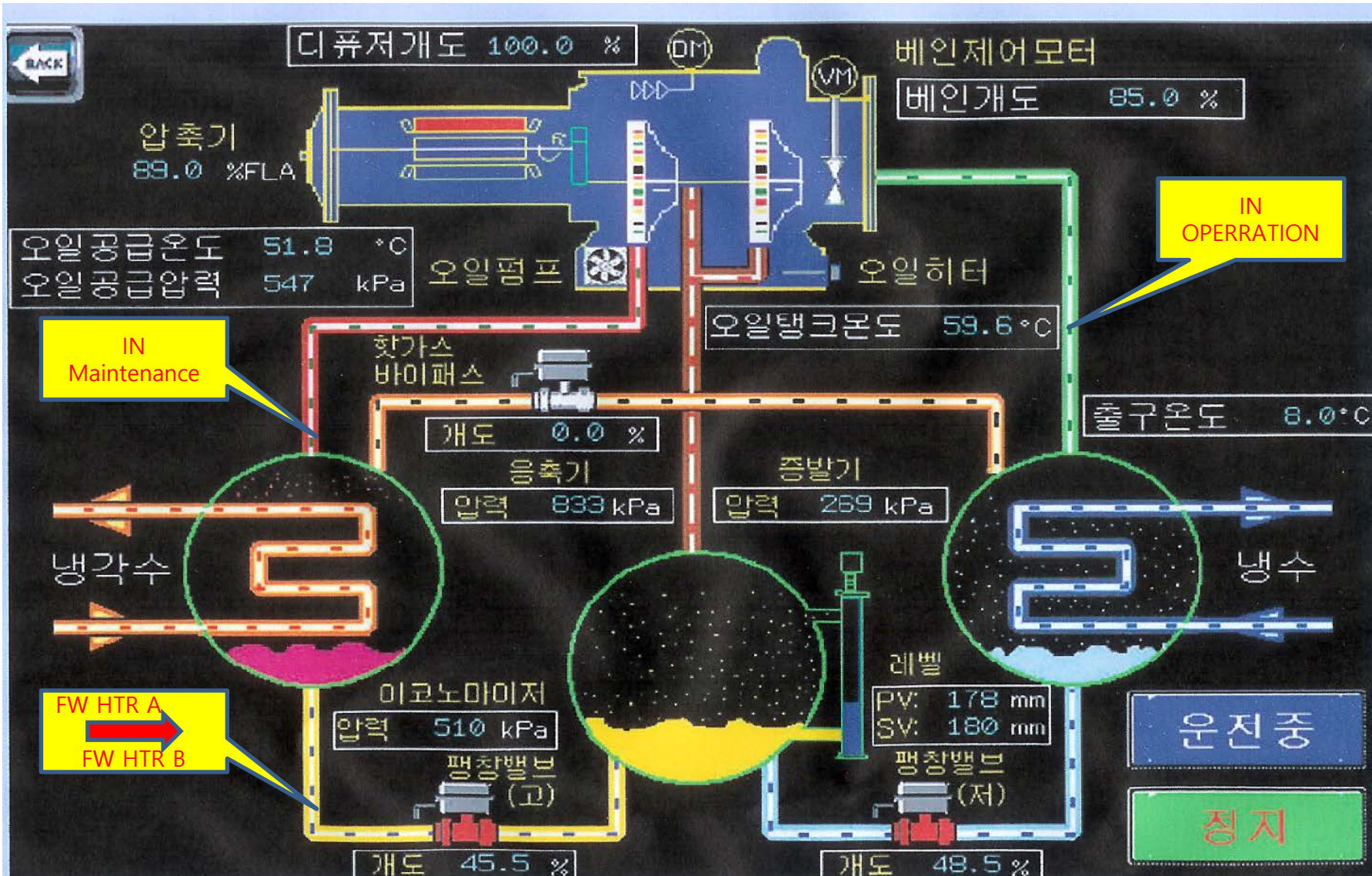
14. INSPECTION, TEST, AND OPERATING STATUS

ITEM	COLOR for FINISH COATING/PAINTING	
• CHMICAL	Light Violet	
• HYDROGEN SUPPLY PIPING	Orange	
• NITROGEN SUPPLY PIPING	Grey	
• GAS	Yellow	
• OIL	Green	
• SEA WATER	Blue	

14. INSPECTION, TEST, AND OPERATING STATUS

< EXAMPLE >





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III. Verification Practice

Verify whether Tags used are assured

- Physical location
- Tags and markings
- Shop travelers
- Stamps
- Inspection records

...

IV. Case of Deviation

Case of Deviation

Inspection and Test Status Procedure requires that a stamp assigned to an individual shall never lent to or used by another individual.

Contrary to this, a quality inspection stamp was used to indicate acceptance of items which have not passed the required test by **another personnel**.

Always we keep watching
our Atomic Power



Thank You



한국원자력안전기술원
KOREA INSTITUTE OF NUCLEAR SAFETY