Article 63 of the Electricity Utility Act (Pre-use inspection) based on the power plant Welding Inspection Guide

2014. 10
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Preface

With reference to electricity business act, all processes, such as electrical construction approval & report, electrical equipment inspection and etc., basically contain technical matters to secure the public safety.

As for manufacturing and installing of boilers, pressure vessels and pipes for high temperature and pressure, welding inspection is essential and important as the special process.

However, technical standards, criteria and inspection procedures for welding inspection in electric business act actually have some difficulties to understand.

This guide is published to help you well understand about overall welding inspection, especially necessary parts.

This guide was intended to be a reference for inspection applicants through analysis and typical examples for related regulations or electricity business act.

We sincerely hope that this guide would help you.

The director of Electric Facility Inspection Agency Jong-Gyu, Song
Chapter 1

Introduction

1. Purpose

2. Coverage

3. Law information cited in the guide book
1. Purpose
The purpose of this guide is that it represents an example and explanation of the pre-use welding inspection required in the fabrication and installation of power generation facilities on the basis of Article 31 of the Enforcement Regulations and Article 63 of the Electricity Act.

2. Coverage
This guide, in accordance with Article 31 of the Enforcement Regulations and Article 63 of the Electricity Act, the subject of the weld inspection pre-use, boilers of power generation equipment, containers, piping, installation manager/producer of fuel combustion facility is required to prepare the application.

3. Law information quoted in the guide book
See Table 1 for details related to welding inspection laws cited in this document include
When laws and ordinances are revised, I quote the latest edition
When abnormality occurs in laws and ordinances and the interpretation with the guide book, higher laws and ordinances interpretation is given priority to

<table>
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<th>Abbreviations Guide</th>
<th>References</th>
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<tr>
<td>Electricity Act</td>
<td>Act</td>
<td>Article 63 (pre-use inspection)</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Electricity Act Enforcement order</td>
<td>Enforcement order</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Electricity Act enforcement regulations</td>
<td>enforcement regulations</td>
<td>Article 31 (Object:standard and procedure of pre-use inspection)</td>
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<td>Technical Standards</td>
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<td>Attachment 9</td>
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<td>Welding power plant</td>
<td>Welding criteria</td>
<td>4. welding power plant</td>
<td>Attachment 9</td>
</tr>
</tbody>
</table>
Chapter 2

Weld inspection laws pre-use inspection Commentary

1. Regulations on inspection before use as Weld's configuration
2. Analysis of Electricity Act Enforcement Rules 31 paragraph 2
3. Used for power generation before welding inspection Range Overview
4. Pressure and temperature, separated by a weld test before using the scope
5. Weld inspection before using the target's maximum operating temperature and maximum operating pressure defined
6. Ready for inspection
7. Inspection for welded structures
8. Import Regulations
9. Weld Inspection Precautions before use
   9.1 During pressure test, the leakage of welding cannot be checked by visual checking
   9.2 Regulatory pressure test is difficult to conduct
   9.3 Repair Welding
   9.4 The boundary between the boiler and the heat exchanger, etc.
   9.5 Weld inspection of equipment prior to use liquefied gas coverage
1. Regulations for the inspection of weld configurations before use

[Inspection Range]
Paragraph 2 of Article 31

[Inspection target]
Used for welding pre-use inspection the plant's boilers, turbines, pressure vessels, liquefied gas storage tank, LPG gas bottle holder, gas fire and refrigeration equipment and more than 150mm in outside diameter pipe falls under any of the following: a pressure above is designed for the part.
However, less than 61mm diameter nozzle and reinforcement of the valve as it will not be a continuous weld to attach prior to use if you are exempt from inspection

[Inspection Standard]
Paragraph 3 of Article 31

1. For construction and installation of electrical equipment to change Article 61 of this Act or authorized pursuant to Article 62 of the law, or to report a work plan will be suitable for
2. Technical standards will be suitable for
3. Other test procedures prescribed by the Ministry of Knowledge Economy, or electrical equipment, such as test items would be suitable to the standards of

[Inspection Time]
Annex 9 Enforcement Rules

The plant's boilers, turbines, pressure vessels, piping, liquefied gas fuel burning equipment regarding construction.
① Non-destructive testing in accordance with technical standards
② Butt welds in accordance with the technical standards of mechanical testing
③ Pressure that is ready to test

[Inspection Application]
Enforcement Rule 31 Section

Who intend to use the pre-test Appendix No.28 of the form before pre-use inspection application attach the following documents to the examination of the 7 days before the day you want to receive in accordance with Law 74 shall be submitted to the Korea Electrical Safety Corporation (Attachments: weld statement: Attachment 1)

[Penalties]
Law Article 106
Pre-use Inspection Act 63

- Inspection range

Paragraph 2 of Article 31

[Inspection range]
1. Using water as the vessel or pipe maximum working temperature of 100 degrees Celsius less than the maximum operating pressure in the case of 20 kilograms per square centimeter
2. Secretary of liquefied gas container or if the maximum operating pressure is 0 kilograms per square centimeter
3. No.1 and No.2 in the regulations in the case of a vessel other than the vessel maximum operating pressure one kilogram per square centimeter
4. No. 1 and No. 2, if specified in the Secretary of the tube than the maximum operating pressure is 10 kilograms per square centimeter (in the case of the longitudinal joints 5 kilograms per square centimeter)

Pre-use Inspection Act 63

- Acceptance Criteria

Law Article 71

[Technical standard conformity Command]
Or at the Ministry of Knowledge Economy, Governor pursuant to Article 63 or Article 65 or the result of examination of electrical equipment installed in accordance with Article 20 (4) of the Telecommunications Technical Standard Line facility is deemed not suitable for the electrical carriers in , electrical equipment, general electric equipment of car owners or occupiers (line telecommunications equipment installed includes one character) to the telecommunication line to the electrical equipment or electrical equipment repair, modification, transfer or use may order the suspension or use restrictions.

[Electrical equipment technical standards and criteria]
Electrical Equipment Technical Standards - Chapter 5 welding power plant Criteria - Chapter 2 and Chapter 4 for power generation thermal power plant welding equipment

Pre-use Inspection

- Terminology and test items

[Processing Guidelines]
Import Inspection - complete electrical equipment manufactured in foreign and domestic wish to install on the import of the request made by the on-site inspector to perform the inspection in the presence speaks to receive.

[Test item]
☐ Common - specification, welded construction method, materials, weld appearance, weld heat treatment
☐ Non-destructive testing - Radiographic testing, ultrasonic testing, magnetic particle testing, Liquid penetrant testing
☐ Mechanical tests - Tensile test, bend test, impact test
☐ Pressure testing - hydrostatic test, pressure testing, leak testing
2. Analysis of Electricity Act Enforcement Rules 31 paragraph 2

**Inspection target**
For power generation, such as boiler under pressure inside the container or on the part of the pipe welding test before using the high temperature inside the high-pressure steam or gas containing boilers, turbines, pressure vessels, containers, or perfusion pressure, such as damage to If you inflict enormous damage to life and property because of these concerns in order to prevent the production of container or tube from the installation process to completion for each part of the regulation seeks to weld.

Target for weld inspection of the power plant boilers, turbines, pressure vessels, liquefied gas storage, liquefied gas container, fire, gas, Holder and refrigeration equipment and more than 150 mm in outside diameter pipes as specified in Rule 31, paragraph 2 is shown in constant pressure in the vessel or pipe, as this is part of the weld.

In addition, even for pressure vessels or pipes or welded part or not part of the Shall not be subject to inspection.

**Inspection Standards**
Check the rules about the standard of Article 31, paragraph 3, as prescribed in the original construction is that the construction is planned or notification of whether the appropriate technical standards, inspection procedures prescribed by the Minister of Commerce, Industry and Energy else. for example, based on appropriate test items to check whether or not the confirmation that, and all electrical equipment must pass inspection by the standard can be used.
Inspection time
Time to undergo inspection rules set forth in Article 31, paragraph 4, depending on the type of electrical equipment as different, but when the process is completed a major construction work is completed and the entire process is completed, an important but sometimes the checks each time to receive when that process is completed, it is checked if not conducted after the inspection, it can not due to the construction or inspection is difficult, even if the judgment is because it is.

The boiler is produced and inspected, and making those places that is subject to interpretation by Screening. About the production process of the boiler because such tests to check if the documents related to its production as well as the producers that productions of inspection and testing carried out at a production location is because it is necessary.

Installation
Existing electrical equipment repair, modification and replacement work also refers to the electrical equipment without changing the existing capacity, or to construct a new thing in the same place are included.

Change construction
Subject to be inspected as specified in the law or change the installation of electrical equipment for those who work ie installation of electrical equipment for construction or alteration of approved construction plans or the self-report and the approval of construction plans or one who self-report may be changed during the installation of electrical equipment that has changed the self-test to receive Yaya.
Repair. Modifications
Electrical equipment was removed by one and re-install or repair or alteration, demolition, repair or renovation, even if not due to the original characteristics or properties of the electrical equipment changes or replacement of major components have a significant impact on the safety concerns, if says.

Alternative
Existing electrical equipment in whole or in part, dismantle and replace electrical equipment if you are new to say.
3. Used for power plants before welding test range

Electricity Act scan range (business power plants)

Figure 1 weld test (business), an overview of the range

<table>
<thead>
<tr>
<th>Division</th>
<th>Boiler</th>
<th>Vessel</th>
<th>Liquefied gas fuel burning equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel</td>
<td>Drum, Separator, Aux. Boiler, etc.</td>
<td>Heater, Flash Tank, Air Tank, Deaerator, etc.</td>
<td>Heater, Filter, Rubber, etc.</td>
</tr>
<tr>
<td>Pipe</td>
<td>More than 150mm diameter pipe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

※ desulfurization and denitrification equipment boilers, pressure vessels and piping equipment is part of
Electricity Act - Community Energy Act (business license) test range delimiting

<table>
<thead>
<tr>
<th>Division</th>
<th>KESCO</th>
<th>KEMCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>Steam turbine power plant systems and heat supply systems test inspection separated by a decision.</td>
<td>Boilers (including auxiliary boiler) Pressure vessel (open Material: Medium Steam) DH HTK, heat exchangers (steam bath), Deaerator Heat supply piping system (Including auxiliary boiler) Piping systems, except steam turbine The remaining pipe.</td>
</tr>
<tr>
<td>Inspection range</td>
<td>Pressure vessels and piping systems for steam turbines (Medium: water, air, oil, gas, etc.) Pressure vessel: air tanks, gas tanks, Oil tanks, filters, etc. Heat exchanger: oil, fuel, gas etc. Piping: Main steam, water, fuel, steam, Postscript, Gas, oil, etc.</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Survey of integrated energy business division is permitted only applies to equipment that</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electric power generation facilities Act applies to the entire facility Cogeneration facility in accordance with the design requirements apply separately (examples below are for indication only)</td>
<td></td>
</tr>
</tbody>
</table>

- Steam turbine system and the responsibilities of heat supply equipment system function (when available), separated by threshold tests conducted.
4. Pressure and temperature, separated by a weld test before using the scope

<table>
<thead>
<tr>
<th>Fluid Division</th>
<th>Water</th>
<th>NG Gas</th>
<th>Other (steam, oil, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vessel</strong></td>
<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
<td><img src="image3" alt="Graph" /></td>
</tr>
<tr>
<td><strong>Piping</strong></td>
<td><img src="image4" alt="Graph" /></td>
<td><img src="image5" alt="Graph" /></td>
<td><img src="image6" alt="Graph" /></td>
</tr>
</tbody>
</table>

- **: Inspection target range**  - **: Inspection range (Seam Pipe)**

<table>
<thead>
<tr>
<th>Machinery, equipment</th>
<th>Fluid</th>
<th>Temperature (Design)</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler</td>
<td>-</td>
<td>-</td>
<td>Eco. clause in the inlet check valve head side Final superheater outlet header to the first valve (If you do not have the header side near the valve The first welds)</td>
</tr>
<tr>
<td>Vessel</td>
<td>Water</td>
<td>Less than 100 °C</td>
<td>20 kg/cm² or more (standard design pressure)</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>100 °C or more</td>
<td>1 kg/cm² or more (based on the design pressure)</td>
</tr>
<tr>
<td></td>
<td>NG gas</td>
<td>-</td>
<td>0 kg/cm² or more (based on the design pressure)</td>
</tr>
<tr>
<td>Oil, air Steam and gas, Etc.</td>
<td>-</td>
<td>-</td>
<td>1 kg/cm² or more (based on the design pressure)</td>
</tr>
<tr>
<td>150mm diameter pipe over</td>
<td>Water</td>
<td>100 °C or more</td>
<td>20 kg/cm² or more (based on the design pressure)</td>
</tr>
<tr>
<td></td>
<td>NG gas</td>
<td>100 °C or more</td>
<td>10 kg/cm² or more (based on the design pressure)</td>
</tr>
<tr>
<td></td>
<td>Oil, air Steam and gas, Etc.</td>
<td>-</td>
<td>0 kg/cm² or more (based on the design pressure)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>10 kg/cm² or more (based on the design pressure)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In case of the axial joints, 5 kg/cm or more (based on the design pressure)</td>
</tr>
</tbody>
</table>
5. Weld pre-use inspection the target's maximum allowable working temperature and maximum allowable working pressure defined

<table>
<thead>
<tr>
<th>M.A.W.T, M.A.W.P</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Applied to the development of welding equipment maximum allowable working temperature and maximum allowable working pressure are applied to production during the design and implementation based on the value of applying rules based on Article 31 is to be inspected</td>
</tr>
</tbody>
</table>

○ Maximum allowable working temperature
  Allowable working temperature based on design
○ Maximum allowable working pressure
  Allowable working pressure based on design
○ Boiler
  Boilers for power generation in thermal power equipment (including auxiliary boiler), independent heater, independent coal economizer, steam reservoir and air heater.
○ Pressure Vessels
  Internal pressure and external pressure for the development of devices for receiving said container.
○ Pipe
  Development of equipment for steam, water, gas and air moving devices and non-boiler external piping to the boiler external piping or pipe diameter 150 ㎜ says.
○ Fuel burning equipment for liquefied gas
  Liquefied petroleum gas as fuel, liquefied petroleum gas storage tank as the fuel burning equipment, liquefied gas carburetor, Gas Holder and refrigeration equipment and more than 150㎜ diameter tube says.

6. Inspection preparations
  Inspectors check the following matters to the applicant and that the test should be carried out smoothly.
○ the applicant is a construction plan. Notification, technical specifications, test reports, and is ever ready before the test.
○ inspection application testing departments or agencies other than the Department of the exams, if necessary, certification or test report shall be prepared as a copy after the test is complete.

7. Inspection for weldments

Commissioning for weldment weld, the welding of the pressure applied to a portion of each weld shown in Table 2 for each test method used in all tests carried out by the process.

① The weld material
② Groove of weld
③ welding jobs and welding equipment
④ post-weld heat treatment (PWHT if conducted)
⑤ non-destructive testing (non-destructive testing, if performed)
⑥ machine testing (if the machine tested)
⑦ pressure test

【Commentary】
I express a method of the inspection every welding inspection process for the welding structure.
The specific methods for each test, see 3,4,5,6 attached.
<table>
<thead>
<tr>
<th>Inspection of processes</th>
<th>Action of Weld Inspection</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>material tests</td>
<td>Groove inspection is carried out before</td>
<td>Documents</td>
</tr>
<tr>
<td></td>
<td>Before welding is carried out</td>
<td>Documents</td>
</tr>
<tr>
<td></td>
<td>PWHT</td>
<td>Documents</td>
</tr>
<tr>
<td></td>
<td>NDT (UT,MT,PT)</td>
<td>Review</td>
</tr>
<tr>
<td></td>
<td>Mechanical testing</td>
<td>Witness</td>
</tr>
<tr>
<td></td>
<td>Pressure test</td>
<td>Witness</td>
</tr>
</tbody>
</table>

Table 2 For each welding process pre-use inspection of the effective time of the inspection

8. Import Regulations

【Test interpretation】
Imports and related issues (business process test instructions Article 3)
- Welding part of pressure vessels, boilers, piping and etc. shall be inspected in accordance with technology standards and criteria.

Inspection application and inspection fee payment (checks business processing instructions Article 7 paragraph 4)
- If import inspection was carried out by the request of the applicant, the applicant should pay all expenses including airfare, cost of stay and etc.

[Commentary]
Regarding pre-use inspection, both domestic and imported goods shall be subject to welding inspection.
The development of equipment manufacturing, applying international standards for inspection, the technical requirements of international standards and their proximity to ensure the level of safety sufficient technical basis rules other than the criteria can be applied.

With reference to the above description, the installer shall specify
the necessary subjects on their POS and request that it would be well performed when they order to foreign suppliers.

In addition, for imports, in case that some manufacturing processes are carried out in domestic areas, technical standards and criteria should be applied.

1. Applicable technical standards
   Electricity Act applicable technical standards and, if necessary, at least equivalent to the technical standards and international standards or national standards may be applied.

2. Inspection documents
   ○ Technical Specification (Drawings, WPS, PQR, etc.)
   ○ Test Report
     NDT, PWHT, Mill Sheet, etc

3. Inspection in presence of inspector
   1) If necessary, process shall be executed with inspector
   2) Pressure test witness, and depending on the required conditions can be difficult to test the pressure test can be replaced by the condition test (non-destructive testing) inspection can be.

9. Notes for welding inspection requirements

The following items, technical standards and interpretations is not specifically stated, but the real test of the welding operation is as follows.

9.1. If you can not see the leaking of welds by visual examination during pressure
For power generation structure, In case that it is difficult to check the leakage of welding by visual inspection due to power plant structure, NDT can be applied.

9.2. If the pressure to perform inspection by regulatory pressure is difficult

If the pressure to perform inspection by regulatory pressure is difficult
① Can not be boosted if you can identify the cause
   You should remove the cause of impossibility for the pressure boost. Then, take a pressure inspection in accordance with regulations.

② From the structural constraints that can not be pressurized to the specified pressure, if
   Under pressure in order to replace the test is conducted. In addition, in this case, replace the test pressure is necessary to verify the validity of.

1) Available in a high-pressure test is carried out.
2) Pressure test as an alternate non-destructive testing is performed.
3) the provision of alternative non-destructive testing and non-destructive testing is carried out separately.
4) Alternative non-destructive testing which is best for the non-destructive testing is carried out at the time.

9.3. Repair Welding

Welds used for power generation after the end of pre-test, the weld in the weld comes to performing, piping, heat exchangers, boiler drums and headers, and replace or repair welds inspected before use.
9.4. Boundaries of the boiler

Welding and related technical standards and conformity criteria specified for how to check, but as boilers and heat exchangers for the boundary, and is divided as follows.

The ranges of "Boiler" are from the water supply stop valve of the coal economizer (if there is no stop valve, water inlet header of coal economizer) to the stop valve of final reheater valve for main steam lines (stop valve if you do not have the final superheater header), and from the first header of reheater to the header of final reheater.
(Refer to the figure 2: Boundary of the boiler)

9.5. Liquefied gas equipment welding inspection coverage

For equipments of liquid ammonia, “High-pressure Gas Act” is applied to.

Fuel burning equipments of liquefied gas facility (LNG pipes and vessels) and desulfurization(denitrification) equipment are subject to “Electricity Utility Act”. (see Figure 3 liquefied gas, welding inspection equipment coverage)

The nitrogen tank for fuel cell power generation is subject to “Electricity Utility Act”, because it is facility for safe fuel substitution.
Figure 2, the boundary of the boiler

※ If there is a shut-off valve in the governor valve block boundaries

Figure 3 liquefied gas welding equipment before using the test coverage
Chapter 3

Classification of technical standards and criteria

1. Material inspection
2. Post-weld heat treatment
3. Non-destructive testing
4. Mechanical testing
5. Five. Pressure test
1. Material inspection (check materials scorecard report – attached)

【The purpose of the material inspection】

I confirm whether the examination for materials is suitable for a criterion, and you use it

I confirm the chemical ingredient for materials, machine examination presence, heat-treatment examination requirements, a mechanical hardness adequacy

◎ Check material certificate
   ① material specifications
   ② identifiers, numbers (Heat No., Etc.)
   ③ mechanical strength
   ④ chemical composition
   ⑤ Presence of heat-treated and non-destructive testing

◎ Seam Pipe Inspection of material (more than 150mm diameter pipe)
Design is more than the value of the design pressure of 100 °C 5Kg/cm² than if Seam Pipe Weld Act for making electricity by using the pre-test machine testing, non-destructive testing (if required), pressure test (if required) shall be used after the completion of the (fuel combustion pipe 0Kg/cm² more)
However, except ERW pipe

2. Test post-weld heat treatment (PWHT DOE-attached)

【The purpose of the heat treatment after welding inspection】
Post-weld heat treatment (PWHT) for the purpose of removing the residual stress of the weld, welding, heat stress relief, toughness, recovery, refining weld heat treatment in order to improve

◎ Check post-weld heat treatment
① Temperature Range  
② Hold Time  
③ heating rate and cooling rate  
④ two kinds of heat treatment of the weld material

3. NDT (non-destructive testing form-attached)  
【The purpose of the radiographic examination】  
Radiographic testing of the weld quality assurance tests on the key and the criteria according to the boiler, piping, pressure vessels, liquefied gas fuel burning equipment, each affected

◎ Check radiographic examination  
① check documents - number of films, photos, concentration, permeability meter, Ug values or  
② Radiographic film(Review)  
Reading range confirmation, the transmittancy meter certification, density range confirmation, combination right or wrong judgment  
※ ultrasonic testing, magnetic particle testing, liquid penetrant testing that witness inspection

4. Mechanical tests (mechanical testing form-attached)  
【The purpose of mechanical tests】  
Welding machine for the welding of the test is to verify tensile test, bending test, tensile test applied to the weld metal

◎ Check mechanical test  
① pre-stamped  
② specimen processing (see Appendix 5)  
③ kind of test
5. Pressure tests (pressure test form-attached)

【Purpose of pressure test】
For welded structures and transform Check for leakage and pressure tests and pressure tests shall provide
◎ Check pressure test
① Test Pressure
   - Determined in accordance with the provisions of the test (boilers, vessels, piping, etc.)
   - Pressure gauge shall be installed in the highest position, if pressure gauge is installed in the lower position, head pressure calculations is required by the difference of level
② Test temperature
   - Needs attention, especially in winter when the water pressure test
③ The surface of the weld
   - Pneumatic test cases in the weld is important to apply enough foams, oils and debris should be removed.
<table>
<thead>
<tr>
<th>Division</th>
<th>Boiler</th>
<th>Vessel</th>
<th>Pipe</th>
<th>Fuel combustion Equipment</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drum</td>
<td>Pipe, tube, header</td>
<td>Stamping Mechanical testing *(Article 53)</td>
<td>Vessel, Pipe *(Article 91)</td>
<td>witness</td>
</tr>
<tr>
<td>Nondestructive Test</td>
<td>Stamping / Machine Test *(Article 35)</td>
<td>X</td>
<td>Stamping Mechanical testing *(Article 53)</td>
<td>Vessel, Pipe *(Article 91)</td>
<td>witness</td>
</tr>
<tr>
<td>Pressure test</td>
<td>Hydrostatic test *(Article 37)</td>
<td>X</td>
<td>Hydrostatic test *(Article 55)</td>
<td>X (Seam Pipe When confirmation)</td>
<td>Hydrostatic test *(Article 55)</td>
</tr>
<tr>
<td>Nondestructive Test</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Heat Treatment</td>
<td>X</td>
<td>Heat *(Article 31)</td>
<td>X</td>
<td>Heat *(Article 67)</td>
<td>Film Review</td>
</tr>
<tr>
<td>Pressure test</td>
<td>X</td>
<td>Hydrostatic test *(Article 37)</td>
<td>X</td>
<td>Hydrostatic test *(Article 73)</td>
<td>Pneumatic/leak testing Pipe *(Article 93)</td>
</tr>
</tbody>
</table>

Table 3. Status of production and on-site welding inspection
Welding inspection work flow

1. Construction plan approval received
2. Inspection Guide
3. Inspection application receipt (7 days ago)
4. Inspection is the person who... check writing Technical Review Report
5. Inspection preparations confirmation
6. Inspection duties accomplishment
7. Meeting before the inspection
8. Inspection
9. After-inspection meeting
10. Test results
   - Accepted
   - Rejected
11. Test results reported
12. Issue approval letter (Within 5 days)

13. PWHT
14. NDT
15. Mechanical testing
16. Pressure test

1 Pre-use inspection the application
2 Welding statement
Weld inspection target flow

- NDT: Boilers, vessels, piping, combustion equipment, etc.
  - Acceptance
  - Yes: Inspect Target
  - No: Self-inspection

- Inspect Target (Boiler, Vessel, Piping, etc.)
  - Pressure test
    - Acceptance
    - Yes: Acceptance
    - No: Mechanical testing

- Mechanical testing (Boiler, Vessel, Piping, etc.)
  - Acceptance
  - Yes: Acceptance
  - No: Inspection completion

- Inspection completion
  - Boiler: Article 28
  - Vessel: Article 46
  - Piping: Article 64
  - Gas: Article 84

- Boiler: Article 35
- Vessel: Article 53
- Piping: Article 71
- Gas: Article 92
Chapter 4

Weld inspection laws pre-use inspection Duties

1. Inspection time
2. Inspection Standards
3. Inspection application and mention point
4. Ready for inspection
5. Perform visual inspection
6. Processing test results
7. Retest
8. Administrative measures fail during re-
9. Notification of rejection and other
10. Inspection certificate
11. Etc.
1. Inspection time
   ① 1st process: When the non-destructive testing is possible in accordance with technical standards
   ② 2nd process: Regarding butt welding, when mechanical test is possible in accordance with technical standards
   ③ 3rd process: When pressure test is possible

2. Inspection Standards
   ① Shall be suitable for the construction plans in accordance with the provisions of law or the declaration applied Article 61 Article 62 or under Article installation of electrical equipment and change content, Ltd.
   ② Shall be suitable for technical standards, such as power plants and thermal power plant technology, welding technology standard reference
   ③ Minister of Commerce, Industry and Energy or the prescribed test procedures will be adapted to the standards of electrical equipment, such as test items

3. Application for Inspection
   ① Application time
      7 days before the day you want to execute a inspection

   ② Application Inspection Documents (Attachment 1)
      ○ Application form for pre-use inspection
      ○ Welding inspection sheet (including welding length)
      ○ Business license of company who pays the inspection fee
        (only for the first application)

   ③ How to Apply
      ○ Mail, FAX(+82-63-716-9648) or visit us in person
○ The person in charge of inspection application(+82-63-716-2512)

④ Inspection schedule changes
   In case that inspection cannot be carried out owing to unavoidable circumstances, notify us of the reason why you cannot perform the inspection and the day you would like to progress inspection by document or phone-call

⑤ Inspection fees
   ○ The principles is the payment upon receipt of inspection.
   ○ However, regarding welding inspections, the payment can be done after inspection in view of the characteristics (note. full payment should be done within one week).

4. Ready for inspection
   ① The applicant should secure the necessary people for the inspection and prepare construction plan approval letter, technical specifications(specifications, contracts, drawings and etc.), necessary document for each test item, inspection forms, inspection procedures and test reports.

   ② If any test was required with other inspection departments or agencies, it should be finished before the pre-use inspection. And, a copy of the test report or approval letter should be submitted to us with a signature of the head of the responsible department. (However, the inspection shall be performed with a inspector if required)

5. Performing inspection
   ① Examinees shall follow the safe working precautions to ensure the safety of people and check the safety requirements related to
inspection. And, examinees shall ensure the safety of the personnel through performing safety education.

② Should be conducted for each test item to confirm such details prior to inspection readiness inspection schedule and inspection checks are seamless.

③ Electrical safety management personnel or pre-use welding inspection personnel should attend the inspection.

④ Technical standards, test items, and on-the-spot inspection by checking documents in accordance with the instructions of the electrical inspection business process business process guidance and business electrical installation inspection car electrical equipment

⑤ The pre-use inspection reports for electrical equipment are created as two original documents. And, one of them is issued to the applicant.

⑥ The inspector has a “After-inspection” meeting and explain the test results to examinees. Also, the inspector discusses about countermeasures for problems founded during inspection.

6. Test result processing

① Accepted : If you check the construction plan is the (reported) results of the repair electrical equipment in accordance with the appropriate inspection criteria

② Rejected : If not handled and passed the inspection period, Ltd. Is a checking plan (report) the repair electrical equipment
based on the examination result, if inadequate criteria

7. Retest
   ① Check with us for the first time and check in the same application

   ② Only the last inspection of Rejected tests

   ③ Retest results of treatment
      ○ Accepted : If appropriate technical standards are unsuitable electrical equipment Accepted process
      ○ Rejected : If the retest results of the electrical equipment are inadequate or unsuitable for testing standards, or if it does not be accepted within the retest corrective treatment period

   ④ The first half of the examination fee of the monthly fee retest fee

8. Administrative measures Rejected during retest
   If the Rejected retest results are reported as "non-performing contractors" to City. Governor having jurisdiction over the contractor if you get a retest within the time limit.

9. Various non-conformity notification process and results
   A. "Requirements for Electrical Equipment Visibility," published
      ○ If you Rejected to issue a suitable criterion to check test results
      ○ The corrective term is 15 days from the last day of inspection and within 30 days for a retest and building maintenance and repair equipment and appliances.

   B. Published "Electrical test results pointed at"
      ○ If the issue that may affect such standard procedures, such as
below, the drawings, specification tests for safety and quality
○ The completion of the inspection period, even any intellectual
  standing intellectual test results are issued.
○ If no termination notice to the memorandum pointed out that any
  applicant with supporting documents address the measures that
  have been pointed out to write the results

C. "Minutes after checking" Record
○ Supplement. Measures in the field as soon as minor details when
  the recording
○ If stated in the DOE and its contents may be omitted.

10. Inspection certificate
○ The Electricity Act enforcement regulations issued to Article 31
  has been completed on the basis of plant site by the end
  expiratory pressure test.
○ If you apply for a checking author, if you apply a test of the
  intermediate steps in the power plant site, the test results are
  notified only if the Rejected is official.

11. Others
   Please query by using Internet Home (www.kesco.or.kr) the page.
### Application for Pre-use Inspection

<table>
<thead>
<tr>
<th>Applicant</th>
<th>Pre-use Inspection Application Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Representative</td>
<td>② Phone</td>
</tr>
<tr>
<td>③ Company Name</td>
<td>④ Corporate registration number</td>
</tr>
<tr>
<td>⑤ Address</td>
<td></td>
</tr>
<tr>
<td>⑥ Installation Place</td>
<td></td>
</tr>
<tr>
<td>⑦ Facility Summary</td>
<td></td>
</tr>
<tr>
<td>⑧ Last Inspection Date</td>
<td>⑨ Time Limit</td>
</tr>
<tr>
<td>⑩ Inspection Date to be Postponed</td>
<td></td>
</tr>
<tr>
<td>⑪ Postponement Reason</td>
<td></td>
</tr>
</tbody>
</table>

We apply for postponement of the periodic inspection time according to Article 65 of 「Electricity Business Act」 and [Separate Chart 10] of Clause 1 and 2 of Article 32, Enforcement Regulations.

Date :

Applicant (Sign or Stamp)

KESCO Messrs.

※ Attached Document
1. Operation time and number of starting since the last time of inspection
2. Maintenance record since the last time of inspection
3. Periodic Inspection Postponement Review

- If the inspection institution is needed, it is able to investigate suitability of postponement reason on the spot after discussion with the applicant.
## Electrical installation Inspection Report

1. **Name of Business Place:**  
2. **Electrical Installations:**  
3. **Inspection Type:**  
4. **Inspection Process:**  
5. **Inspection Date:**  
6. **Judgment:**

We have confirmed that above electrical installations are inspected according to the Article ___, the Electricity Business Act and the Article ___, the Enforcement Regulations

<table>
<thead>
<tr>
<th>Applicant</th>
<th>o o o o o o</th>
<th>o o o (Stamp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendee</td>
<td>Electrical Safety Manager(Electric)</td>
<td>o o o (Stamp)</td>
</tr>
<tr>
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<td>Electrical Safety Manager(Mechanical)</td>
<td>o o o (Stamp)</td>
</tr>
<tr>
<td></td>
<td>Electrical Safety Manager(Civil Engineering)</td>
<td>o o o (Stamp)</td>
</tr>
<tr>
<td>Welding pre-service inspection Inspector(Welding)</td>
<td>o o o (Stamp)</td>
<td></td>
</tr>
<tr>
<td>Inspector</td>
<td>KESCO</td>
<td>o o o (Stamp)</td>
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</tbody>
</table>
The corrective request document of electrical installations

<table>
<thead>
<tr>
<th>Name of business place</th>
<th>Inspection target</th>
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</thead>
<tbody>
<tr>
<td>Inspection type</td>
<td>Issue date</td>
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</table>

<table>
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<table>
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<tr>
<th>Comment</th>
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</table>

Inspector Sign

Task action plan

<table>
<thead>
<tr>
<th>Applicant</th>
<th>Sign</th>
<th>Electrical safety manager</th>
<th>Sign</th>
</tr>
</thead>
</table>

Due date:

Comment document of inspection result of electrical installations

<table>
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<tr>
<th>Name of business place</th>
<th>Inspection target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection type</td>
<td>Issue date</td>
</tr>
</tbody>
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<table>
<thead>
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<table>
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<tr>
<th>Comment</th>
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</table>

Inspector Sign

<table>
<thead>
<tr>
<th>Action result</th>
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<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Applicant</th>
<th>Sign</th>
</tr>
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</table>
Appendix 3 Common criteria and post-weld heat treatment

1. General (Materials, construction, welding procedures and construction)

Thermal equipment for power generation – 4~33Article, 45~81Article, 83~95Article, 103, 104, 109, 110, 115, 116, 120, 121Article)

Development of welding equipment
- Chapter 2 Welded construction method(4~19Article)

2. Weld appearance (misalignment, reinforcement Allowed values)
   - Boilers – 21~24Article
   - Pressure Vessels – 38~42Article
   - Piping – 56~60Article
   - Liquefied gas fuel burning equipment – 76~80Article

3. PWHT (Material by heat treatment requirements)
   - Boilers – 31Article
   - Pressure Vessels – 49Article
   - Piping – 67Article
   - Liquefied gas fuel burning equipment – 87Article
1. Boiler
   ① Nondestructive testing range (28Article)
      ○ RT - 455℃ Over
         - Length of weld - All size and thickness
         - Circumferential weld( Drum) - DN 250㎜ Over or 29t Excess
         - Circumferential weld(PIPE/ TUBE)

Required radiographic test of welded butt joints

<table>
<thead>
<tr>
<th>Butt weld type</th>
<th>Pressure Part Service Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subject to Furnace Radiant Heat</td>
</tr>
<tr>
<td>Contains Steam and/or Water</td>
<td>Contains Water</td>
</tr>
<tr>
<td>Longitudinal</td>
<td>RT all sizes and thickness</td>
</tr>
<tr>
<td>Circumferential Welds in drums</td>
<td>RT &gt;DN250 or &gt;29mm thick</td>
</tr>
<tr>
<td>and shells</td>
<td></td>
</tr>
<tr>
<td>Circumferential Welds in pipes</td>
<td>RT &gt;DN100 or &gt;13mm thick</td>
</tr>
<tr>
<td>tubes, headers</td>
<td></td>
</tr>
</tbody>
</table>

Note
(1) The designer determines the operating conditions and the pressure unit contents.
(2) If you have more than 05 columns in the weld between the tube and the heating, does not look radiant heat from heating to weld.

○ UT
   - Non-destructive testing is remarkably difficult, if regulations
   - Electrolux welding slag

○ MT / PT
   - If UT is not possible to substitute a non-destructive test
   - Part is welded to the other edge of the pressure part to make joints of flat end plate is in excess of 13t
② Non-destructive testing procedures (29Article)
- RT : Appendix1
- UT : Appendix2
- MT / PT : Appendix3 / Appendix4

③ Non-destructive testing acceptance criteria (30Article)
- RT (Rejected)
  The indications shown on the radiographs of the welds and characterized as imperfections are unacceptable under the following conditions.
  - Any indication characterized as a crack or zone of incomplete fusion or penetration.
  - Any other elongated indication on the radiograph that has a length greater than

    (a) 6 mm for t up to 19 mm
    (b) 1/3 t for from 19mm to 57 mm
    (c) 19 mm for t over 57 mm (where t is the thinner thickness of the weld)

  - Any group of the aligned indications that have an aggregate length greater than t in a length of 12t, except when the distance between the successive imperfection exceeds 6L where L is the l length of the longest imperfection in the group.

  - Rounded indications in excess of those shown in the acceptance criteria, Attachment 5.

- UT (Rejected)
  If the reference level exceeds 20%, the below conditions are rejected.
  - Other imperfections are unacceptable if the indication exceeds the reference level and their length exceed the following.
(a) 6 mm for t up to 19 mm  
(b) 1/3 t for t from 19 mm to 57 mm  
(c) 19 mm for t over 57 mm. (where t is the thinner thickness of the weld)

2. Pressure Vessels

(1) Nondestructive testing range (46Article)

- RT (FULL)
  - All butt welds in the shell and the head of the vessels used to contain the lethal substance.
  - All butt welds in the vessels in which the nominal thickness at the welded joint exceeding 38 mm.
  - The complete radiographic examination is required for each butt welded joint at which the thinner of the plate or vessel wall thickness at the welded joint exceeds the thickness limit above which the full radiography is required in Table for the pressure vessels constructed of the ferritic steels with tensile properties enhanced by the heat treatment and of carbon and low alloy steels, high alloy steels, clad vessel.

Thickness above which full radiographic examination of butt welded joints is mandatory

<table>
<thead>
<tr>
<th>Classification of Material</th>
<th>Nominal Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-No. Gr. No.</td>
<td></td>
</tr>
<tr>
<td>1 1, 2, 3</td>
<td>32</td>
</tr>
<tr>
<td>3 1, 2, 3</td>
<td>19</td>
</tr>
<tr>
<td>4 1, 2</td>
<td>16</td>
</tr>
<tr>
<td>5A, 5B 1</td>
<td>0</td>
</tr>
<tr>
<td>9A, 9B 1</td>
<td>16</td>
</tr>
<tr>
<td>10A 1</td>
<td>19</td>
</tr>
<tr>
<td>10B 2</td>
<td>16</td>
</tr>
<tr>
<td>10C 1</td>
<td>16</td>
</tr>
<tr>
<td>10F 6</td>
<td>19</td>
</tr>
</tbody>
</table>

- Spot radiography
  - The butt joints as attained by double-welding or by other means which will obtain the same quality of deposited weld
metal on the inside and outside weld surface. And the weld joint efficiencies are 0.7~0.85 in the joint category A, B, C, D. The welds using metal backing strips which remain in place are excluded.
- The single-welded butt joint with backing strip and the weld joint efficiencies are 0.65~0.80 in the joint category A, B, C, D.

○ UT
- If the unit is remarkably difficult structural RT

○ UT (RT et additional test)
- All welding made by electron beam welding
- All welding done by a flexible drive inertia, friction welding

○ MT
- That improves the tensile properties by heat treatment ferritic steel
- ID 50㎜ Less the nozzle welds(That improves the tensile properties by heat treatment ferritic steel)

○ PT
- All of the cold welded pressure vessels (Before or after hydrostatic)
- Gr SB-443, 444, of 44. 2, the weld of 6 (After heat treatment)
- Ti, Zr and Ti, all joints of a Zr alloy pressure vessel
- SA-333, 334 Gr 8, SA-522 Gr A, B, SA-645 RT of the container except for the weld (Before or after hydrostatic)

② Non-destructive testing procedures (47Article)
○ RT : Appendix1
○ UT : Appendix2
○ MT / PT : Appendix3 / Appendix4

③ Non-destructive testing acceptance criteria (48Article)
○ RT - FULL (Rejected) *** Same as boiler ***
- Any other elongated indication on the radiograph that has a
length greater than

(a) 6 mm for t up to 19 mm
(b) 1/3 t for from 19mm to 57 mm
(c) 19 mm for t over 57 mm (where t is the thinner thickness of the weld)

- Any group of the aligned indications that have an aggregate length greater than t in a length of 12t, except when the distance between the successive imperfection exceeds 6L where L is the l length of the longest imperfection in the group.
- Rounded indications in excess of those shown in the acceptance criteria, Attachment 5.

○ RT - SPOT (Rejected)
  How to : 1 place per 15m (Minimum150㎜)
  - Crack, fusion defects, lack of penetration
  - slag / cavity : 2/3t Excess (t: Thinner thickness)
  - The line up is indicated if the group length t or more from the maximum at intervals of Less 3L L is indicated in the range 6t
  - 19㎜Excess Indicated (6㎜ Permitted under)

  If the Rejected : Two additional areas adjacent test

○ UT (Rejected) *** Same as boiler ***
  If the reference level exceeds 20%, the below conditions are rejected.
  - Other imperfections are unacceptable if the indication exceeds
  the reference level and their length exceed the following.
  (a) 6 mm for t up to 19 mm
  (b) 1/3 t for t from 19mm to 57 mm
  (c) 19 mm for t over 57 mm. (where t is the thinner thickness of the weld)

○ MT/PT (Rejected) *** Same as boiler ***
  - Linear Indicated
  - Excess 6㎜ circular Indicated
- Four or more separate circular indicated on the same line interval of less than 1.5 ㎜

3. Piping

① Nondestructive testing range (64Article)
- Diameter than 150㎜ (VT Mandatory)

Required radiographic of welded butt joints

<table>
<thead>
<tr>
<th>Welding Type</th>
<th>piping design conditions and Non-destructive Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperatures over 400℃ and at All pressure</td>
</tr>
<tr>
<td>Butt welds (girth and longitudinal)</td>
<td>RT or UT : over DN 50 MT or PT : DN 50 and less</td>
</tr>
<tr>
<td>Welded branch connections</td>
<td>RT or UT : over DN 100 MT or PT : DN 100 and less(2)</td>
</tr>
<tr>
<td>Fillet, socket, attachment, and seal welds</td>
<td>PT or MT : all size and Thickness(5)</td>
</tr>
</tbody>
</table>

**NOTE**

1. The thickness of welds is defined as the thicker portion among the two adjacent ends of the butt weld after the process for welding groove
2. RT may be used as an alternative to PT or MT when it is performed in accordance
3. RT or UT of branch welds shell be performed before any non integral reinforcing material is applied
4. When required in the above table, of the branch connection the weld volume test (RT, UT) for the welding branch connection can be replaced with the surface inspection (PT, MT). In this case, the smaller one of the half or 12.5mm from the weld thickness and all final welding surface which is accessible should be examined.
5. In case of using a fillet weld throat thickness not exceeding 6mm for the permanent attachment of non-pressure-retaining parts, it would be exempt from the above table MT or PT requirements.

② Non-destructive testing procedures (Article 65)
- RT : Appendix1
- UT : Appendix2
- MT / PT : Appendix3 / Appendix4
3. Non-destructive testing acceptance criteria (Article 66)
   - RT (Rejected) *** Same as boiler ***
   - UT (Rejected) *** Same as boiler ***
   - MT/PT (Rejected)
     - Linear Indicated
     - Excess 6㎜ circular Indicated
     - Four or more separate circular Indicated on the same line interval of less than 1.5 ㎜
     - Any Area 3870㎜² (Long side Less 150㎜) More than 10 in the circular Indicated
1. Inspection Target (Article 35, 53, 71, 92)
   Mechanical test target classification and acceptance criteria

2. Type of test
   - Joint tensile test
   - Weld metal tensile test (Thickness over 16㎝ - only boiler)
   - Bending test
     - 10㎝Less: Each 1 test for Surface and Back
     - 10㎝Over 19㎝Less: Each 1 test for Surface and Back or 2 tests for Sides
     - 19㎝Over: 2 tests for Sides (Thickness 10㎜)

3. Acceptance criteria
   - Joint tensile test: Minimum tensile strength of the base material
   - Weld metal tensile test: Minimum tensile strength of the base material
   - Bending test: Discontinuity under 3㎜

4. Retest (Article 36, 54, 72, 93)
   - When satisfied with the applicable requirements in less than 10%
   - Damage caused by the allowable discontinuity
   - Weld metal tensile test: The elongation is less than a specified value, if more than 19㎜ away from the center of the destruction of the gauge
5. Mechanical test specimens machined dimensions

Milling 2

Edge of the wide side of the weld
Machining

6 mm

4 mm

6 mm

25 mm is less than W = 38 ± 0.2

It exceeds the 25 mm W = 25 ± 0.2

Tensile specimens

Bend specimen
1. Boilers (Article 37)
   - After the boiler has been completed, it shall be subjected to the pressure tests using water at not less than ambient temperature, but in no case less than 20℃.
   - No part of the boiler shall be subjected to the general membrane stress greater than 90% of its yield strength at test temperature.
   - The hydrostatic pressure tests shall be applied by raising the pressure gradually to not less than 1.5 times the maximum allowable working pressure as shown on the data report to be stamped on the boiler.
   - The hydrostatic tests pressure may then be reduced to the maximum allowable working pressure, to be stamped on the boiler and maintained at this pressure while the boiler is carefully examined. The metal temperature shall not exceed 50℃ during the close examination.

2. Pressure Vessels (Article 55)
   Hydrostatic test
   - The vessels designed for the internal pressure shall be subjected to the hydrostatic test pressure which at every point in the vessel is at least equal to 1.3 times the maximum allowable working pressure to be marked on the vessel multiplied by the lowest ratio (for the materials of which the vessel is constructed) of the stress value S for the test temperature on the vessel to the stress value S for the design temperature.
   - Following the application of the hydrostatic test pressure, the inspection shall be made of all the joints and connections. This inspection shall be made at the pressure not less than
the test pressure divided by 1.3.

Except for the leakage that might occur at the temporary test closures for those openings intended for the welded connections, the leakage is not allowed at time of the required visual inspection.

- The vent shall be provided at all high points of the vessel in the position in which it is to be tested to purge the possible air pockets while the vessel is filling.

- Before applying the pressure, the test equipment shall be examined to see that it is tight and that all the low-pressure filling lines and the other appurtenances that should not be subjected to the test pressure have been disconnected.

Pneumatic test
- The pneumatic test pressure shall be at least equal to 1.1 times the maximum allowable working pressure to be stamped on the vessel multiplied by the lowest ratio (for the materials of which the vessel is constructed) of the stress value $S$ for the test temperature of the vessel to the stress value $S$ for the design temperature.

- The metal temperature during the pneumatic test shall be maintained at least 17°C above the minimum design metal temperature to minimize the risk of the brittle fracture.

- The pressure in the vessel shall be gradually increased to not more than one-half of the test pressure. Thereafter, the test pressure shall increase in step of approximately one-tenth of the test pressure until the required test pressure has been reached.

- The pressure shall be reduced to the value equal to the test pressure divided by 1.1 and held for a sufficient time to permit the inspection of the vessel.
- Except for leakage that might occur at temporary test closures for those openings intended for the welded connections, the leakage is not allowed at the time of the required visual inspection.

3. Piping

Hydrostatic test (Article 73)
- The hydrostatic test pressure at any point in the piping system shall not be less than 1.5 times the design pressure, but shall not exceed the maximum allowable test pressure of any non isolated components, such as the vessels, pumps or the valves.

- The pressure shall be continuously maintained for the minimum time of ten minutes and may then be reduced to the design pressure and held for such time as may be necessary to conduct the examination for the leakage.

- The examination for the leakage shall be made of all the joints and connections. The piping system, exclusive of possible localized instances at the pump or the valve packing, shall show no visual evidence of weeping or leaking.

Pneumatic test (Article 74)
- It is recommended that pneumatic test be used only when one of the following conditions exists. When piping systems are so designed that they cannot be filled with water. When the piping systems are to be used in service where the traces of the testing medium cannot be tolerated.

- The gas used as the test medium shall be not non flammable and nontoxic.

- The pneumatic test pressure shall be not less than 1.2 or more than 1.5 times the design pressure of the piping system. The test pressure shall not exceed the maximum allowable test pressure of any non isolated component.
The pressure in the system shall gradually increase to not more than one-half of the test pressure after which the pressure shall be increased in step of approximately one-tenth of the test pressure until the required test pressure has been reached.

- The pressure shall be continuously maintained for the minimum time of 10 minutes.

- It shall then be reduced to the lesser of the design pressure or 700kPa and held for such time as may be necessary to conduct the examination for the leakage.

- The piping system, exclusive of the possible localized instances at the pump or the valve packing, shall show no visual evidence of the leakage.

4. Liquefied gas fuel burning equipment (Article 94)

The internal pressure test in the liquefied gas fuel combustion equipment shall be applied to the pressure vessel and piping.
CHAPTER 1 GENERAL PROVISIONS

Article 1(Purpose)
The purpose of this guideline is to secure the safety of the electrical installations by prescribing the inspection procedures and items to be inspected in order to perform the pre-service inspection (Article 63, Electricity Business Act) and the periodic inspection (Article 65, Electricity Business Act) regulated in Electricity Business Act.

Article 2(Scope of application)
This guideline is to apply to the business process of the pre-service inspection and the periodic inspection of the approval of the construction plan and the facility to be reported according to the Reference 5, 9 and 10, Enforcement Regulation, Electricity Business Act.

Article 3(Definition)
① The definitions of the terms used in this procedure shall be as follows:

1. The term "the Electro-technical Standards" means the Electro-technical Standards and the acceptance criteria for the Electro-technical Standards announced by the Minster of Trade, Industry & Energy according to the Article 67, Electricity Business Act.(From now it is called "Act")

2. The term “Inspection Agency” means Korea Electrical Safety Corporation(From now it is called "KESCO") entrusted by the government and performs the inspection based on the Article 98, the Act.

3. The term “Inspector” means the person qualified with the technique and affiliated in KESCO performing the inspection according to the Article 33, Enforcement Regulation.

4. The term “Electrical Installation Inspection Document” means
the record kept by the inspector and the applicant after the inspector makes the inspection results and signing and sealing by the inspector and the applicant.

5. The term “Examinee” means the person or the applicant carrying out the installation, operation of the electrical installation to be inspected or manufacturing the auxiliary equipment of the related electrical installation.

6. The term “Test Report” means the test report of the official testing institutes by Framework Act on National Standards, the self test report of the manufacturer issued by the product certification institutes and the self test report of the manufacturer exempted from the official certification test.

7. The term “Installation Construction” means that the electrical installations are installed newly including the enlargement of the constructions.

8. The term “Alteration Construction” means the constructions that repair, remodel and replace the existing electrical facilities and it is the construction regulated by the following terms.

a. The term “Repairing & Remodeling” means the construction reinstalled after repairing and remodeling with the demolition of the electrical installations or the construction altered or changed in part of the electrical installations by repairing or remodeling without the demolition of the electrical installations.

b. The term “Replacement” means the replacement of the existing facilities with new ones after the demolition in whole or in part of the electrical installations.

9. The term “Contractors Responsible Engineer” means the person affiliated in contractors as an electrical construction engineer and he carries out the construction of the electrical installations.
10. The term “Supervisor” means the person affiliated in the construction supervision corporations conducts the construction supervision of the electrical installations, in case that the electrical safety manager supervises autonomously, it means the electrical safety manager.

11. The term “Continuous operation allowable output” means the maximum output able to generate continuously under the regulated operation condition between the maximum guarantee output and the output of the construction plan authorization (report) guaranteed on the performance by the supplier (manufacturer) after the final load operation test by the output of the construction plan authorization(report) as the thermal and hydro (pumped storage) power plant. And it means the accepted output after some test inspections applied and determined by the generation licensee in the light of the manufacture, installation, modification, aging condition and the other conditions of the generation facility.

12. The term “New & Renewable Energy Power Facilities” means the installations using solar energy, bio energy, wind power, water power, fuel cells, waste energy, geothermal energy, hydrogenous energy and the integrated coal-gasification combined-cycle of the new & renewable energy according to the Act on The Promotion of the Development, Use, and Diffusion of New & Renewable Energy.

13. The term “Importing Inspection” means the inspection inspected on the spot with attendance of the inspector by the request of the person who wants to install the electrical installations at the country after manufacturing the electrical installations in the other country.

② The terms not defined in this guideline are prescribed according to the Enforcement Ordinance, the Act and the Electro- technical Standards.
CHAPTER 2 INSPECTION TARGET, TIME AND CRITERIA

Article 4(Inspection target and time)

① The basis, target, standard, procedure and the time of the pre-service inspection and the periodic inspection according to the Act and the Enforcement Regulation are as follow.

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<tr>
<th>Classification</th>
<th>Legal Basis</th>
<th>Target, Standard, Procedure and Time</th>
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<tbody>
<tr>
<td>Pre-service inspection</td>
<td>Article 63, the Act</td>
<td>Article 31, the Enforcement Regulation</td>
</tr>
<tr>
<td>Periodic inspection</td>
<td>Article 65, the Act</td>
<td>Article 32, the Enforcement Regulation</td>
</tr>
</tbody>
</table>

② The target and time for the periodic inspection according to Article 65, the Act are regulated in the reference 10, the Enforcement Regulation. However, the time of the inspection is able to be regulated by the Minister of Trade, Industry & Energy in case of belows:

1. In case that the emergency generator is considered unnecessary to carry out the periodic inspection considering the number of the operation and the purpose of the use for the emergency generators.

2. In case that it is impossible to carry out the periodic inspection on the commercial generators due to the deficiency in the electric power supplies and the natural disasters.

③ The inspection for the generation facility is carried out in the period of the shutdown. If the facilities’ malfunction of the adjustment reason for the inspection time occurs, submit the postponement application(Reference 2, forms) for the periodic inspection and then it is able to adjust the inspection time within the range of 2 months.
after the consultation with the inspection institution.

Article 5 (Inspection Standard)
The Inspection Standard of the electrical installation for the utility is as follows.

1. The installation and the alteration construction of the electrical installation shall be suitable to the construction plan approved (reported) by Article 61 or Article 62, the Act.

2. It shall be suitable to the Electro-technical Standards.

3. It shall be suitable to the inspection procedures or items regulated by the Minister of Trade, Industry & Energy.

Article 6 (Inspection item)
The inspection items of the electrical installations for the utility are the detailed contents according to Reference 1.

CHAPTER 3 INSPECTION PROCEDURES

Article 7 (Inspection application and payment of inspection fee)

① The person who intends to inspect (From now, it is called "applicant") shall apply for the pre-service inspection (Reference 28, Enforcement Regulation) or the periodic inspection (Reference 29, Enforcement Regulation) before 7 days of the inspection date when the applicant wants to be inspected.

② When the applicant applying for the periodic inspection prescribed in clause ① desires to be inspected by the continuous operation allowable output. The applicant shall submit the technical review data concerning the safety certification for the generation facilities. In case that the applicant wants to be inspected by the rated output or the output less than before the inspection, it shall be not applied.

③ The applicant shall make a payment of the inspection fee to KESCO
approved by the Minister of Trade, Industry and Energy

④ In case that the applicant applies for the importing inspection, all of the required expenses, business expenses and the flight fare shall be paid by the applicant.

Article 8(Alteration of inspection schedule)
In case that the compelling circumstances or another reasons of the business place to be inspected occurs, the applicant could change the inspection date by the documents or the phone after the consultation with the inspector.

Article 9(Inspection Management)
① The inspector shall carry out the inspection of the electrical installations according to the Enforcement Ordinance, the Act.

② In case modification and supplementation of the inspection item are required because addition of the inspection item needed for inspection is required or technical development of the electrical installation. KEISCO shall carry out the inspection after approval from the Minister of Trade, Industry & Energy.

Article 10(Inspection procedures)
The inspection of the electrical installation is carried out as follows.

① Information of the inspection business

1. In case of the pre-service inspection, send the required documents, inspection fee, installation of the indicator board and so on which are necessary for the inspection to the operator and the owner of the electrical installation within 1 month after the receipt of the construction plan authorization or the acceptance document of the report.

2. In case of the periodic inspection, send the guide as to the method of the inspection application, inspection fee, etc, which are necessary for the inspection to the related business place to be
inspected according to the inspection schedule for the year.

a. Sending Time: January on the year that the inspection shall be
done or before two months of the approximate date for the
inspection.

b. The elapse of the inspection period: The urging guide as to
the administrative measure is sent to the examinee missing the
legal period of the periodic inspection or the reinspection.

② Inspection Preparation
The inspector shall conform the follows from the applicant in order
to perform the inspection well.

1. The applicant shall prepare the construction plan authorization
(report), technical specification, test report and etc, prior to the
inspection.

2. If the test by the test department and the specialized organization
excluding the applicant is needed, let the applicant submit the test
report or the copy of the test report after them complete the test
before the inspection.

③ Meeting before inspection
Discuss follows in order to perform well the inspection of the
electrical installations.

1. The inspector shall observe the safety instruction in order to
secure the safety of the human life including the inspector himself
and the safety of the facility and carry out the safety instruction
after checking the safety management details needed for the
applicant.

2. The inspector shall discuss the detailed inspection schedule and
the inspection method by each inspection item with the applicant in
order to be not delayed in the inspection.
3. The inspector shall review and check the technical materials related to the inspection test reports submitted by the applicant.

④ Implementation of inspection

1. The inspector shall carry out the inspection according to the inspection items and the inspection standards after checking the inspection range based on the approved (reported) drawing and the technical review about the safety verification. In case that the field test of the equipment and facilities imported from the foreign country is impossible, it is able to replace with the test report.

2. The result of implementation of the inspection shall be judged as follows.
   
a. It shall be suitable to the construction plan authorization(report)

b. It shall be suitable to the Electro-technical Standards. But if necessary, it is able to comply with the worldwide or national standards in order to supply the enough power and for the public safety.

   c. It shall be suitable to the inspection procedures or the inspection items of the electrical installations for the utility(Reference 1) regulated by the Minister of Trade, Industry and Energy.

⑤ Meeting after inspection

Explain the inspection result to the applicant and take measure of followings regarding problem brought up during the inspection, solutions and the measuring plan.

1. When the rejection item is discovered, issue the corrective request document of the electrical installations(Reference 3. forms) and explain the reasons and details in order to be reinspected after correction.

2. When the inspection result is against or below the matters
influencing on the safety and quality, issue the comment document of the inspection results of the electrical installations (Reference 4. forms). And check the correction result in writing or on the spot.

3. Record in the meeting minutes after the inspection about slight matters and the matter handled on the spot shortly.

4. In case of the pre-service inspection, explain the installation mandatory of the indicator board of the completion to the applicant. And explain that the pressure vessel shall be installed with the name plate.

Article 11 (Process of inspection result)

① The inspection result is judged as pass, partial pass, temporary use and rejection. And the inspection document is issued on the spot.

② In case that the inspection result is apt for the criteria, it is judged as pass or partial pass.

③ According to the criteria, if the inspection result of the electrical installations is unsuitable, judge it as rejection. And issue the corrective request document of the electrical installations and let the applicant have the reinspection.

④ According to Article 64, the Act, in case that KESCO permits the temporary use, KESCO shall notice the period and the method of the use. And the period of the temporary use and the permission methods are as follows.

1. Appoint the period in range of 3 months (If the last day of the reinspection period is holiday, it is the next day) since the next day of the final inspection day in light of the expiration of the reason of temporary use and risk. But in the period of the temporary use, if it is admissibile that there is a special reason not to expire the reason of the temporary use, it is able to extend the
period of the temporary use within 1 year.

2. Check and state the range of the use and method of the electrical installations concretely in order to prevent the negligent accident during the period of the temporary use.

3. The allowable criteria of the temporary use are as follows

   a. In case that the generator's output is lower than the approved or the reported output but it is admissible that there is no risk to use.

   b. In case that the safety fence and etc. not related directly to the transmission and distribution are not installed but the safety measures is taken to prohibit the approach of human.

   c. In case of alternating, preparatory facility or emergency stand-by generator of the electrical installations whose construction plan is approved or reported is not installed but it is admissible that the main facility is unproblematic to use.

Article 12(Notice of the inspection result)

① In case of the pre-service inspection, KESCO shall issue the inspection certificate(Reference 2, clause 28, Enclosure, Enforcement Regulations) by each process to the applicant within 5 days after the completion of the inspection. And in case of the periodic inspection, KESCO shall issue the inspection certificate when the final inspection is completed. If the inspection result is rejection, then notify the contents and reason. But the inspection certificate of the welding inspection is issued on the spot of the power plant when the final inspection by the unit is completed.

② In case of the pre-service inspection of the generation facility according to clause ①, the rated output shall be recorded in the inspection facility column of the inspection certificate. In case of the periodic inspection, the rated output or the continuous operation
allowable output shall be recorded there and in case of the combined cycle, record the corrected output according to the designed outdoor temperature.

**Article 13(Implementation of partial inspection)**

① Inspectors perform the inspection about the requesting parts among the construction plan authorization or the reported electrical installations.

② In case of the partial pass for the installation, the inspector shall notify the applicant of that reinspection is needed after the completion of the facility. And record that the use of the rest inspection target without guide and inspection is the violation of the Act in the official document when the inspection certificate is issued.

③ In case that the incomplete facility exceeds 1 year from the final inspection after the partial inspection, notify the applicant of the availability of the inspection after checking whether the requirement to change the construction plan authorization is occurred or not.

**Article 14(Reinspection)**

① The electrical installations whose inspection result is rejection shall have the reinspection and the application of the reinspection is accepted of only the application then, inspect the part of the rejection or the temporary use.

② Report that the business place whose result of the reinspection is rejection is the shoddy and fault construction enterprise (Reference 6. forms) to the mayor or the governor who has the jurisdiction the location of the main office of the construction company.

**Article 15(Other Detail)**

① KESCO could provide the necessary information describing the complemented rectification and the corrective measure from the
inspection performance to the applicant in order to prevent the recurrence.

② KESCO shall report that the person using the facility without the pre-service inspection and the periodic inspection to the related authorities and report the electric facility rejected to the reinspection to the related authorities.

Supplementary Provision

Article 1 (Enforcement date)
This guideline would be enforced on the designated day by the Minister of Trade, Industry and Energy.
I - 8 Welding Inspection

☐ Common term

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<tr>
<th>Inspection Items</th>
<th>Detailed Contents</th>
<th>Required Documents</th>
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<td>* Specification</td>
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</tr>
<tr>
<td></td>
<td>* Welding Execution Method</td>
<td>◦ Mill Sheet</td>
</tr>
<tr>
<td></td>
<td>* Material Checking</td>
<td>◦ WPS &amp; PQR</td>
</tr>
<tr>
<td></td>
<td>- Chemical Composition</td>
<td>◦ Record of Welder Examination for a License</td>
</tr>
<tr>
<td></td>
<td>- Mechanical property</td>
<td>◦ Welding DATA</td>
</tr>
<tr>
<td></td>
<td>- Basic Material Specification</td>
<td>◦ Basic Material &amp; Weld Zone Intensity Check</td>
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<tr>
<td></td>
<td>* Weld Zone Appearance</td>
<td></td>
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<tr>
<td></td>
<td>- Weld Zone Cross-Joint</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Weld Excess Weld Metal</td>
<td></td>
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<tr>
<td></td>
<td>- Weld Zone Surface State</td>
<td></td>
</tr>
<tr>
<td>2. Heat Treatment After Welding</td>
<td>* Heat Treatment Method</td>
<td>◦ Heat Treatment Zone Mark Drawing</td>
</tr>
<tr>
<td></td>
<td>* Warm Up &amp; Interlayer Temperature</td>
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<tr>
<td></td>
<td>* Heatup Rate &amp; Cooling Rate</td>
<td>◦ Thermocouple &amp; Record Calibration Report</td>
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<tr>
<td></td>
<td>* Maintenance Temperature</td>
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<td></td>
<td>* Maintenance Time</td>
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</tbody>
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☐ When the nondestructive test could be carried out.

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<tr>
<th>Inspection Items</th>
<th>Detailed Contents</th>
<th>Required Documents</th>
</tr>
</thead>
<tbody>
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<td>1. Nondestructive Test</td>
<td>* Test Method</td>
<td>◦ Nondestructive Test Part Mark Drawing</td>
</tr>
<tr>
<td></td>
<td>* Radiant-ray Test Method</td>
<td>◦ Nondestructive Tester Qualifications</td>
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<td></td>
<td>* Radiograph qualifications</td>
<td>◦ Nondestructive Test Procedure</td>
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<tr>
<td></td>
<td>* Radiograph Read</td>
<td>◦ Radiograph</td>
</tr>
<tr>
<td></td>
<td>* Ultrasonic Test Method</td>
<td>◦ Calibration Report</td>
</tr>
<tr>
<td></td>
<td>* Sightseeing &amp; Assessment</td>
<td>◦ Nondestructive Test Report</td>
</tr>
<tr>
<td></td>
<td>* Magnetic Particle Test Method</td>
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</tr>
<tr>
<td></td>
<td>* Sightseeing &amp; Assessment</td>
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<tr>
<td></td>
<td>* Penetrant Test Method</td>
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<tr>
<td></td>
<td>* Sightseeing &amp; Assessment</td>
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When the mechanical test could be carried out.

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<th>Inspection Items</th>
<th>Detailed Contents</th>
<th>Required Documents</th>
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</thead>
<tbody>
<tr>
<td>1. Test Plate Imprint</td>
<td>• Shape &amp; Size of Test Plate</td>
<td>○ Mechanical Test Part Mark Drawing</td>
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<tr>
<td></td>
<td></td>
<td>○ Mechanical Test Procedure</td>
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<tr>
<td>2. Joint &amp; Deposition Metal Tension Test</td>
<td>• Shape, Size &amp; Quantity of Test Plate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tension</td>
<td>○ Calibration Report</td>
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<td></td>
<td>• Elongation Percentage</td>
<td>○ Mechanical Test Report</td>
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<tr>
<td>3. Bend Test (Side, Surface, Root)</td>
<td>• Shape, Size &amp; Quantity of Test Plate</td>
<td></td>
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<tr>
<td></td>
<td>• Bending Angle</td>
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<td>• Surface State(Crack, Discontinuity)</td>
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<td>4. Impulse Test (Welding Metal Part &amp; Heat Affected Zone)</td>
<td>• Shape, Size &amp; Quantity of Test Plate</td>
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<td></td>
<td>• Absorption Energy</td>
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When the pressure-resistant test could be carried out.

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<tr>
<td></td>
<td>• Test Tool</td>
<td>○ Pressure-Resistant Test Part Mark Drawing</td>
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<tr>
<td></td>
<td>• Test Pressure</td>
<td>○ Pressure-Resistant Test Procedure</td>
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<td></td>
<td>• Maintenance Time</td>
<td>○ Pressure-Resistant Test Report</td>
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<td></td>
<td>• Leakage &amp; Change in Form</td>
<td>○ Pressure Gauge Calibration Report</td>
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