

Foreword

This standard is developed by Sinopec Engineering Incorporation in cooperation with other involved organizations based on the requirements of Document JIANBIAO [2012] No.5 issued by the Ministry of Housing and Urban-Rural Development of the People's Republic of China- "Notice on Printing' the Development and Revision Plan of National Engineering Construction Standards in 2012".

In preparing this standard, the development team made extensive investigations and summarized the lessons learnt from the large earthquakes occurred both in China and abroad, especially earthquake damage experience in petrochemical engineering from Wenchuan earthquake in 2008, highlighted cost effectiveness and engineering practices in petrochemical industry in China, and discussed, revised, and finalized this standard based upon comments from the organizations involved in survey, design and construction.

This standard comprises 16 chapters and 1 appendix with the main contents as follows: general provisions, terms, basic requirements, site and soil foundation, processing equipment, process piping, General machinery, power and dynamic equipment, chemical fibre equipment, instrument, apparatus and computer(control) system, electric and telecommunications equipment, building, other special structures, onshore drilling platform, offshore platform and ground production facilities, etc.

The provisions printed in bold type are compulsory and must be enforced strictly.

The Ministry of Housing and Urban-Rural Development of the People's Republic of China is in charge of administration of this standard and explanation of its compulsory provisions. China Petroleum and Chemical Corporation (Sinopec Group) is responsible for its routine management. Sinopec Engineering Incorporation is tasked for explanation of specific technical contents. All relevant organizations are kindly requested to sum up your experiences in actual practices during the process of implementing this standard. The relevant comments and information can be posted or passed on to the Management Team for *Appraisal Standard for Earthquake Destruction in Petrochemical Engineering* in Sinopec Engineering Incorporation (Address: Bldg. 21 Anyuan, Anhui Bei Li, Chaoyang District, Beijing, Postcode: 100101) for reference in future revision.

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1 General provisions

1.0.1 This standard is developed to authenticate destruction extent of earthquake in the petrochemical engineering, and to estimate the direct economic loss.

1.0.2 This standard is applicable to authentication of earthquake destruction to processing equipment, process piping, universal machine, power and dynamic equipment, chemical fibre equipment, instrument and computer (control) system, apparatus, electric and telecommunications equipment, buildings, other other special structures, onshore drilling platform, offshore platform and ground production facilities, etc. in petrochemical engineering after destructive earthquake occurs, to authentication of damage caused by secondary disaster rising from earthquake, and to Estimated direct economic loss resulting from earthquake destruction.

1.0.3 Classification of earthquake destruction level in petrochemical engineering shall be on basis of direct earthquake destruction.

1.0.4 Earthquake destruction level in petrochemical engineering shall be classified into 5 class basically intact, minor damage, moderate damage, severe damage and collapse according to the following requirements:

1 Basically intact: integral structure isn't destructed; individual parts have been damaged slightly, and continued use without repair is generally allowed;

2 Minor damage: integral structure has been damaged slightly; individual parts have been damaged, and continued use is allowed after repair;

3 Moderate damage: integral structure has been damaged; individual parts have been destructed obviously, and continued use is allowed only when the repair has been performed;

4 Severe damage: integral structure has been destructed obviously; individual parts have been destructed severely, and continued use is allowed only when a great deal of repair works have been performed;

5 Collapse: individual structure has been destructed severely, and is no longer worth repairing.

1.0.5 Estimate of direct economic loss after earthquake destruction in the petrochemical engineering may be in accordance with the requirements of Appendix A of this standard.

1.0.6 In addition to the requirements stipulated in this standard, those stipulated in the current relevant standards of the nation shall be complied with.

2 Terms

2.0.1 Main body of equipment

The equipment's casing, shell, and body, etc.

2.0.2 Bearing member of equipment

A member bearing the vertical or horizontal action.

2.0.3 Main assembly of equipment

A complete assembly forming the main body of the equipment.

2.0.4 Structural member of building and special structures

A member bearing the vertical, horizontal or other actions.

2.0.5 Non-load bear structural member of building and other special structures

A member bearing self-weight only.

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3 Basic requirements

3.0.1 Quantity and extent of destruction to the integral structure or structural units of the engineering shall be determined based on the following principles:

- 1 A few(a little), minority, few, slight: less than 10%;
- 2 Part of(partly), local(locally): more than or equal to 10%, and less than 50%;
- 3 Most of, a great deal of, majority of, many: more than or equal to 50%;
- 4 Breakage (break), damage: continued use is allowed only when an ancillary assembly or a member has been repaired/replaced after it suffered destruction from the earthquake;
- 5 Destruction(destroy): continued use is allowed only when a main assembly or a member has been replaced after it suffered destruction from the earthquake;
- 6 Collaps Destroyed(destroy): it is no longer worth repairing after it suffered severe damage from the earthquake.

3.0.2 Degree of damage to the welds may be determined based on the following principles:

- 1 Crack: a visual slight surface gap in the local welding zone located by the macrographic examination or the NDT;
- 2 Fissure: a visual and obvious gap through the local welding zone located by the macrographic examination or the NDT;
- 3 Severe fissure: fissure or fracture at many positions in the local welding zone.

3.0.3 Degree of liquid leakage may be determined based on the following principles:

- 1 Seepage: content in the equipment and/or the piping exudes in gradual diffusion along the outer wall surface without forming drop;
- 2 Leakage: content in the equipment and/or the piping escapes dropwise;
- 3 Jet leakage: content in the equipment and/or the piping sprays in continuous column-like or curtain-like flow.

3.0.4 Degree of gas leakage may be determined based on the following principles:

- 1 Seepage: less than 0.1kg/s;
- 2 Leakage: 0.1kg/s—1kg/s;
- 3 Leakage in the spraying way: greater than 1kg/s.

3.0.5 Degree of damage to foundation may be determined based on the following principles:

- 1 Slight crack: a visual gap not through the foundation;
- 2 Displacement: the horizontal position or the elevation of foundation has been changed;
- 3 Crack: an obvious and visual gap through the foundation.

4 Site and soil foundation

4.0.1 In case of earthquake destruction to site and soil foundation, check for landslip, crack, dislocation, earthquake subsidence, collapse, liquefaction; and check the retaining wall for damage.

4.0.2 Earthquake destruction to site and soil foundation shall be classified according to the following:

1 Basically intact: site and soil foundation are in good conditions, and few site and soil foundation have been cracked slightly;

2 Minor damage: site and soil foundation are basically in good conditions, and cracking of local site and soil foundation has been induced;

3 Moderate damage: there is local dislocation or earthquake subsidence in the part of site and soil foundation; and the ejected sand phenomenon has occurred;

4 Severe damage: there are obvious fissures or dislocation in most of the site and soil foundation;

5 Collaps: earthquake subsidence or the ejected sand phenomenon is severe in the site and soil foundation, and landslip or collapse has occurred.

4.0.3 Earthquake destruction to the retaining wall shall be classified according to the following:

1 Basically intact: wall and foundation are in good conditions, and few walls have been cracked slightly;

2 Minor damage: wall and foundation are basically in good conditions, and cracking of local walls have been induced;

3 Moderate damage: there are dislocations or differential settlement of part of the walls or foundation;

4 Severe damage: there are obvious fissures or dislocations on most of the walls and foundation;

5 Collaps: there are dislocations, settlement or collapse of most of the walls.

5 Processing equipment

5.1 Industry furnace

5.1.1 The following shall be checked when industry furnace suffer destruction from the earthquake:

1 Check furnace body for tilt, deformation, displacement or collapse; check beam, column, bracing, connection, wallpanel and support of steel structures for distortion, deformation or fracture; and check welds for fissure;

2 Check foundation for differential settlement or crack, and check for loosened, elongated or broken anchor bolt;

3 Check for content leakage; and check all of furnace tubes and accessories for deformation, displacement, fracture, damage;

4 Check stack, flue gas duct, baffle plate and adjusting mechanism for sticking, malfunction or damage; and check the connection bolts between convection chamber and stack for fracture, shedding;

5 Check furnace tube, and radiation and convection sections for displacement, deformation or fracture; and check lifting hook, drag hook, tube sheet and connecting bolts for fracture, shedding;

6 Check furnace wall, refractory layer, insulating layer, burner brick and sill pillar refractory layer for fissure, collapse;

7 Check burner and connecting parts for damage, shedding; and check the accessories such as ignition and flame detection, and the soot blower components for malfunction, damage;

8 Check waste heat recovery system, blower, duct and damper for displacement, deformation, damage; and check blower and drive mechanism for abnormal vibration or stop;

9 Check platform stair and ladder for deformation, fracture;

10 Check the soot blower facilities, the safety accessories such as safety valve, pressure gauge, thermometer and level meter, and the electrical and instrument elements and lines for lighting and inspection for malfunction, shedding or damage;

11 Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.1.2 Earthquake destruction to industry furnace shall be classified according to the following:

1 Basically intact: furnace body and furnace tube aren't deformed obviously; there are a few cracks on the furnace roof, furnace wall and lining; hanging tube, furnace tube, furnace tube-to-piping connection, and connecting position of burner connection isn't damaged; steel frame and load bearing structural member aren't deformed, tilted; all of furnace accessories such as burner aren't damaged; and there is no content seepage;

2 Minor damage: furnace wall and lining have been cracked partly or shed slightly; foundation is free from displacement, but slight cracking of foundation has been induced; structural members have been deformed slightly; platform, ladder have been fractured; there is content seepage; electrical and instrument elements have been damaged;

3 Moderate damage: furnace wall and lining have been fissured, shed at many positions; stack, steel frame and structural member have been deformed obviously; there are deformation, fissure of part

of furnace tube-to-piping connections, and connecting position of burner connection; there is slight content leakage; the chimney-to-furnace body bolts have been deformed; there is vibration or stop of blower; cracking or differential settlement of foundation has been induced; and few anchor bolts have been loosened or elongated;

4 Severe damage: furnace body has been tilted; furnace tube, fire tube, steel frame, structural member and main internal members have been damaged severely; a great deal of content has leaked; chimney has been tilted; main accessories such as burner have been damaged or shed; severe fissuring or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;

5 Collaps: furnace body has been tilted severely or collapsed; chimney has collapsed; main accessories such as burner have been shed; severe fissuring or severe differential settlement of foundation has been induced.

5.2 Vertical vessel

5.2.1 The following shall be checked when tower and vertical vessel supported by leg, lug and skirt, etc. suffer destruction from the earthquake:

1 Check main body of equipment for deformation, fissure, tilt, collapse; check welds for leakage, fissure; and check the internals for deformation, fissure, shedding;

2 Check skirt, lug, leg, stiffening ring, supports, external members and their welds for deformation, distortion, fissure or shedding;

3 Check safety accessories such as safety valve, pressure gauge, thermometer and level meter, and the electrical and instrument elements and lines of lighting and inspection for malfunction, shedding or damage;

4 Check foundation for differential settlement or fissure, and check anchor bolts for loose, elongated or broken;

5 Check tower refractory and insulating layers for fissure, shedding;

6 Check operating platform, ladder for deformation, fracture; and check the tower connecting bolts for loosening, deformation, shedding;

7 Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.2.2 Earthquake destruction to vertical vessel shall be classified according to the following:

1 Basic intact: main body, skirt and main part of equipment aren't damaged; anchor bolts aren't loosened; and foundation is free from differential settlement, crack;

2 Minor damage: part of ancillary parts has been damaged or shed; safety accessories, electrical and instrument elements have been damaged or shaken out; platform, ladder have been fractured; fire protection and insulating layers have been shed; cracking of foundation have been induced; and few anchor bolts have been loosened;

3 Moderate damage: internals of equipment have been partly damaged and shed, deformed; the supports such as skirt have been deformed obviously; welds have been fissured; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated;

4 Severe damage: main body of equipment has been deformed, tilted; welds have been fissured severely; a great deal of internal and external members have been destructed; severe fissuring or

differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;

5 Collaps: main body of equipment has been severely deformed or collapsed; and severe fissuring or severe differential settlement of foundation has been induced.

5.3 Vertical storage tank

5.3.1 The following shall be checked when a vertical storage tank suffer destruction from the earthquake:

- 1** Check tank body for leakage, deformation, tilt, fissure; and check welds for fissure;
- 2** Check foundation for differential settlement or fissure, and check for loose, elongated or broken anchor bolt;
- 3** Check floating plate, floating roof sealing device, ladder, guide device and center drain pipe, floating roof electrostatic guiding device for leakage, deformation, sticking, fracture or damage;
- 4** Check tank accessories such as level meter, thermometer, overflow pipe and breather valve for damage, shedding;
- 5** Check metering and fire-fighting equipment for malfunction or damage;
- 6** Check cryogenic tank body interlayer, hanging ladder for shedding, fracture or damage;
- 7** Check lighting, electrical and instrument element and lines for malfunction or damage;
- 8** Check tank body insulating layer for fissure, shedding;
- 9** Check spiral stairway, platform, handrail for deformation, fracture;
- 10** Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.3.2 Earthquake destruction to vertical storage tank shall be classified according to the following:

- 1** Basically intact: tank body isn't deformed; the welds on key position aren't cracked; no sealing structure is damaged; there is no seepage; guide device of floating roof is proper; there is minor damage to ancillary assembly; and the foundation is in good conditions;
- 2** Minor damage: there is seepage from few position of tank shell; slight cracking of foundation have been induced; floating roof sealing and guide devices have been damaged partly; accessories have been damaged; electrical and instrument elements, fire-fighting equipment have been damaged; platform, ladder have been fractured; slight cracking of foundation has been induced; and few anchor bolts have been loosened;
- 3** Moderate damage: there is local buckling of tank body; part of welds have been fissured; floating plate and ladder have been damaged; connecting parts have been disconnected; accessories have been shed; floating roof sealing and guide devices have been damaged; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated or elongated;
- 4** Severe damage: tank body has been deformed; many welds have been fissured; supporting members have been deformed severely; there is buckling of tank roof; there is tilt and sinking of floating plate; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;
- 5** Collaps: tank body has been deformed severely; and welds have been fissured severely.

5.4 Gas holder

5.4.1 The following shall be checked when a gas holder suffer destruction from the earthquake:

- 1 Check tank body for leakage, deformation, tilt, fissure; check the bearing members such as column, truss, support and ring beam for deformation, tilt, fracture; and check welds for leakage, fissure;
- 2 Check foundation for differential settlement or fissure, and check for loose, elongated or broken anchor bolt;
- 3 Check piston parts, bell jar, sealing facilities, guide wheel and anti-rotation mechanism for leakage, deformation, sticking, malfunction, fracture or damage;
- 4 Check seal oil flash system, oil tank, oil bath for leakage, damage;
- 5 Check auxiliary facilities such as tank capacity indication, ventilation and fire protection for malfunction or damage;
- 6 Check cage, first aid facilities for fracture, shedding or damage;
- 7 Check lighting, electrical and instrument elements and lines for malfunction or damage;
- 8 Check steel ladder, hanging ladder, platform, walkway and handrail for deformation, fracture;
- 9 Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.4.2 Earthquake destruction to gas holder shall be classified according to the following:

- 1 Basically intact: tank body, column aren't deformed; welds on the key positions aren't cracked; sealing facilities are free from damage, seepage; guide wheel and anti-rotation mechanism are perfect; ancillary assembly is slightly damaged; and foundation is in good conditions;
- 2 Minor damage: there is seepage from few positions of tank wall; slight cracking of foundation has been induced; sealing facilities and guide mechanism are damaged partly; ancillary facilities and electrical and instrument elements, fire-fighting equipment have been damaged; platform, ladder have been fractured; slight cracking of foundation has been induced; and few anchor bolts have been loosened;
- 3 Moderate damage: tank body has been tilted, displaced or locally buckled; welds on key positions have been fissured; piston parts, bell jar have been damaged; truss, support members have been disconnected partly; main ancillary facilities have been destructed; seal facilities and guide mechanism have been damaged severely; cracking or differential settlement of foundation has been induced; and anchor bolts have been loosened or elongated;
- 4 Severe damage: tank body has been deformed; many welds have been fissured; column, truss, support members have been deformed, fractured; piston parts, bell jar have been destructed severely; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;
- 5 Collaps: tank body has been deformed severely; welds have been fissured severely; and supporting members have been severely deformed, fractured.

5.5 Spherical tank

5.5.1 The following shall be checked when a spherical tank suffered destruction from the earthquake:

- 1 Check spherical tank shell, column, tie-rod for deformation, tilt, displacement; and check connecting positions, welds for leakage, fissure or damage;
- 2 Check foundation for differential settlement or fissure, and check for loose, elongated or broken

anchor bolt;

- 3 Check safety accessories such as safety valve, pressure gauge and level meter, and metering, sprinkling, fire-fighting equipment for malfunction, shedding or damage;
- 4 Check column fire protection layer and tank insulating layer for fissure, shedding;
- 5 Check tank spiral stairway, platform for deformation, fracture;
- 6 Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.5.2 Earthquake destruction to spherical tank shall be classified according to the following:

- 1 Basically intact: the shell-to-column welds and the column-to-lug plate welds aren't damaged; column fire protection layer has been shed slightly; there is no loose anchor bolt; there is no seepage from the spherical tank-to-piping connection; and foundation is in good conditions;
- 2 Minor damage: column fire protection layer has been shed; slight cracking of foundation has been induced; and few anchor bolts have been loosened;
- 3 Moderate damage: few shell-to-column and column-to-lug plate welds, or flange plate attachment welds have been fissured; part of tie-rods have been damaged; platform, ladder have been fissured; safety accessories, fire-fighting equipment have been damaged; there is leaking at the tank body-to-piping connection; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated;
- 4 Severe damage: the column-to-lug plate welds or the flange plate attachment welds have been fissured partly; many tie-rods have been fractured; many pins have been broken; columns have been deformed severely; the spherical tank-to-piping connections have been fractured; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;
- 5 Collaps: tank body has been deformed severely; many column-to-lug plate welds, or flange plate attachment welds have been fissured; and equipment has been tilted or collapsed.

5.6 Heat-exchange equipment and horizontal vessel

5.6.1 The following shall be checked when heat-exchange equipment and horizontal vessel suffer destruction from the earthquake:

- 1 Check main body and internals of equipment for leakage, deformation, fissure, shedding or damage; and check welds for fissure or damage;
- 2 Check foundation for differential settlement or fissure, and check anchor bolts for loose, elongated or broken;
- 3 Check support, lug, saddle, frame, connection parts, connecting bolts for fissure, deformation, shedding, fracture;
- 4 Check inspection instruments such as safety valve, pressure gauge, thermometer and level meter for malfunction or damage;
- 5 Check insulating layers of equipment for fissure, shedding;
- 6 Check operating platform, ladder and their connecting bolts for deformation, fracture, shedding;
- 7 Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.6.2 Earthquake destruction to Exchanger, and horizontal vessel shall be classified according to the

following:

1 Basic intact; main body and internals of equipment aren't deformed; there is no seepage from connecting positions; foundation is in good conditions and free from crack and displacement; supports are in good conditions; and few anchor bolts and connecting bolts for stacked support have been loosed;

2 Minor damage: main body and internals of equipment aren't deformed; there is seepage from few equipment-to-piping connecting positions; insulating layer has been shed; majority of anchor bolts and connecting bolts for stacked support have been loosed; slight cracking of foundation has been induced; and few anchor bolts have been loosed;

3 Moderate damage: welds between the supports and main body of equipment have been fissured; shell and internals of equipment have been deformed; platform, ladder have been fractured; there is seepage from the tube-to-tubesheet connection, tube bundle, heat exchange tube; there is leaking at part of connecting positions; platform, ladder have been fractured; cracking or differential settlement of foundation has been induced; and part of anchor bolts and connecting bolts have been loosed or elongated;

4 Severe damage: main body and internals of equipment have been destructed; accessories such as safety valve have been shaken out, damaged; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts and connecting bolts have been elongated or broken;

5 Collaps: main body and internals of equipment have been destructed severely.

5.7 Air cooler

5.7.1 The following shall be checked when an air cooler suffer destruction from the earthquake:

1 Check main body of equipment, air-cooler frame, tube bundle, welds for leakage, deformation, fissure or damage; and check louvers for damage;

2 Check motor, blower for abnormal vibration, stop or damage; and check reducer, transmission for sticking or damage; and check blades for deformation, shedding;

3 Check support, bracing for deformation, fracture; check platform, ladder for deformation, fracture; and check anchor bolts or connecting bolts; for loose, fractured;

4 Check lighting, electrical and instrument elements and lines for malfunction or damage;

5 Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.7.2 Earthquake destruction to air cooler shall be classified according to the following:

1 Basic intact; structural member and tube bundle of air cooler aren't deformed; there are a few cracks on the baffle welds; and blower isn't damaged;

2 Minor damage: supporting parts have been deformed slightly; part of baffle welds have been fissured; louver has been damaged; electrical and instrument elements have been damaged; platform, ladder have been fractured; and few anchor bolts or connecting bolts have been loosed;

3 Moderate damage: a great deal of baffle welds have been fissured; tube bundle has been displaced or deformed; blower frame has been deformed; blower blades have been damaged; reducer, transmission have been damaged; supporting structures have been tilted; and part of anchor bolts or connecting bolts have been loosed or elongated;

4 Severe damage: supporting parts have been destructed; tube bundle have been destructed; supporting structures have been tilted severely; and most of anchor bolts or connecting bolts have been

elongated or broken;

5 Collaps: tube bundles of air cooler have been shaken out; and supporting structures are close to collapse or have collapsed.

5.8 Reaction kettle equipment

5.8.1 The following shall be checked when the reaction kettle equipment suffer destruction from the earthquake:

1 Check main body of equipment for deformation, crack; check attachment welds for fissure; check external adjoining pipe of equipment for deformation; and check welds for fissure;

2 Check welds between the equipment support-or hanger and equipment for fissure; and check anchor bolts or connecting bolts for loose, elongated;

3 Check equipment lining for shedding or breakage, damage;

4 Check mixing shaft for distortion, deformation; check seals for damage; check connections between the reducer support and equipment for crack; and check couplings for shedding or offset;

5 Check heating coiling in the equipment for displacement, toppling; check fixing support of mixing shaft in the equipment for damage; and check bottom sliding bearing for shedding or destruction;

6 Check foundation for differential settlement or fissure, and check anchor bolts for loose, elongated or broken;

7 Check all of pipe fittings for damage such as distortion, displacement and fracture; and check flange, gasket for deformation or leakage;

8 Check safety accessories for damage; check measuring instrument elements such as thermocouple or thermometer, electrical instrument elements such as level meter for damage;

9 Check metal band of far-infrared heating equipment for short or open circuit; check silicon carbide for fragmentation, shedding; and check thermal insulation materials for shedding or destruction;

10 Check power cable for destruction; check cable connector for loose; and check whether rotation of motor is normal;

11 Check nozzle and flange to external connection for deformation, fissure or damage; and check seals for leakage.

5.8.2 Earthquake destruction to reaction kettle equipment shall be classified according to the following:

1 Basic intact: main body of equipment isn't deformed; conjoint weld isn't cracked; external adjoining pipe, mixing shaft aren't deformed; no seal is damaged; connections between the reducer support and equipment aren't cracked; internals of equipment aren't damaged; far-infrared heating equipment is free from short circuit; and foundation is free from displacement;

2 Minor damage: mixing shaft is free from slight deformation; there are slight cracks on few weld; there is seepage from few rotating, static seal positions; minority of safety accessories, measuring instrument elements, level meter have been damaged; slight crack of foundation has been induced; and few anchor bolts or connecting bolts have been loosed;

3 Moderate damage: mixing shaft has been deformed; main part of equipment has been damaged; part of welds have been cracked; there is seepage from many rotating, static seal positions; part of safety accessories, measuring instrument elements, level meter have been damaged; connecting piping has been deformed; cracking or differential settlement of foundation has been induced; and part of anchor bolts or connecting bolts have been loosed or elongated;

4 Severe damage: main body of equipment has been deformed; mixing shaft has been deformed severely; majority of parts have been damaged; there is severe seepage from many rotating, static seal positions; most of safety accessories, measuring instrument elements, level meter have been destructed; connecting piping has been deformed severely; shedding or offset of coupling has been caused; severe cracking or differential settlement for foundation has been induced; and most of anchor bolts or connecting bolts have been elongated or broken;

5 Collaps: main body of equipment has been destructed severely; and majority of parts have been destroyed.

5.9 Chlorin-alkali electrolysis equipment

5.9.1 The following shall be checked when the chlorin-alkali electrolysis equipment suffered destruction from the earthquake:

1 Check adsorption type diaphragm graphite electrolyzer for displacement, tilt or falling; check porcelain insulator supporting the electrolyzer for breakage, damage; check support of ionic membrane electrolyzer for displacement; check frame support for deformation or destruction; check for loose and disordered sequence arrangement of anode terminal cell frame, cell, cathode terminal cell frame; and check for short circuit between the cell and support side beam;

2 Check the connection between the electrolyzer electrode and copper bar for loose or damage; check the connecting copper bar among the cells for fracture, deformation; and check connecting bolts for loosed, elongated or shed;

3 Check membrane in the electrolyzer for shedding; check cathode and anode screens for damage by short circuit; check membrane and electrode in the cells of ionic membrane for destruction; check anode and cathode gaskets of cell for leakage or damage; and check wiring and fuse of the circuits for loose, shedding or damage;

4 Check pressure gauge, level meter, saltwater inlet glass pipe or glassware in electrolyzer for breakage, damage; check electrolyte spraying nozzles of cathode and anode chambers for loose weld; and check electrolyte inlet, outlet pipes for leakage or damage;

5 Check saltwater, electrolyte, caustic soda, chlorine, hydrogen pipes for damage such as distortion, deformation, displacement and fracture;

6 Check anti-corrosive facilities for damage;

7 Check whether oil hydraulic system is in good conditions; check whether motor is normal; check plunger pump and high pressure oil piping and oil cylinder for damage; and check instruments and interlocks for damage.

5.9.2 Earthquake destruction to chlorin-alkali electrolysis equipment shall be classified according to the following:

1 Basic intact: porcelain insulator is in good conditions; electrolyzer body isn't damaged; few accessories have been damaged slightly; and frames aren't deformed;

2 Minor damage: slight cracks of few porcelain insulators have been induced; there is slight seepage from few cells (including ionic membrane, anode and cathode gaskets); there is slight seepage from few electrolyte inlet, outlet pipes; frame has been slightly deformed; spraying nozzles and bonding wires for few cell inlet and outlet have been damaged; and few connecting bolts have been loosed;

3 Moderate damage: electrolyzer body and part of main assemblies have been damaged; part of

porcelain insulators have been damaged; there is slight seepage from part of cells (including ionic membrane, anode and cathode gaskets); there is seepage from electrolyte inlet, outlet pipes; frame has been deformed; spraying nozzles and bonding wires for part of cell inlet and outlet have been damaged; instruments and interlocks have been damaged; and part of connecting bolts have been loosed or elongated;

4 Severe damage: majority of porcelain insulators have been broken; connecting members among the electrolyzers have been fractured; electrolyzer body has been deformed; electrolyzer frame has been deformed severely; multipolar cell consisting of the cells has been destructed entirely; oil hydraulic unit has been destructed entirely; connecting piping has been deformed severely; and most of connecting bolts have been elongated or broken;

5 Collaps: electrolyzer and main parts have been destructed severely; and frame has been deformed severely or collapsed.

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6 Process piping

6.1 Non-buried piping

6.1.1 The following shall be checked when the non-buried piping suffer destruction from the earthquake:

- 1 Check piping weld for crack, fissure; and check whether piping sealing position are in good conditions and free from leakage;
- 2 Check for separation of the piping from piping support; check for the impact between the piping and adjacent piping or equipment; and check piping for deformation, displacement;
- 3 Check piping supports, hangers for deformation, shedding; and check sliding positions for sticking;
- 4 Check piping valve for sticking, malfunction; check piping flange joint for loose, damage; and check piping compensator for damage;
- 5 Check piping heat insulation layering for damage, shedding;
- 6 Check heat tracing system for damage;
- 7 Check the static grounding connectors of piping for damage.

6.1.2 Earthquake destruction to non-buried piping shall be classified according to the following:

- 1 Basically intact; piping and piping connector aren't damaged; there is no seepage; and few piping supports, hangers have been damaged;
- 2 Minor damage; cracking of few piping welds have been induced; slippage of few piping positions has occurred; and there is slight leaking at a few piping sealing positions;
- 3 Moderate damage: the piping has been deformed; a few welds have been fissured; and piping supports, hangers have been deformed, shed;
- 4 Severe damage: the piping has been deformed severely; parts of piping flanges have been damaged; and welds have been fissured partly;
- 5 Collapse: most of piping has been severely deformed, fractured.

6.2 Buried piping

6.2.1 The following shall be checked when the buried piping suffer destruction from the earthquake:

- 1 Check buried piping for leakage;
- 2 Check joint between the aboveground piping and underground piping for deformation, destruction; and check piping for settlement or uplift;
- 3 Check whether piping ground ID (testpost, markerpost, additionapost, and warning sign) and fencing are in good conditions;
- 4 Check whether the paving which piping passes is in good conditions;
- 5 Check the connection between the piping passing through the spool and the buttress anchorage for loose, damage, fracture, etc.; and check whether the sleeve inspection hole is in good conditions;
- 6 Check hydraulic protection facilities for damage;
- 7 Check ancillary well for damage, clogging, collapse;

- 8 Check piping valve for sticking, malfunction; and check piping flange joint for loose, damage;
- 9 Check whether insulating layers of piping ends entering and leaving the ground, exposed spool and piping in the valve station are in good conditions;
- 10 Check cathode protection for damage.

6.2.2 Earthquake destruction to buried piping shall be classified according to the following:

- 1 Basically intact: the ground surface of the section through which piping passes is basically in good conditions and not changed obviously; and there is no seepage from piping;
- 2 Minor damage: ground surface of the section through which piping passes is changed slightly; there is seepage from piping; and part of ancillary wells have been damaged;
- 3 Moderate damage: differential settlement in the ground surface of the section through which piping passes has been induced; part of piping have been exposed; there is leaking at piping; the piping has been deformed locally; and cathodic protection has been destructed;
- 4 Severe damage: piping has been deformed severely; piping connection and welded joint have been fissured partly; hydraulic protection has been destructed severely; local piping has been deformed severely; and part of piping has been suspended;
- 5 Collapse: a great deal of piping has been severely deformed or broken; and many piping connections and welded joints have been fissured.

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7 General machinery

7.1 Machine equipment

7.1.1 The following shall be checked when the general machine equipment suffer destruction from the earthquake:

- 1 Check base, body for deformation, crack, displacement; and check levelness, squareness tolerance for out-of-specification;
- 2 Check whether fit clearances of dynamic and static parts are acceptable; and check whether vibration, noise and bearing temperature are proper;
- 3 Check the components such as gearbox, bearing housing, coupling and governor for deformation, damage;
- 4 Check whether the parts such as rotor, stator, guide vane and thrust disc are proper; and check whether the skewness is acceptable;
- 5 Check whether instrument detection control system, instrument safety interlocking alarm system are in good conditions;
- 6 Check pneumatic circuit system, lube oil system, sealing system, cooling water system, hydraulic control system for leakage, interruption, damage; and check whether fixing supports are secure;
- 7 Check foundation for differential settlement or fissure, and check for loose, elongated or broken anchor bolt;
- 8 Check ancillary equipment and transmission components for deformation, damage;
- 9 Check accessories such as pressure gauge, level gauge for damage;
- 10 Check whether safety protection facilities are installed securely;
- 11 Check whether various rolls, pulleys and parts rotate smoothly; and check surface of roll, pulley, etc. for damage.

7.1.2 Earthquake destruction to machine equipment shall be classified according to the following:

- 1 Basically intact: rotor and other main transmission components aren't deformed; balancing is perfect; fit accuracies of main assembly isn't affected; instrument system, power supply system, safety system, protection facilities are perfect; equipment is in good conditions and free from damage; there is a little seepage from few sealing positions of lubrication, hydraulic control, cooling water system, pneumatic circuit system and equipment;
- 2 Minor damage: few signal lines have been loosened; concentricity, vibration, noise and bearing temperature of rotating, static parts are slightly out-of-specification; there is a little leaking at sealing positions of lubrication, hydraulic control, cooling water system, pneumatic circuit system and equipment; surface of roll, pulley, etc. has been damaged slightly; slight cracking of foundation has been induced; and few anchor bolts have been loosened;
- 3 Moderate damage: rotor, roll, pulley and other main transmission components have been deformed slightly; fit accuracy, clearance, levelness, squareness installation tolerances of main assembly is out-of-specification; instrument system, safety components, protection facilities have been damaged;

the components such as gearbox, coupling and governor have been deformed; lube oil, sealing system, cooling water, pneumatic system and hydraulic control system have been damaged; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated;

4 Severe damage: cracking of base, body has been induced; body has been tilted; main and transmission components have been damaged or deformed; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;

5 Collapse: base, body have been severely fissured and deformed; and main and transmission components have been damaged severely.

7.2 Compressor

7.2.1 In addition to the checks specified in Article 7.1.1 of this standard, the following shall also be checked when a compressor suffer destruction from the earthquake:

- 1** Check fixing and connecting bolts of body for loose, removal;
- 2** Check inter-stage piping, equipment for leakage, damage;
- 3** Check auxiliary system such as electric gate valve, control valves, inlet filtering system for out-of-control, damage.

7.2.2 Earthquake destruction to compressor shall be classified according to the following:

1 Basically intact: body is in good conditions; fit accuracies of transmission, rotating positions aren't affected; and there is a little seepage of pneumatic circuit, lubrication, cooling, compressed medium;

2 Minor damage: fixing bolts of body have been loosened; concentricity of transmission connecting parts is slightly out-of-tolerance; there is leaking at pneumatic circuit, lubrication, cooling, compressed medium; slight cracking of foundation has been induced; and few anchor bolts have been loosened;

3 Moderate damage: rotating, transmission components have been slightly deformed; fit accuracies, clearance are out-of-tolerance; coupling has been damaged; there is a great deal of leaking at pneumatic circuit, lubrication, cooling, compressed medium; electric gate valve, control valves, inlet filtering system are out of control; safety accessories have been damaged; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated;

4 Severe damage: body has been tilted; rotating, transmission components have been deformed; pneumatic circuit, lubrication, cooling, compressed medium sealing system have been destructed; electric gate valve, control valve, inlet filtering system have been destructed; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;

5 Damage: body has been severely fissured, deformed; rotating and transmission components have been damaged severely.

8 Power and dynamic equipment

8.1 Boiler

8.1.1 The following shall be checked when a boiler suffer destruction from the earthquake:

1 Check drum shell welds for crack, fissure; check whether the contact surface between the drum hanger ring and drum shell is proper and free from sticking; check drum suspender for damage; and check connecting welds on connecting tubes of drum for fissure;

2 Check water wall tube, convection tube and their welds for fissure; check water wall buckstay for distortion, bending deformation; and check welds on connecting parts between the water wall buckstay and water wall for fissure or shedding;

3 Check header welds, and welds between superheater tube and header or nipple for fissure;

4 Check superheater tube for deformation, crack; check superheater tube supporting beam, tube clip, backing plate, hook and roof superheater top members (top beam, etc.) for deformation, damage; and check for displacement of superheater tube relative to both side walls and inclined bottom walls, which affects uniform heating of superheater;

5 Check economizer coil for deformation; check welds for fissure; check economizer suspension beam for deformation, fracture; check hanger rod for damage; check tube clips for displacement; and check economizer anti-wear device for shedding;

6 Check air preheater tube orifice welds for crack; check tube for damage; check air preheater tube supporting leg, supporting beam and expansion joint for deformation, damage; and check air preheater air inlet and outlet, preheater expansion joint for air leakage;

7 Check whether boiler water level is proper; and check feedwater system for trouble;

8 Check furnace wall masonry for fissure, bulge, peeling, air leakage, smoke leakage, collapse; check suspending parts used for suspending the furnace wall for deformation, damage; and check packing in the clearance between the furnace wall suspending part and wall hole for shedding;

9 Check safety accessories and the connecting members for leakage, sticking, damage; and check finely-pulverized coal separator for collapse;

10 Check foundation of the main body and the related facilities of boiler for differential settlement or fissure, and check for loose, elongated or broken anchor bolt.

8.1.2 In addition to the checks specified in Article 8.1.1 of this standard, the following shall also be checked when a coal-fired boiler suffer destruction from the earthquake:

1 Check coal pulverizing equipment, coal conveying equipment for deformation, damage;

2 Check grate transmission for sticking; and check grate components for damage;

3 Check primary, secondary air systems, and pulverized coal preheating, slag discharge and dust removal systems for damage.

8.1.3 In addition to the checks specified in Article 8.1.1 of this standard, the following shall also be checked when an oil-fired boiler suffer destruction from the earthquake:

1 Check oil-fired heater for damage;

2 Check air distributor for clogging or damage;

3 Check the piping from oil tank to boiler for leakage, damage.

8.1.4 In addition to the checks specified in Article 8.1.1 of this standard, the following shall also be checked when a gas-fired boiler suffer destruction from the earthquake:

- 1 Check flame arrester for damage;
- 2 Check fuel gas heater for damage;
- 3 Check fuel gas piping welds for fissure, leakage.

8.1.5 In addition to the checks specified in Article 8.1.1 of this standard, conditions of flue gas header water seal facility and regulating mechanism shall be checked. when a FCC regenerator flue gas boiler suffer destruction from the earthquake.

8.1.6 Earthquake destruction to boiler equipment shall be classified according to the following:

1 Basically intact: furnace wall, supporting and hanging members (suspending linkage, suspending beam and supporting beam, etc.) aren't damaged; main frame isn't obviously deformed, tilted or damaged; tubing fitting welds in the boiler are free from fissure, displacement; and there is no leaking at external connecting piping, valves;

2 Minor damage: local cracking or a little shedding of furnace wall has been induced; hanging members of main assembly in the boiler have been deformed slightly; main frame isn't obviously deformed, tilted; tubing fitting in the boiler aren't damaged; there is slight seepage from external connecting piping, few valves; a few cracks on the foundation have been induced; and few anchor bolts have been loosened;

3 Moderate damage: large area of cracking or local shedding of furnace wall has been induced; part of tubing fittings and supporting and hanging members in the boiler have been deformed or damaged; main frame has been slightly deformed or tilted; welds on main assembly of part of furnace body have been fissured; many external connecting pipes have been deformed; there is seepage from part of flanges, valves or sealing facilities; safety accessories, main rotating equipment, ancillary facilities have been damaged; differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated;

4 Severe damage: furnace wall have been shed severely; tubing fittings and supporting and hanging members in the boiler have been destructed severely; main frame has been severely deformed, tilted or damaged; a great deal of welds on components of furnace body have been fissured; external connecting pipes have been deformed severely; there is severe leaking at flange, valve and sealing facilities; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;

5 Collaps: tube bundles in the boiler have been shaken out; and main frame is close to collapse or have collapsed.

8.2 Turbine, flue gas expander

8.2.1 The following shall be checked when turbine, flue gas expander suffer destruction from the earthquake:

- 1 Check connecting bolts of casing for threading off, deformation or broken;
- 2 Check foundation for differential settlement or fissure, and check for loose, elongated or broken anchor bolt;
- 3 Check diaphragm, moving and stator blades for damage;

- 4 Check steam and vacuum systems for leakage; and check the piping for damage;
- 5 Check control valves such as pneumatic gate valve, electric gate valve, high temperature butterfly valve for sticking, malfunction or damage;
- 6 Check whether control components of governor system are in good conditions; and check whether the scale is fixed securely;
- 7 Check components and equipment of condensate system for displacement, deformation or damage;
- 8 Check flue gas system for leakage; and check the piping for damage;
- 9 Check coupling for damage.

8.2.2 Earthquake destruction to turbine, flue gas expander shall be classified according to the following:

- 1 Basically intact: diaphragm and moving and stator blades aren't damaged; connecting bolts of casing aren't deformed; there is no leaking at steam and vacuum systems; no piping is damaged; control valves are free from sticking, malfunction; control components of governor system are in good conditions; equipment and components of condensate system are free from displacement, deformation; and there is no leaking at flue gas system;
- 2 Minor damage: there is a little seepage from steam and flue gas systems; few control valves have been stuck or failed; part of piping has been deformed locally; slight cracking of foundation has been induced; and few anchor bolts have been loosened;
- 3 Moderate damage: there is leaking at many positions of steam system; local sealing trouble of vacuum system has occurred; piping at many positions has been damaged; control valve has been stuck, failed or damaged; components, equipment of condensate system have been displaced, deformed or damaged; there is leaking at many positions of flue gas system; most of pipes have been deformed or damaged; cracking or differential settlement of foundation has been induced; part of anchor bolts have been loosened or elongated;
- 4 Severe damage: diaphragm and moving and stator blades have been damaged; control components of steam system, vacuum system, control valve, governor system have been damaged severely; components and equipment of condensate system have severely displaced, damaged; there is a great deal of leaking at flue gas system; the piping has been deformed severely; severe cracking or differential settlement of foundation has been induced; and anchor bolts have been elongated or broken;
- 5 Collaps: the main rotating components such as diaphragm, moving and stator blades have been damaged severely.

8.3 Generator, electric motor

8.3.1 The following shall be checked when generator, motor suffer destruction from the earthquake:

- 1 Check coiling, commutator, terminal and flexible pipe for damage;
- 2 Check shaft for deformation; check shaft bushing for score, breakage; and check coupling for damage;
- 3 Check whether radial and axial positioning of rotor have been changed;
- 4 Check foundation for differential settlement or fissure;
- 5 Check base anchor bolts for loose;
- 6 Check excitation system for damage;

7 Check lubrication, cooling systems for damage.

8.3.2 Earthquake destruction to generator, emotor shall be classified according to the following:

1 Basically intact: coiling isn't damaged; shaft isn't deformed; shaft bushing isn't damaged; fit accuracies of machine parts meet the requirements; lubrication and cooling systems aren't damaged; commutator is in good conditions; and excitation system is in good conditions;

2 Minor damage: there is seepage from lubrication and cooling systems; commutator and excitation system are slightly damaged; slight cracking of foundation has been induced; and few anchor bolts have been loosened;

3 Moderate damage: coiling has been locally damaged; shaft bushing has been damaged; fit accuracies of machine parts don't meet the requirements; lubrication and cooling systems have been partly damaged; terminal and flexible pipe have been obviously damaged; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated;

4 Severe damage: coiling has been damaged severely; shaft has been locally deformed; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been elongated or broken;

5 Collaps: shaft has been severely deformed, fractured.

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9 Chemical fibre equipment

9.1 Chemical fibre machine

9.1.1 The following shall be checked when the chemical fibre machine equipment suffer destruction from the earthquake:

- 1** Check foundation for differential settlement or crack;
- 2** Check for loose, elongated or broken anchor bolts;
- 3** Check whether various roll, pulley and parts rotate smoothly; check surface of roll, pulley and heater for damage; and check whether sealing system is in good conditions;
- 4** Check various piping for deformation, fracture, destruction; and check for loose piping clip, hanger, support;
- 5** Check surface of cutter and cutter head for damage; and check whether rotation of cutter is proper;
- 6** Check drive and transmission systems such as belt and chain for damage;
- 7** Check valves, switches for malfunction, damage.

9.1.2 Earthquake destruction to chemical fibre machine equipment shall be classified according to the following:

- 1** Basically intact: body and accessories are in good conditions; and there is a little seepage from seals;
- 2** Minor damage: there is nick on the surface of various roll, pulley, cutter, cutter head, plate, and yarn guide components, but there is no yarn catching; transmission system failed partly; few fasteners, connecting fittings and anchor bolts have been loosened; and there is leaking at the seal;
- 3** Moderate damage: the surface of various roll, pulley, cutter, cutter head, plate and yarn guide components have been damaged; transmission components have been damaged; part of fasteners, connecting fittings and anchor bolts have been loosened; main assembly has been deformed or fractured; there is a great deal of leaking at the seal; cracking or differential settlement of foundation has been induced; and part of connecting fittings and anchor bolts have been loosened or elongated;
- 4** Severe damage: body has been deformed; majority of components and transmission system have been destructed; severe cracking or differential settlement of foundation has been induced; most of fasteners, most of connecting fittings and anchor bolts have been elongated or broken;
- 5** Collaps: main body of equipment, most of components have been severely deformed or destructed; and supporting structure is close to collapse or has collapsed.

9.2 Spinning machine

9.2.1 In addition to the checks specified in Article 9.1.1 of this Standard, the following shall also be checked when a spinning machine suffer destruction from the earthquake:

- 1** Check housings and their jacket for leakage; and check relative positions between the housings and pump for variation;
- 2** Check for seepage from assembly, melt piping connection and seal.

9.2.2 Earthquake destruction to spinning machine shall be classified according to the following:

1 Basically intact: housing isn't deformed; transmission system is smooth; spinning components, melt piping connection seal are free from seepage; and there is no loose fastener, connecting fitting and anchor bolt;

2 Minor damage: housing has been slightly deformed; transmission system isn't smooth; there is seepage from few spinning components and seals; slight cracking of foundation has been induced; and few fasteners, connecting fittings and anchor bolts have been loosened;

3 Moderate damage: housing has been deformed; components of transmission system have been damaged; main assembly has been deformed; there is leaking at part of spinning components, melt piping connection seal; cracking or differential settlement of foundation has been induced; and part of fasteners, connecting fittings and anchor bolts have been loosened or elongated;

4 Severe damage: housing has been deformed; majority of components and transmission system have been destructed; severe cracking or differential settlement of foundation has been induced; and most of fasteners, connecting fittings and anchor bolts have been elongated or broken;

5 Collaps: housing, most of components, transmission system have been severely deformed or destructed; and supporting structure is close to collapse or has collapsed.

9.3 Pelletizer

9.3.1 In addition to the checks specified in Article 9.1.1 of this Standard, the following shall also be checked when a pelletizer suffer destruction from the earthquake:

- 1** Check track, friction clutch, universal joint for deformation, damage;
- 2** Check whether feed system is proper;
- 3** Check pellet cooling water system for damage.

9.3.2 Earthquake destruction to pelletizer shall be classified according to the following:

1 Basically intact: main motor, main gearbox, pelletizer barrel, gear pump, die head, pelletizing chamber aren't deformed; there is no leaking at connections; there is no seepage from the seal; foundation isn't cracked; fasteners, connecting fittings and anchor bolts aren't loose; and track on the ground is in good conditions;

2 Minor damage: pelletizer barrel has been slightly deformed; main assembly has been damaged; piping, piping support, equipment to be connected have been partly damaged and have been displaced; there is seepage from few seals; a little cracking of foundation has been induced; few fasteners, connecting fittings and anchor bolts have been loosened; and track on the ground has been slightly deformed;

3 Moderate damage: pelletizer barrel has been deformed; main assembly has been damaged; equipment base, supports, pipe fittings have been deformed or damaged; instrument elements, lines have been damaged, resulting in malfunction of control circuit; there is seepage from part of the seal; cracking or differential settlement of foundation has been induced; part of fasteners, connecting fittings and anchor bolts have been loosened or elongated; and track on the ground has been deformed;

4 Severe damage: pelletizer barrel, majority of components have been deformed or damaged; transmission system, control system have been destructed; severe cracking or differential settlement of foundation has been induced; most of fasteners, connecting fittings and anchor bolts have been elongated or broken; and track on the ground has been deformed severely;

- 5 Collaps: pelletizer barrel, most of components have been severely deformed or destructed.

9.4 Tension film machine

9.4.1 In addition to the checks specified in Article 9.1.1 of this Standard, the following shall also be checked when a tension film machine suffer destruction from the earthquake:

- 1 Check die head, die lip for damage, and for contact with strip cast windlass;
- 2 Check barrel, silo wall, horizontal pulled oven for deformation, crack;
- 3 Check whether pulverizer, blower, heater, vacuum pump, hot oil pump, stirrer, horizontal pulled chain disc operate properly.

9.4.2 Earthquake destruction to tension film machine shall be classified according to the following:

- 1 Basically intact: transmission system is smooth; there is no loose fastener and anchor bolts; there is a little seepage from sealing positions of hot oil system; foundation is free from displacement or crack; and parallelism of driving rollers isn't changed;

- 2 Minor damage: transmission system isn't smooth; there is seepage from sealing positions of hot oil system; parallelism of driving rollers is almost unchanged; slight cracking of foundation has been induced; and few fasteners, connecting fittings and anchor bolts have been loosened;

- 3 Moderate damage: transmission system has been damaged; there is a great deal of seepage from seal of hot oil system; parallelism of driving rollers has been damaged; cracking or differential settlement of foundation has been induced; and part of fasteners, connecting fittings and anchor bolts have been loosened or elongated;

- 4 Severe damage: body has been deformed; a great deal of components and transmission system have been destructed; severe cracking or differential settlement of foundation has been induced; and most of fasteners, connecting fittings and anchor bolts have been elongated or broken;

- 5 Collaps: body, most of components, transmission system have been severely deformed or destructed.

9.5 Wiredrawing

9.5.1 In addition to the checks specified in Article 9.1.1 of this Standard, when wiredrawing suffer destruction from the earthquake, check die head, cooling water tank, traction, forming heating plate, traction and forming rollers for deformation, damage.

9.5.2 Earthquake destruction to wiredrawing shall be classified according to the following:

- 1 Basically intact: body isn't deformed; gearboxes, rollers and connecting fittings are in good conditions; electrical system isn't damaged; there is no loose fastener and anchor bolt; and foundation is free from displacement.

- 2 Minor damage: body has been slightly deformed, or welded positions have been cracked slightly; there are few loose fasteners, connecting fittings; slight cracking of foundation has been induced; and few anchor bolts have been loosened;

- 3 Moderate damage: body has been deformed; few gearboxes, rollers and connecting fittings have been damaged; non-main control elements of electrical system have been damaged; part of fasteners have been loosened; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or removed;

- 4 Severe damage: body has been deformed severely; a great deal of components have been

destructured; electrical system has been damaged severely; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts have been removed or broken;

5 Collaps: body, most of component, electrical system have been severely deformed or destructed.

9.6 Braider

9.6.1 In addition to the checks specified in Article 9.1.1 of this Standard, the following shall be checked when a braider suffer destruction from the earthquake:

1 Check whether frame, palm fibre system and shuttle pushing system are proper; and check shuttle for damage;

2 Check whether ring gauge spreading system, drive vertical shaft system (flexible coupling) are proper; and check their components for dislocation, damage;

3 Check organzine combing plate, organzine frame guide plate, organzine key supporting arm, organzine frame, winder frame for deformation, damage.

9.6.2 Earthquake destruction to braider shall be classified according to the following:

1 Basically intact: body isn't deformed; transmission system is smooth; various frame isn't deformed; and there is no loose fastener, connecting fitting and anchor bolt;

2 Minor damage: body has been damaged slightly, but operation accuracy requirements aren't affected; transmission system isn't smooth; slight cracking of foundation has been induced; and few fasteners, connecting fittings and anchor bolts have been loosened;

3 Moderate damage: body has been deformed; part of transmission system has been destructed; cracking or differential settlement of foundation has been induced; and part of fasteners, connecting fittings and anchor bolts have been loosened or elongated;

4 Severe damage: body has been deformed severely; a great deal of components and transmission system have been destructed; severe cracking or differential settlement of foundation has been induced; and most of fasteners, connecting fittings and anchor bolts have been elongated or broken;

5 Collaps: body, most of components, transmission system have been severely deformed or destructed.

9.7 Compress

9.7.1 In addition to the checks specified in Article 9.1.1 of this Standard, the following shall also be checked when compress suffer destruction from the earthquake:

1 Check reserve box and noil channel for damage; and check anti-bouncing device, door opening and box rotation mechanism, metering components for damage;

2 Check fibre pushing, box rotation sections for deformation; check their driving sections for damage; and check whether pushing plate moves smoothly and properly;

3 Check whether hydraulic system is proper.

9.7.2 Earthquake destruction to compress shall be classified according to the following:

1 Basically intact: reserve box and channel aren't deformed, and they are smooth, no yarn catching; metering components aren't damaged; anti-bouncing hook in-and-out, door opening and box rotation mechanism, transmission system are stable and smooth; hydraulic system is in good conditions; surface of piston rods of pre-pressing, main-pressing and box-lifting cylinders is proper; and there is no loose fastener, connecting fitting;

2 Minor damage: reserve box and channel are slightly nicked or deformed, but free from yarn catching; few meter components have been damaged; antibouncing hook in-and-out, door opening and box rotation mechanism, transmission system aren't smooth; piston rods of pre-pressing, main-pressing and box-lifting cylinders are slightly nicked; there is slight seepage from few seals; slight cracking of foundation has been induced; and few fasteners, connecting fittings and anchor bolts have been loosened;

3 Moderate damage: reserve box and channel have been nicked or deformed; meter components, anti-bouncing hook in-and-out, door opening and box rotation mechanism, transmission system components, hydraulic system have been damaged; piston rods of pre-pressing, mainpressing and box-lifting cylinders have been deeply nicked, bent and deformed; there is seepage from part of seals; cracking or differential settlement of foundation has been induced; part of fasteners, connecting fittings and anchor bolts have been loosened or elongated;

4 Severe damage: body has been deformed; oil cylinders, piston rods have been deformed severely; a great deal of components and transmission system have been destructed; severe cracking or differential settlement of foundation has been induced; and most of fasteners, connecting fittings and anchor bolts have been elongated or broken;

5 Collaps: body, most of components, hydraulic system, transmission system have been severely deformed or destructed.

10 Instrument, apparatus and computer (control) system

10.1 Site instrument

10.1.1 The following shall be checked when a site instrument suffer destruction from the earthquake:

1 Check instrument panel, box and cabinet for displacement, toppling, strong current on the enclosure; and check whether any instrument in the instrument panel, box and cabinet have been shed or loosened;

2 Check instrument for shedding, loose, malfunction or damage;

3 Check instrument impulse piping (including valves, fittings), heat tracing piping and air piping for leakage;

4 Check for loose, fractured or damaged cable; and check cable trays, piping and cable supports for damage;

5 Check the cables, optical cables laid in the trench or buried directly for fracture, bending, damage;

6 Check for loose or elongated anchor bolt or connecting bolt; and check welds on base plate for fissure.

10.1.2 Earthquake destruction to site instrument shall be classified according to the following:

1 Basically intact: instrument body is in good conditions; measuring element or actuator isn't loosened, broken; accessories aren't damaged or deformed; and accuracy and sensitivity of instruments meet the requirements after calibration;

2 Minor damage: few measuring elements or actuators have been loosened; there is slight leaking at piping; few cables and supports have been broken; few instrument bodies have been damaged visually; insulating housing or heat tracing piping has been deformed; accuracy and sensitivity of instrument may be restored after repair; and few anchor bolts or connecting bolts have been loosened;

3 Moderate damage: part of instrument panels, boxes or cabinets have been displaced; instruments in the instrument panels, boxes or cabinets have been loosened; part of measuring elements or actuators have been damaged; part of piping has been fractured; part of anchor bolts or connecting bolts have been loosened or elongated; and part of welds on base plate have been fissured;

4 Severe damage: most of instrument panels, boxes or cabinets have been displaced or toppled; instruments in the instrument panels, boxes or cabinets have been loosened or shed; instrument body has been broken; measuring elements or actuators have been destructed or deformed; many piping and cables have been fractured; most of anchor bolts or connecting bolts have been elongated or broken; and welds on base plate have been fissured;

5 Collaps: instrument body has been deformed severely; and most of piping or cables have been disconnected by pulling or fractured.

10.2 Indoor instrument and control system

10.2.1 The following shall be checked when indoor instrument and control system suffer destruction from the earthquake:

1 Check instrument panel, box and cabinet for displacement, toppling, strong current on the enclosure; and check whether any instrument in the instrument panel, box and cabinet has been shed or loosened;

2 Check instrument for shedding, loose, malfunction or failure; and check whether power supply and wiring of instrument and control system is in good conditions;

3 Check whether instrument buttons and switches are proper;

4 Check whether process control system, interlocking protection system and emergency shutdown system are in good conditions;

5 Check piping, wiring of electrical, pneumatic instruments for loose, fracture or leakage;

6 Check for loose earthing system; and check whether earthing performance have decreased;

7 Check cable trays and cable supports for damage;

8 Check for loose or elongated anchor bolt or connecting bolt; and check for fissured weld on anchor bolts.

10.2.2 Earthquake destruction to indoor instrument and control system shall be classified according to the following:

1 Basically intact: instrument panels, cabinets, consoles aren't basically damaged; piping, cable aren't damaged; few terminals have been loosened; and accuracy and sensitivity of instrument meet the requirements after repair;

2 Minor damage: part of instrument panels, cabinets, consoles have been slightly broken; wiring of consoles, panels and cabinets has loosened; instrument sensitivity decrease or accuracy out-of-tolerance indicated by few records may be restored after calibration; and few anchor bolts or connecting bolts have been loosened;

3 Moderate damage: instruments in part of instrument panels, boxes and cabinets have been loosened; part of piping or cables have been disconnected by pulling; part of instrument panels, cabinets, consoles have been broken or deformed; part of anchor bolts or connecting bolts have been loosened or elongated; and part of welds on base plate have been fissured;

4 Severe damage: instrument panels, boxes and cabinets have been displaced; instrument in the cabinet has loosened or shed; instrument bodies have been broken; part of instrument panels, cabinets, consoles have been severely broken or deformed; piping or cables have been disconnected by pulling or fractured; most of anchor bolts or connecting bolts have been elongated or broken; and welds on base plate have been fissured;

5 Collaps: instrument panel, box and cabinet have been toppled; instrument body has been deformed severely; process control system, interlocking protection system and emergency shutdown system failed; most of piping or cables have been disconnected by pulling or fractured.

10.3 Apparatus of laboratory and labouratory

10.3.1 The following shall be checked when apparatus of laboratory and labouratory suffer destruction from the earthquake:

1 Check apparatus body for damage;

2 Check control system of apparatus for malfunction or damage;

3 Check for loose or fractured piping and wiring of apparatus;

4 Check operating medium tubing for destruction and leakage.

10.3.2 Earthquake destruction to apparatus of laboratory and labouratory shall be classified according to the following:

- 1 Basically intact: apparatus body isn't damaged; and accuracy and sensitivity of instruments meet the requirements after calibration;
- 2 Minor damage: apparatus body isn't obviously damaged; and sensitivity decrease or accuracy out-of-tolerance may be restored after calibration;
- 3 Moderate damage: apparatus body has been partly broken or has been deformed, and may be restored after repair;
- 4 Severe damage: apparatus and ancillary equipment have been destructed, and cannot be restored after repair;
- 5 Collaps: apparatus and ancillary equipment have been destructed severely, and have lost the use function.

10.4 Computer (control) system

10.4.1 The following shall be checked when a computer(control) system suffer destruction from the earthquake:

- 1 Check power supply system of data center room and equipment room for damage;
- 2 Check air-conditioning system of data center room for damage;
- 3 Check gas fire extinguishing system of data center room for damage;
- 4 Check fresh air system of data center room for damage;
- 5 Check whether server hardware and system operation are proper;
- 6 Check whether storage, backup hardware and system are proper;
- 7 Check whether network switching equipment and system are proper;
- 8 Check piping and cable supports for damage;
- 9 Check host computer enclosure for damage;
- 10 Check client computer hardware for damage;
- 11 Check whether client computer access system is proper.

10.4.2 Earthquake destruction to computer (control) system shall be classified according to the following:

- 1 Basically intact: power supply system, air-conditioning system, gas fire extinguishing system and fresh air system of center room and equipment room aren't damaged; and server hardware and system, network switching equipment, storage(backup) hardware and system, client computer hardware and access system operate properly;
- 2 Minor damage: few power supply system, air-conditioning system, gas fire extinguishing system and fresh air system of center room and equipment room have been damaged; and operations of server hardware and system, network switching equipment, storage(backup) hardware and system, client computer hardware and access system are basically normal after commissioning;
- 3 Moderate damage: part of power supply system, air-conditioning system, gas fire extinguishing system and fresh air system of center room and equipment room have been damaged; and operations of server hardware and system, network switching equipment, storage(backup) hardware and system, client computer hardware and access system aren't normal;
- 4 Severe damage: host computer has been destructed; most of power supply system, air-

conditioning system, gas fire extinguishing system and fresh air system of center room and equipment room have been destructed; and most of server hardware and system, network switching equipment, storage (backup) hardware and system, client computer hardware and access system have been destructed, and cannot operate;

5 Collaps: host computer has been destructed severely; and server hardware and system, storage (backup) hardware and system, interface equipment, network switching equipment and client computer hardware and access system have been destructed severely.

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11 Electric and telecommunication equipment

11.1 Power transformer and petersen coil

11.1.1 The following shall be checked when power transformer and petersen coil suffer destruction from the earthquake:

- 1 Check main body of equipment for displacement, tilt, damage; and check welds for fissure;
- 2 Check electroceramic components for crack, damage;
- 3 Check connecting piping between the oil cooler and transformer body for fissure, oil leakage;
- 4 Check whether emergency oil drain and emergency oil storage facilities are in good conditions; and check whether oil drain piping is unobstructed;
- 5 Check coiling for damage; and check whether electrical connections are secure;
- 6 Check earthing facilities for damage;
- 7 Check supporting frames and accessories of equipment for deformation, damage;
- 8 Check for loose, elongated or broken anchor bolts and connecting bolts;
- 9 Check foundation for differential settlement or fissure.

11.1.2 Earthquake destruction to power transformer and petersen coil shall be classified according to the following:

- 1 Basically intact: main body and ancillary component of equipment aren't deformed, damaged; and there is no loose anchor bolt and connecting bolt;
- 2 Minor damage: main body of equipment isn't obviously displaced; ancillary component has been damaged slightly; there is slight seepage; slight cracking of foundation has been induced; and few anchor bolts and connecting bolts have been loosened;
- 3 Moderate damage: main body of equipment has been displaced; part of porcelain bushings have been fractured; there is leaking at radiator or body; cracking or differential settlement of foundation has been induced; and part of anchor bolts and connecting bolts have been loosened or elongated;
- 4 Severe damage: main body of equipment has been severely displaced, tilted; coiling has been damaged; radiator oil pipe has been fractured; oil conservator has been deformed or shed; severe cracking or differential settlement of foundation has been induced; and most of anchor bolts and connecting bolts have been elongated or broken;
- 5 Collaps: main body of equipment has been toppled; coiling has been destructed severely; and radiator, oil conservator have been shed.

11.2 Reactor

11.2.1 The following shall be checked when a reactor suffer destruction from the earthquake:

- 1 Check cement column of reactor for damage;
- 2 Check supporting porcelain insulator for breakage;
- 3 Check coil for damage;
- 4 Check for loose, elongated or broken anchor bolts and connecting bolts;
- 5 Check foundation for differential settlement or fissure;

6 For seismic reinforced three-phase concrete reactor in vertical layout, also check epoxy glass fibre reinforced plastic column for fracture; check whether the fixing with foundation is secure; check for loose, shed insulating block; and check for loose or broken circumferential fastening steel strips.

11.2.2 Earthquake destruction to reactor shall be classified according to the following:

1 Basically intact: coil isn't deformed, damaged; supporting porcelain insulator isn't damaged; cement column is in good conditions, or few cement columns have been cracked slightly; and foundation isn't destructed;

2 Minor damage: coil isn't obviously deformed, damaged; few supporting porcelain insulators have been damaged slightly; part of cement columns have been cracked slightly; slight cracking of foundation has been induced; and few anchor bolts or connecting bolts have been loosened;

3 Moderate damage: coil has been deformed slightly; part of supporting porcelain insulators have been damaged; few cement columns have been fractured, cracking or differential settlement of foundation has been induced; and part of anchor bolts or connecting bolts have been loosened or elongated;

4 Severe damage: reactor has been displaced or tilted; coil has been destructed; most of supporting porcelain insulators have been broken; severe cracking or differential settlement of foundation has been induced; and anchor bolts and connecting bolts have been elongated or broken;

5 Collaps: reactor has been toppled or broken; coil has been destructed severely; and most of cement columns of three-phase concrete reactor in vertical layout have been fractured.

11.3 Oil switch and lightning arrester

11.3.1 The following shall be checked when oil switch and lightning arrester suffer destruction from the earthquake:

1 Check conducting rod of oil switch for deformation; check operating mechanism for damage; and check seal for seepage;

2 Check oil tube(vacuum tube), insulating bushing for damage;

3 Check whether the connection between the porcelain insulator and flange is secure and not fractured;

4 Check insulating rod of lightning arrester for damage, fracture;

5 Check support for fissure; and check foundation for differential settlement or crack;

6 Check for loose, elongated or broken anchor bolts and connecting bolts.

11.3.2 Earthquake destruction to oil switch and lightning arrester shall be classified according to the following:

1 Basically intact: conducting rod of oil switch, lightning arrester and supporting porcelain insulator, and porcelain bushing aren't damaged; operating mechanism and members are in good conditions; moving and static contacts are in good conditions; and support is in good conditions;

2 Minor damage: conducting rod of oil switch, lightning arrester aren't deformed, damaged; supporting porcelain insulator and porcelain bushing aren't damaged; operating mechanism is in good conditions; moving and static contacts aren't loose; there is slight seepage from few seals; support has been cracked slightly; slight cracking of foundation has been induced; and few anchor bolts and connecting bolts have been loosened;

3 Moderate damage: conducting rod of oil switch, lightning arrester have been deformed slightly;

few supporting porcelain insulators and porcelain bushings have been damaged; operating mechanism has failed; moving and static contacts have been loosened; few rods of lightning arrester have been fractured; support has been cracked; cracking or differential settlement of foundation has been induced; and part of anchor bolts and connecting bolts have been loosened or elongated;

4 Severe damage: conducting rod of oil switch and lightning arrester have been deformed severely; supporting porcelain insulator and porcelain bushing have been damaged severely; moving and static contacts have been destructed; there is leaking at seal; most of rods of lightning arrester have been fractured; support has been fissured; severe cracking or differential settlement of foundation has been induced; and anchor bolts and connecting bolts have been elongated or broken;

5 Collaps: many conducting rods of oil switch and lightning arresters have been deformed severely or broken; supporting porcelain insulator and porcelain bushing have been destructed severely; moving and static contacts have been destructed; there is leaking at seal; and most of rods of lightning arrester have been fractured.

11.4 Power capacitor, disconnecting switch, stick insulator, current (voltage) transformer

11.4.1 The following shall be checked when electroceramic equipment such as power capacitor, disconnecting switch, stick insulator and current (voltage) transformer suffer destruction from the earthquake:

- 1** Check insulating bushing for damage, fracture;
- 2** Check coil for damage;
- 3** Check for loose terminals;
- 4** Check support for damage; and check equipment for shedding;
- 5** Check foundation for differential settlement or fissure;
- 6** Check for loose fixing equipment; and check for elongated or broken bolts.

11.4.2 Earthquake destruction to electroceramic equipment such as power capacitor, disconnecting switch, stick insulator, current (voltage) transformer shall be classified according to the following:

1 Basically intact: porcelain components such as coil, insulating bushing aren't damaged; use functions are basically in good conditions; support is in good conditions; and equipment fixing bolt isn't loose;

2 Minor damage: coil isn't obviously deformed, and isn't damaged; insulating bushing isn't damaged; few porcelain components have been damaged slightly; support has been deformed slightly; slight cracking of foundation has been induced; and few equipment fixing bolts have been loosened;

3 Moderate damage: coil has been deformed slightly; few insulating bushing have been damaged; part of porcelain components have been damaged, part of supports have been tilted; cracking or differential settlement of foundation has been induced; and equipment fixing bolts have been loosened or elongated;

4 Severe damage: part of insulating bushings have been fractured; coil has been destructed; severe cracking or differential settlement of foundation has been induced; and equipment fixing anchor bolts have been elongated or broken;

5 Collaps: most of insulating bushings have been fractured; coil has been destructed severely; and equipment has fallen off and damaged.

11.5 Battery pack

11.5.1 The following shall be checked when a battery pack suffer destruction from the earthquake:

- 1 Check pole plate and separator for deformation, damage;
- 2 Check body for breakage; and check electrolyte for overflow;
- 3 Check fixing support for destruction;
- 4 Check battery box (drawer or trolley) installed in the panel, cabinet for shedding.

11.5.2 Earthquake destruction to battery pack shall be classified according to the following:

- 1 Basically intact: pole plate and separator aren't deformed, damaged; battery body isn't broken; there is no electrolyte overflow; fixing support of battery is in good conditions; battery box installed in the panel, cabinet is in good conditions; and part of wiring has loosened;
- 2 Minor damage: pole plate and separator have been deformed; few battery bodies have been broken; few terminals have been damaged; there is electrolyte overflow; fixing support of battery has been deformed slightly; and battery boxes installed in the panels, cabinets have been displaced slightly;
- 3 Moderate damage: pole plate and separator have been deformed severely; part of battery bodies have been broken; there is electrolyte overflow; fixing support of battery has been deformed; battery boxes installed in few panels, cabinets have been displaced; and wiring has been disconnected;
- 4 Severe damage: most of battery bodies have been broken severely; there is a great deal of electrolyte flouting out; fixing support of battery has been deformed severely or toppled; and battery boxes in the panels, cabinets have been displaced or fallen off;
- 5 Collaps: battery body has been damaged severely; fixing support of battery has been toppled; and battery boxes in the panel, cabinet have been fallen off and broken.

11.6 High-voltage switch gear, low-voltage distribution pane, control (protective) panel, DC system panel and distributing box

11.6.1 The following shall be checked when high-voltage switchgear, low-voltage distribution panel, control (protective) panel, DC system panel and distributing box suffer destruction from the earthquake:

- 1 Check oil circuit breaker, relay, instrument, disconnecter, switch in the cabinet, panel, box for damage, malfunction;
- 2 Check whether various elements and connecting wires are in good conditions;
- 3 Check cabinet, panel, box bodies for deformation or toppling;
- 4 Check for loose or elongated anchor bolt; and check for fissured weld on anchor bolts;
- 5 Check whether sealing positions of GIS (Gas Insulated Switchgear) are in good conditions, and not damaged; and check for gas leakage.

11.6.2 Earthquake destruction to high-voltage switchgear, low-voltage distribution panel, control (protective) panel, DC system panel and distributing box shall be classified according to the following:

- 1 Basically intact: cabinet, panel, box bodies aren't deformed, displaced; and electrical elements such as relay and instrument aren't loosened;
- 2 Minor damage: cabinet, panel, box bodies aren't damaged obviously; few elements such as relay and instrument have been loosened; part of terminals have been loosened slightly; and few anchor bolts have been loosened;
- 3 Moderate damage: part of cabinet, panel, box bodies have been deformed; few elements such as

relay and instrument have been damaged; porcelain insulator has been damaged partly; most of terminals have been loosened; there is gas seepage from GIS sealing positions; and part of anchor bolts have been loosened, or welds on base plate have been cracked;

4 Severe damage: cabinet, panel, box bodies has been displaced or tilted; most of elements such as relay and instrument have been damaged; connecting wires have been broken or have been fractured; there is gas leaking at GIS sealing positions; most of anchor bolts have been loosened, elongated, or welds on base plate have been fissured;

5 Collaps: cabinet, panel, box bodies have been severely deformed or toppled; and most of elements such as relay and instrument have been destructed.

11.7 Power cable, communication line and overhead line

11.7.1 The following shall be checked when power cable, communication line and overhead line suffer destruction from the earthquake:

1 Check poles, towers for tilt, toppling; check for loose, fractured guy wire; and check for loose wire clamp;

2 Check porcelain insulator for damage;

3 Check wires for fracture;

4 Check foundation of poles and towers for differential settlement or fissure;

5 Check protective coverings of cables for damage; and check cable connector for damage.

11.7.2 Earthquake destruction to power cable, communication line and overhead line shall be classified according to the following:

1 Basically intact: cables, cable terminations aren't damaged; poles, towers aren't deformed; guy wires or wire clamps aren't loosened; and foundation is in good conditions;

2 Minor damage: few positions of outer covering of cable have been damaged; poles, towers aren't tilted; few guy wires or wire clamps have been loosened; few porcelain insulators have been damaged; and slight cracking of foundation has been induced;

3 Moderate damage: few cables, cable terminations and middle connectors have been damaged; local wire strand has loosened or fractured; part of porcelain insulators have been damaged; differential settlement of foundation has been induced; and few poles, towers have been deformed or tilted;

4 Severe damage: cables have been damaged severely; severe differential settlement of foundation has been induced; many poles, towers have been tilted or toppled; and many wires have been fractured;

5 Collaps: many cables have been damaged severely; and poles, towers have been tilted, toppled or broken.

11.8 Telecommunications equipments

11.8.1 The following shall be checked when telecommunications equipments suffer destruction from the earthquake:

1 Check whether exchanger, cabling signal, power supply systems of telecommunications are in good conditions;

2 Check whether transmitting and receiving systems of wireless communication telecommunications are in good conditions;

3 Check control cabinets and power distribution equipment of telecommunications equipment shall be checked according to the requirements of Article 11.6.1 of this standard;

4 Check whether various elements are in good conditions;

5 Check communication line and overhead line shall be checked according to the requirements of Article 11.7.1 of this standard;

6 Check whether anchor bolts are in good conditions.

11.8.2 Earthquake destruction to telecommunications equipment shall be classified according to the following:

1 Basically intact: exchange, cabling, signal, power supply systems of telecommunications may be used properly; and transmitting and receiving systems are in good conditions;

2 Minor damage: part of elements have been loosened slightly; few connecting wire connector have been loosened; slight cracking of foundation has been induced; and few anchor bolts have been loosened;

3 Moderate damage: part of exchange, cabling, signal, power supply systems of telecommunications cannot be used properly; transmitting and receiving systems cannot be used properly; part of elements have been damaged; cracking or differential settlement of foundation has been induced; and part of anchor bolts have been loosened or elongated;

4 Severe damage: most of exchange, cabling, signal, power supply systems of telecommunications have been damaged severely; part of communication lines and overhead lines have been fractured; transmitting and receiving systems have been damaged; severe cracking or differential settlement of foundation has been induced; most of anchor bolts have been deformed or fractured; and cabinet body has been tilted severely;

5 Collaps: exchange, cabling, signal, power supply systems of telecommunications have been destructed severely; most of communication lines and overhead networks have been fractured; transmitting and receiving systems have been destructed severely; and cabinet body has been toppled.

12 Building

12.1 Masonry building

12.1.1 The following shall be checked when masonry building suffer destruction from the earthquake:

- 1 Check differential settlement of foundation; inclination of building; and crack of ground surface;
- 2 Check the loading position of bearing wall for crack;
- 3 Check roof and floor slab for crack;
- 4 Check masonry column for crack;
- 5 Check cushion blocks at connection between the roof or floor beam and wall or column for slippage, loosening;
- 6 Check connection between the precast floor slab and floor beam or ring beam for dislocation;
- 7 Check the members such as balcony, corridor and stair for fracture, collapse.

12.1.2 Earthquake destruction to masonry building shall be classified according to the following:

- 1 Basically intact: bearing wall is in good conditions; roof is in good conditions; a few ancillary members have been cracked slightly; and floor surface has been cracked slightly;
- 2 Minor damage: part of bearing walls have been cracked slightly; roof has been damaged slightly; ground floor have been cracked obviously; staircase wall, small building protruded from roof have been cracked obviously; nonbearing member has been destructed obviously; and part of ancillary members have been fissured or collapsed;
- 3 Moderate damage: majority of bearing walls have been cracked slightly; part of walls have been cracked obviously; few bearing walls have been cracked severely; few roof members have collapsed; part of nonbearing members have been cracked severely or become crisp locally; and differential settlement of foundation has been induced;
- 4 Severe damage: majority of bearing walls have been cracked obviously; part of bearing walls have been destructed severely; most of nonbearing walls have been cracked severely and become crisp, or stretches of nonbearing walls have collapsed; roof and floor systems have been cracked; part of roofs and floors have collapsed; severe differential settlement of foundation has been induced; and whole building have been tilted obviously;
- 5 Collaps: majority of walls have been destructed severely; severe differential settlement of foundation has been induced; and structure is close to collapse or has collapsed.

12.2 Reinforced concrete building

12.2.1 The following shall be checked when Reinforced concrete building suffer destruction from the earthquake:

- 1 Check foundation for differential settlement; inclination of building; and crack of ground surface;
- 2 Check Reinforced concrete column, beam and shear wall for crack;
- 3 Check roof, floor plate for crack;
- 4 Check concrete for being crisp ; and check reinforcement for breakout;

- 5 Check filled wall for crack;
- 6 Check staircase, small building protruded from roof and ancillary members for destruction.

12.2.2 Earthquake destruction to Reinforced concrete building shall be classified according to the following:

1 Basically intact: frame column, beam and shear wall are in good conditions; few nonbearing members have been damaged slightly; few connections between the filled wall and column have been fissured; and floor surface has been cracked slightly;

2 Minor damage: few frame columns, beams or shear walls have been cracked slightly; there is locally slight concrete scaling; part of filled walls have been cracked obviously; small building protruded from roof has been cracked obviously; and part of ancillary members have been damaged;

3 Moderate damage: part of frame beams, columns or shear walls have been cracked slightly or part of beams have been cracked obviously; concrete scaling of few beam, column or shear wall ends has occurred; part of filled walls have been cracked severely or become crisp locally; most of ancillary members have been destructed; and differential settlement of foundation has been induced;

4 Severe damage: majority of frame beams, columns or shear walls have been cracked obviously; concrete of few members become crisp, and main reinforcement has been protruded; part of floors have collapsed; severe differential settlement of foundation has been induced; and buildings have been tilted obviously;

5 Collaps: majority of frame beams, columns, shear walls have been destructed severely; severe differential settlement of foundation has been induced; and structure is close to collapse or has collapsed.

12.3 Inner frame and bottom-frame building

12.3.1 The following shall be checked when inner frame and bottom-frame building suffer destruction from the earthquake:

1 Check foundation for differential settlement; check building for whole tilt; and check floor surface for fissure;

2 Check main load-carrying positions of bearing wall for crack;

3 Check connection between the prefabricated floor slab and floor system girder or ring beam for destruction;

4 Check ancillary members such as balcony, corridor, stair and small building protruded from roof for fracture, collapse.

5 Check Reinforced concrete column and beam for crack;

6 Check concrete for being crisp and check reinforcement for breakout;

7 Check filled wall for crack.

12.3.2 Earthquake destruction to inner frame and bottom-frame building shall be classified according to the following:

1 Basically intact: bearing wall is in good conditions; roof is in good conditions; frame column and beam are in good conditions; few nonbearing members have been damaged slightly; a few ancillary members have been cracked slightly; floor surface has been cracked slightly; and few connections between the filled wall and column have been fissured;

2 Minor damage: part of bearing walls have been cracked slightly; roof have been damaged slightly; floor surface has been cracked obviously; few frame columns or beams have been cracked

slightly; part of filled walls have been cracked obviously; walls of small building protruded from roof have been cracked obviously; few nonbearing members has been destructed obviously; and part of ancillary members have been fissured or collapsed;

3 Moderate damage: part of bearing walls have been cracked obviously; or few bearing walls have been cracked severely; few roof members have collapsed; part of nonbearing members have been cracked severely or become crisp locally; part of frame columns have been cracked slightly or part of beams have been cracked obviously; part of filled walls have been cracked severely or become crisp locally; most of ancillary members have been destructed; and differential settlement of foundation has been induced;

4 Severe damage: majority of bearing walls have been cracked obviously; most of nonbearing walls have been cracked severely and become crisp, or stretches of nonbearing walls have collapsed; part of roofs, floors have collapsed; main reinforcement of part of frame columns has been protruded; concrete is crisp and falls; severe differential settlement of foundation has been induced; and building has been tilted obviously;

5 Collaps: majority of walls have been destructed severely; part of internal frame beams and slabs have collapsed; bottom frame beams, columns and top bearing walls have lost seismic capacity; severe differential settlement of foundation has been induced; and structure is close to collapse or has collapsed.

12.4 Steel and reinforced concrete bent structure building

12.4.1 The following shall be checked when steel and reinforced concrete bent structure building suffer destruction from the earthquake:

1 Check foundation for differential settlement; check building for whole tilt; and check floor surface for fissure;

2 Check reinforced concrete column, roof girder, roof truss or skylight truss for crack; check concrete for crushing; check for the protruded reinforcement; and check steel column for whole or local instability;

3 Check connections between the reinforced concrete roof panel and roof girder or roof truss for destruction;

4 Check connection between the crane beam and column for destruction; and check whether crane beam may be used properly;

5 Check brace between the columns for deformation; check the welds between brace and embedded part for fissure; and check embedded part for disconnection;

6 Check roof bracing for deformation; check the welds between the brace and embedded part on the roof truss for fissure; and check embedded part for disconnection;

7 Check bolts and gusset plate in bolted joint for destruction.

12.4.2 Earthquake destruction to steel and reinforced concrete bent structure building shall be classified according to the following:

1 Basically intact: member, column, beam, roof bracing are in good conditions; a few big roof plates have been loosened; few enclosure wall have been cracked slightly; and floor surface have been cracked slightly;

2 Minor damage: columns are in good conditions, or few columns have been cracked slightly; bracing are basically in good conditions; part of roof member connections have been loosened; few

skylight trusses have been destructed; part of enclosure walls have been cracked obviously, and may continue to be used after slight repair or without repair;

3 Moderate damage: part of reinforced concrete columns have been cracked obviously, or steel column flanges have been deformed locally; part of brace between the columns have been bent; roof bracing has been deformed obviously; part of roof plates have dislocated, and few have collapsed; part of vertical brace of skylight trusses have buckled; part of enclosure walls have collapsed; differential settlement of foundation has been induced; and a few bolted joints have been destructed;

4 Severe damage: part of roof trusses have collapsed; part of reinforced concrete columns have been destructed obviously; concrete has been broken; reinforcement has been protruded; large position change on the column top has occurred or column has been broken; part of steel column flanges of steel columns have been distorted, and there is large column top displacement; part of supports between the columns have been destructed; the support-to-embedded part welds have been fissured; embedded parts have been disconnected; majority of roof bracings have collapsed; severe differential settlement of foundation has been induced; building has been tilted obviously; and a great deal of bolted joints have been destructed;

5 Collaps: concrete at majority of destructed reinforced concrete columns has been broken, and reinforcement has been protruded; steel column has been severely distorted or broken; most of or all of roofs have collapsed; severe differential settlement of foundation has been induced; and whole structure is close to collapse or has collapsed.

12.5 Single-storey frame-bent brick column structure building

12.5.1 The following shall be checked when single-storey frame-bent structure building suffer destruction from the earthquake:

1 Check foundation for differential settlement; check building for whole tilt; and check floor surface for fissure;

2 Check brick column for crack;

3 Check enclosure wall for fissure;

4 Check cushion blocks at connection between the roof truss or grider and brick column for slippage, loosening;

5 Check supporting members of wood roof bracing for destruction;

6 Check connections between the support and roof truss for destruction.

12.5.2 Earthquake destruction to single-storey frame-bent structure building shall be classified according to the following:

1 Basically intact: main bearing members and supporting system are in good conditions; gable, enclosure wall have been cracked slightly; floor surface have been cracked slightly; and a few tiles have been slipped;

2 Minor damage: few columns, walls have been cracked slightly; and few connections between the roofs and columns have been loosened;

3 Moderate damage: majority of columns have been cracked slightly; part of columns have been cracked obviously; roof truss have been tilted; roof supporting system has been deformed obviously, or few roofs have collapsed; and differential settlement of foundation has been induced;

4 Severe damage: majority of brick columns, walls have been cracked severely or become locally

crisp, dislocated; part of roof bracing has collapsed; part of columns, walls have collapsed; severe differential settlement of foundation has been induced; and building has been tilted obviously;

5 Collaps: majority of column roots have been crushed, and have been tilted or collapsed; all of or large area of roof has collapsed; severe differential settlement of foundation has been induced; and whole structure is close to collapse or has collapsed.

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13 Other special structures

13.1 Frame-bent structure

13.1.1 The following shall be checked when frame-bent structure suffer destruction from the earthquake:

- 1 Check reinforced concrete column, beam for cracking; check for crisp concrete; and check reinforcement for the protruded reinforcement;
- 2 Check reinforced concrete column/beam joints, and connections between the columns and foundation for crack, destruction;
- 3 Check steel column, steel beam for bending or torsional buckling;
- 4 Welds on steel structure beam/column joints, and on joints between the bracing and beam/column; check for cracking, connection bolts check for loose, fall off, destructed; and gusset plate check for destructed;
- 5 Check for buckled steel supporting members; and check for put out of embedded part;
- 6 Check for loosened, deformed or fractured anchor bolt;
- 7 Check fire proof for cracking or peel off;
- 8 Check foundation for differential settlement; and check integral structure for tilt.

13.1.2 Earthquake destruction to frame-bent structure shall be classified according to the following:

- 1 Basically intact; frame-bent column, beam, brace are in good conditions; and minority of fire proof have been cracked slightly;
- 2 Minor damage: few beams or platforms have been cracked slightly; part of steel beams or brace have been deformed slightly; and minority of gusset plates have been destructed;
- 3 Moderate damage: part of frame-bent concrete columns have been cracked slightly, or few have been cracked obviously; part of welds on steel structure beam/column joint, and on joints between the bracing and beam/column have been cracked, and bolts have been loosened; part of gusset plates have been destructed; anchor bolts have been deformed; few anchor bolts have been removed or fractured; minority of embedded parts have been disconnected; part of column brace have been destructed obviously; and differential settlement of foundation has been induced;
- 4 Severe damage: frame-bent beam, column members have been destructed severely; majority of beam, column end concrete has scaled; longitudinal reinforcements have been exposed; few longitudinal reinforcements of columns have been buckled; part of steel beam, column members have been buckled; welds have been fractured; bolts have been fractured, destructed; joint have been deformed obviously, or joints have been destructed severely; majority of braces have been buckled or have been fractured; severe differential settlement of foundation has been induced; and integral structure has been tilted obviously;
- 5 Collaps: frame-bent beam, column and brace have been destructed severely; severe differential settlement of foundation has been induced; and integral structure is close to collapse or has collapsed.

13.2 Piperack, pipesleeper

13.2.1 The following shall be checked when piperack, pipesleeper suffer destruction from the

earthquake :

- 1 Check reinforced concrete piperack for cracking ,breakage ,collapse ;
- 2 Check joints between reinforced concrete piperack beam and column ,between column and the connections between columns and foundation for destruction ;
- 3 Check column ,beam of steel piperack ,for bending ,torsional bucking ;
- 4 Check column brace of the steel piperack for buckling ; and check welds on gusset plates of both ends of brace for cracking ;
- 5 Check joints between the steel truss and piperack for destruction ;
- 6 Check anti-drop shoulder for tilt or drop ;
- 7 Check pipe sleeper for crack ;
- 8 Check foundation for differential settlement ;and check integral structure for tilt .

13.2.2 Earthquake destruction to piperack ,pipesleeper shall be classified according to the following :

- 1 Basically intact :column and beam are in good conditions ; pipe sleeper are in good conditions ; and a few anti-drop shoulders have been tilted or dropped ;
- 2 Minor damage : few column , beam have been cracked slightly ; minority of columns , beams of steel piperacks have been bent , distorted ; minority of welds have been cracked ; few joints between the steel truss and piperack have been destructed ; few pipe sleeper have been cracked slightly ; and part of anti-drop shoulders have been tilted or dropped ;
- 3 Moderate damage : part of columns , beams have been cracked slightly , or few have been cracked obviously ; minority of beam / column joints , connections between the column and foundation have been destructed ; part of beams / columns of steel piperacks have been slightly bent , distorted ; part of supporting members between the columns have been deformed ; part of welds on joints have been cracked ; part of joints between the steel truss and piperack have been destructed ; part of pipe sleepers have been cracked severely ; and differential settlement of foundation has been induced ;
- 4 Severe damage : majority of beam , column end concrete has scaled ; longitudinal reinforcements have been exposed ; few longitudinal reinforcements of columns have been buckled ; majority of beam / column joints , and connections between the column and foundation have been destructed ; part of beams / columns of steel piperacks have been severely bent , distorted ; most of supporting members between the columns have been deformed severely ; most of welds on joints have been cracked ; majority of joints between the steel truss and piperack have been destructed ; steel trusses have dropped from piperack ; severe differential settlement of foundation has been induced ; integral structure has been tilted obviously ; and pipe sleepers have been severely cracked , tilted ;
- 5 Collaps : whole piperack has collapsed ; and severe differential settlement of foundation has been induced .

13.3 Shaft tower structure

13.3.1 The following shall be checked when shaft tower structure suffer destruction from the earthquake :

- 1 Check foundation for differential settlement ; and check whole structure for tilt .
- 2 Check steel members such as column , beam and support for bending , distortion ;
- 3 Check welds on beam / column joints for fissure ; check bolts for loosening , shedding , destruction ; and check gusset plate for destruction ;
- 4 Check anchor bolts for loosening , deformation , fracture ;

5 Check ancillary facilities for damage.

13.3.2 Earthquake destruction to shaft tower structure shall be classified according to the following:

1 Basically intact: steel members such as column, beam and diagonal member are in good conditions; and a few ancillary facilities have been damaged slightly;

2 Minor damage: minority of steel members have been bent, distorted; minority of welds have been fissured; and part of ancillary facilities have been damaged;

3 Moderate damage: part of steel members have been bent, distorted; part of welds on beam/column joints have been fissured; bolts have been loosened; a few gusset plates have been destructed; most of ancillary facilities have been damaged severely; few anchor bolts have been deformed or removed; and differential settlement of foundation has been induced;

4 Severe damage: majority of steel members have been bent, distorted; majority of welds on beam/column joints have been fissured; most of anchor bolts have been removed or fractured; part of gusset plates have been destructed; severe differential settlement of foundation has been induced; and structure has been tilted obviously;

5 Collaps: beam, column and support have been destructed severely; severe differential settlement of foundation has been induced; and structure is close to collapse or has collapsed.

13.4 Water tank

13.4.1 The following shall be checked when water tank suffer destruction from the earthquake:

1 Check reinforced concrete water tank wall, bottom plate, top plate for crack;

2 Check tank body for tilt, sinking;

3 Check deformation joints of water tank for mutual dislocation; and check waterproof construction for destruction;

4 Reinforced concrete support of overhead water tank shall be checked according to the requirements of Article 13.1.1 of this standard.

13.4.2 Earthquake destruction to water tank shall be classified according to the following:

1 Basically intact: tank body is in good conditions; and there is no seepage;

2 Minor damage: tank body have been cracked slightly at few positions; and there is local and slight seepage;

3 Moderate damage: local tank body has been cracked obviously; there is slight dislocation at deformation joints; there is leaking at minority of positions; and part of members have been tilted, sunk;

4 Severe damage: tank body have been fissured severely at majority of positions; majority of members have been tilted, sunk; there is obvious dislocation at deformation joints; and there is leaking at many positions;

5 Collaps: whole water tank have collapsed; and there is a great deal of leakage of water stored.

13.5 Cooling tower

13.5.1 The following shall be checked when a cooling tower suffer destruction from the earthquake:

1 Tower frame shall be checked according to the requirements of Article 13.1.1 of this standard;

2 Water tank below tower shall be checked according to the requirements of Article 13.4.1 of this standard;

3 Check duct for deformation, breakage;

- 4 Check packing beam for deformation, crack, etc.;
- 5 Check steel members of receiving water drum, water distribution pipe, water distribution pipe branch support for deformation; and check gusset plates and welds for crack;
- 6 Check water distribution channel, air deflector for deformation, cracking;
- 7 Check for differential settlement of foundation; and check whole structure for tilt.

13.5.2 Earthquake destruction to cooling tower shall be classified according to the following:

- 1 Basically intact: tower body and column are in good conditions; and a few ancillary facilities have been damaged slightly;
- 2 Minor damage: tower body or column have been cracked slightly at few positions; and part of ancillary facilities have been damaged;
- 3 Moderate damage: tower body or column have been cracked obviously at few positions; most of ancillary facilities have been damaged severely; and differential settlement of foundation has been induced;
- 4 Severe damage: tower body has been severely cracked or dislocated; majority of concrete columns have been cracked severely or become crisp; severe differential settlement of foundation has been induced; and tower body has been tilted obviously;
- 5 Collaps: severe differential settlement of foundation has been induced; and tower body is close to collapse or has collapsed.

13.6 Pelletizing tower

13.6.1 The following shall be checked when a pelletizing tower suffer destruction from the earthquake:

- 1 Check tower body for crack and dislocation;
- 2 Check foundation for differential settlement; and check whole structure for tilt.
- 3 Check wall between the air intake opening, grating of air intake, air outlet support and guard for damage;
- 4 Check whether spray layer structure members and their connections are in good conditions;
- 5 Check whether discharge layer structure members and their connections are in good conditions.

13.6.2 Earthquake destruction to pelletizing tower shall be classified according to the following:

- 1 Basically intact: tower body is in good conditions or upper section has been cracked slightly; and a few ancillary facilities have been damaged slightly;
- 2 Minor damage: local tower body has been cracked slightly; and part of ancillary facilities have been damaged;
- 3 Moderate damage: tower body has been cracked obviously; there is local shedding on the top; most of ancillary facilities have been damaged severely; differential settlement of foundation has been induced; and structure has been tilted slightly;
- 4 Severe damage: tower body has been fissured or dislocated; severe differential settlement of foundation has been induced; and structure has been tilted obviously;
- 5 Collaps: severe differential settlement of foundation has been induced; and tower body is close to collapse or has collapsed.

13.7 Chimney

13.7.1 The following shall be checked when a chimney suffer destruction from the earthquake:

- 1 Check reinforced concrete, brick chimney shaft for fissure, breakage, dislocation;
- 2 Check foundation for differential settlement; and check whole structure for tilt.
- 3 Check steel stack shaft and skirt welds for fissure; and check anchor bolts for loosening, deformation, fracture;
- 4 Check insulation, lining for shedding;
- 5 Check ancillary facilities for damage.

13.7.2 Earthquake destruction to chimney shall be classified according to the following:

- 1 Basically intact: chimney shaft is in good conditions or upper section has been cracked slightly; and a few ancillary facilities have been damaged slightly;
- 2 Minor damage: local chimney shaft has been cracked slightly; and part of ancillary facilities have been damaged;
- 3 Moderate damage: many positions of chimney shaft have been cracked slightly; few positions have been cracked obviously, or slightly dislocated, or become locally crisp, have been bulged; top of brick chimney has been locally shed or slightly dislocated; most of ancillary facilities have been damaged severely; steel chimney has been slightly deformed or distorted; skirt welds have been cracked; few anchor bolts have been deformed, pulled out or fractured; part of insulating layer and lining have been shed; and differential settlement of foundation has been induced;
- 4 Severe damage: chimney shaft has been subject to destructions such as severe cracking, dislocation or becoming crisp, bulging; or the head of the top has fallen, but the remaining section is free from obvious crack and other destructions; steel chimney has been severely deformed or distorted; majority of anchor bolts have been deformed, removed or fractured; severe differential settlement of foundation has been induced; and chimney shaft has been tilted obviously;
- 5 Collaps: severe differential settlement of foundation has been induced; and chimney shaft has been broken or has collapsed.

13.8 Reinforced concrete silo

13.8.1 The following shall be checked when a reinforced concrete silo suffer destruction from the earthquake:

- 1 Check silo body for crack or dislocation; and check for the cracked connections between the silo bodies arranged in a group of silos;
- 2 Check column of column type silo for distortion; and check shear wall for crack;
- 3 Check ancillary facilities for damage;
- 4 Check foundation for differential settlement; and check whole structure for tilt.
- 5 Check connection between the silo body and staircase, repair room for crack, damage.

13.8.2 Earthquake destruction to reinforced concrete silo shall be classified according to the following:

- 1 Basically intact: main body of structure is in good conditions; and few ancillary facilities have been damaged slightly;
- 2 Minor damage: local silo body has been slightly cracked; a few columns have been slightly distorted; part of shear walls have been slightly cracked; part of ancillary facilities have been damaged; and the connections between the silo bodies arranged in a group of silos or the connections between the silo body and staircase, repair room have been cracked slightly or have been damaged;
- 3 Moderate damage: silo body has been obviously cracked or slightly dislocated; part of columns

have been distorted; part of shear walls have been cracked obviously; most of ancillary facilities have been damaged; and differential settlement of foundation has been induced;

4 Severe damage: silo body has been severely fissured or dislocated; part of columns have been destroyed; majority of shear walls have been fissured; severe differential settlement of foundation has been induced; and silo body has been tilted obviously;

5 Collaps: severe differential settlement of foundation has been induced; and silo body is close to collapse or has collapsed.

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14 Onshore drilling platform

14.1 Drilling equipment

14.1.1 In addition to the relevant checks specified in Article 7.1.1 of this standard, the following shall be checked when drilling equipment suffer destruction from the earthquake:

- 1 Check derrick guy line, escape system guide rope, climbing booster guide rope ground anchor for loosening, pulling out;
- 2 Check equipment foundation for displacement; and check mast, oil supply tank for tilt;
- 3 Check equipment for displacement;
- 4 Check connecting pins for loosening, shedding;
- 5 Check fastener bolts for loosening, deformation, damage;
- 6 Check ancillary assembly for deformation, damage;
- 7 Check cable for damage; check cable connector for loosening; and check whether motor operates properly;
- 8 Check whether jaw clutch engaging and disengaging are smooth;
- 9 Check transmission and transmission system such as belt, chain and coupling for damage;
- 10 Check various piping for deformation, breakage;
- 11 Check main body and main assembly of equipment for deformation, damage; and check weld for crack or fissure.

14.1.2 Earthquake destruction to drilling equipment shall be classified according to the following:

1 Basically intact: main body and main assembly of equipment aren't deformed, damaged; ancillary assembly isn't deformed, damaged; foundation is free from displacement; equipment is free from displacement; transmission system isn't damaged; mast guy line, escape system guide rope, climbing booster guide rope ground anchor have been loosened; there is seepage from hydraulic, lubrication, cooling and pneumatic control systems; and safety protection facilities are basically in good conditions;

2 Minor damage: few ancillary assemblies have been slightly deformed, damaged; mast guy line, escape system guide rope, climbing booster guide rope ground anchor have been removed; slight displacement of foundation has been induced; few connecting pins and fastener bolts of the equipment have been slightly loosened; part of cable connectors have been loosened; jaw clutch engaging and disengaging are stuck; few transmission systems have been damaged; there is a little leaking at hydraulic, lubrication, cooling and pneumatic control systems and these systems have been damaged; part of fixing devices of safety protection facilities have been slightly loosened; and few piping has been deformed slightly;

3 Moderate damage: few main bodies and main assemblies of equipment have been deformed slightly; part of ancillary assemblies have been deformed or damaged; part of connecting pins have been shed; fastener bolts have been deformed or damaged; obvious displacement of foundation has been induced; part of equipment has been displaced; mast, oil supply tank have been slightly tilted; jaw clutch cannot be engaged; part of belts, chains, cables have been fractured; part of transmission systems have

been damaged; there is a great deal of leaking at hydraulic, lubrication, cooling and pneumatic control systems, and these systems have been damaged severely; part of instrument system, safety protection facilities have been damaged; and piping has been severely deformed, broken;

4 Severe damage: part of main body and main assembly of equipment have been deformed, damaged; most of ancillary assemblies have been deformed or damaged; welds have been cracked; severe displacement of foundation has been induced; mast has been tilted obviously; oil supply tank has been toppled, and resulted in destruction; transmission system, hydraulic system, lubrication system, cooling system, pneumatic control system and instruments, safety protection facilities have been destructed;

5 Collaps: main body and main assembly of equipment have been severely deformed, destructed; welds have been fissured; severe displacement of foundation has been induced; and mast is close to toppling or has been toppled.

14.2 Drilling contents equipment set

14.2.1 The following shall be checked when drilling contents equipment set suffer destruction from the earthquake:

- 1** Check drilling content tank for displacement;
- 2** Check connecting pipe and water supply piping of drilling content tank for seepage, deformation, breakage;
- 3** Check main and ancillary assemblies of the unit for deformation, damage; and check weld for crack, fissure;
- 4** Check connecting pin for loosening, shedding;
- 5** Check all of fastener bolts for loosening, deformation, damage;
- 6** Check valves for sticking, malfunction, damage;
- 7** Check cable for damage; check cable connector for loosening; and check whether motor operates properly.

14.2.2 Earthquake destruction to drilling contents equipment set shall be classified according to the following:

1 Basically intact: drilling content tank is free from displacement; cable is in good conditions; motor operates properly; valve isn't damaged; main assembly of the unit isn't deformed; connecting pin and fastener bolts have been loosened; and there is no leaking at connecting pipe and water supply piping of drilling content tank;

2 Minor damage: drilling content tank has been displaced slightly; few connecting pins have been shed; fastener bolts have been deformed; few ancillary assemblies have been shed or deformed; cable connector has been loosened slightly; valve has been stuck; connecting pipe and water supply piping of drilling content tank have been deformed, leaked;

3 Moderate damage: drilling content tank has been displaced; ancillary assemblies have been damaged locally; part of cable has been broken; main assembly of the unit, welds have been cracked; valve has failed and been destructed; connecting pipe and water supply piping of drilling content tank have been deformed, broken in many positions of;

4 Severe damage: drilling content tank has been destructed. Many welds of main assembly of the unit have been fissured; and ancillary assemblies have been destructed;

5 Collaps; drilling content tank has been destructed severely; and main assembly of the unit has been destructed severely.

14.3 Well control device

14.3.1 The following shall be checked when well control device suffer destruction from the earthquake:

- 1 Check ground guy anchors of oil-gas separator and flare for loosening, removal;
- 2 Check equipment for tilt, displacement;
- 3 Check fastener bolts for loosening, deformation;
- 4 Check bodies of choke and kill manifolds for deformation; and check welds for crack;
- 5 Check bleed, recovery lines for displacement, deformation; and check foundation pier for tilt;
- 6 Check hydraulic, pneumatic control systems for leakage, disconnection, damage;
- 7 Check fixing, connecting devices of blowout preventer stack for loosening, deformation;
- 8 Check valves for sticking, malfunction, damage;
- 9 Check cable for damage; check cable connector for loosening; and check whether motor operates properly;
- 10 Check whether monitoring equipment, instruments are in good conditions.

14.3.2 Earthquake destruction to well control device shall be classified according to the following:

1 Basically intact: equipment isn't tilted, displaced; bodies of choke, kill manifolds aren't deformed; valve isn't damaged; motor operates properly; monitoring equipment, instruments are in good conditions; blowout preventer stack is in good conditions; ground guy anchors of oil-gas separator and flare aren't loosened; fixing device of blowout preventer stack isn't loosened; there is no leaking at hydraulic, pneumatic control system; and manual lever is shed;

2 Minor damage: ground guy anchors of oil-gas separator and flare have been loosened slightly; there is slight leaking at hydraulic, pneumatic control systems; manual lever has been deformed slightly; part of cable connectors, fastener bolts have been loosened slightly; bleed, recovery lines have been displaced; foundation pier has been tilted; part of equipment has been displaced slightly; part of valves have been stuck; and part of monitoring equipment, instruments have been damaged slightly;

3 Moderate damage: oil-gas separator, flare, vertical barite powder tank have been tilted obviously; hydraulic, pneumatic control systems have been locally leaked, disconnected; part of cables have been broken; part of fastener bolts have been deformed; part of equipment has been displaced; part of bodies of manifolds, lines have been deformed; few welds have been cracked; valve has failed; and part of monitoring equipment, instruments have been damaged;

4 Severe damage: oil-gas separator, flare, vertical barite powder tank have been toppled and destructed; most of hydraulic, pneumatic control systems have been destructed; most of bodies of manifolds, lines have been deformed; welds have been fissured; and most of valves, monitoring equipment, instruments have been destructed;

5 Collaps; hydraulic system, choke, kill manifolds have been destructed severely; and blowout preventer stack has been destructed severely.

14.4 Well hole

14.4.1 The following shall be checked when well hole suffer destruction from the earthquake:

- 1 Check wellhead for displacement;

- 2 Check casing for deformation, dislocation; and check lifting, lowering drills for sticking;
- 3 Check drilling content for leak-off, overflow, kick and well blowout;
- 4 Check open interval for collapse; check lifting, lowering drills for sticking; and check for pump blocked during pump startup, spliation.

14.4.2 Earthquake destruction to well hole shall be classified according to the following:

1 Basically intact: wellhead is free from displacement; casing isn't deformed, dislocated; there is no leak-off, overflow, kick and well blowout of drilling content; there is no pump blocked during pump starting, circulating; few open intervals have collapsed slightly; and lifting and lowering of drill isn't stick;

2 Minor damage: there is slight leak-off of drilling content; few open intervals are collapsed slightly; few lifting, lower drills are stick slightly; and there is slight pump blocked during pump starting, circulating;

3 Moderate damage: wellhead has been displaced slightly; casing has been deformed slightly; there is a little leak-off or overflow, kick of drilling content; many open intervals have collapsed; lifting, lower drills are stick obviously; and there is obviously pump blocked during pump starting, circulating;

4 Severe damage: wellhead has been displaced severely; casing has been deformed severely; large area of open interval has collapsed; circulating cannot be established; drilling is stick; and there is a great deal of leak-off of drilling content or effectively controlled well blowout;

5 Collaps: sleve has been deformed severely, dislocated; and well blowout is out of control.

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15 Offshore platform

15.1 Stationary platform

15.1.1 The following shall be checked when a stationary platform suffer destruction from the earthquake :

- 1 Check jacket structure body and all of joints connecting with platform deck for destruction;
- 2 Check joints, skirt plate, bracket plate of trestle truss structure for destruction;
- 3 Check deck surface, key bracket plates, keel, frame for destruction; and check staircase, handrail for deformation;
- 4 Check helicopter deck for deformation;
- 5 Check living quarter structure for destruction.

15.1.2 Earthquake destruction to stationary platform shall be classified according to the following :

1 Basically intact: jacket structure body and all of tubular joints connecting with platform deck are in good conditions; tubular joints, skirt plate, bracket plate of bridge truss structure are in good conditions; deck surface, key bracket plate, keel, frame are in good conditions; staircase, handrail have been deformed slightly; and living quarter structure is in good conditions;

2 Minor damage: jacket structure body and all of tubular joints connecting with platform deck have been damaged slightly; tubular joints, skirt plate, bracket plate of bridge truss structure have been deformed slightly; deck surface, key bracket plate, keel, frame have been deformed slightly; staircase, handrail have been deformed; helicopter deck is basically in good conditions; and living quarter structure has been deformed slightly;

3 Moderate damage: few positions of jacket structure body and all of tubular joints connecting with platform deck have been deformed, cracked; few positions of tubular joints, skirt plate, bracket plate of bridge truss structure have been deformed; few deck surfaces, key bracket plates, keels, frames have been deformed; few staircases, handrails have been deformed severely; helicopter deck has been deformed locally; living quarter structure has been locally deformed, tilted; and main structure of platform has been deformed slightly;

4 Severe damage: few positions of jacket structure body and all of tubular joints connecting with platform deck have been severely deformed, cracked; few positions of tubular joints, skirt plate, bracket plate of bridge truss structure have been deformed severely; few positions of deck surface, key bracket plate, keel, frame have been deformed severely; main structure have been deformed; few positions of helicopter deck have been deformed severely; few positions of living quarter structure have been severely deformed, tilted; and main structure of platform have been deformed;

5 Collaps: main structure of platform has been severely deformed, tilted or have collapsed.

15.2 Bottom founded rig

15.2.1 The following shall be checked when a bottom founded rig suffer destruction from the earthquake :

- 1 Check mat and its tubular joints connecting with platform deck for destruction;

2 Check column, bracing, tubular joints, skirt plate, bracket plate between mat and deck for destruction;

3 Check deck surface, key bracket plate, keel, frame for destruction; and check staircase, handrail for deformation;

4 Check helicopter deck for deformation;

5 Check living quarter structure for destruction.

15.2.2 Earthquake destruction to bottom founded rig shall be classified according to the following:

1 Basically intact: mat body and its tubular joints connecting with platform deck are in good conditions; and living quarter structure is in good conditions;

2 Minor damage: mat body and its tubular joints connecting with platform deck are basically in good conditions; tubular joints, skirt plate, bracket plate of column and bracing structures have been deformed slightly; deck surface, key bracket plate, keel, frame are basically in good conditions; staircases, handrails are basically in good conditions; and living quarter structure has been deformed slightly;

3 Moderate damage: there is local leaking at mat body; keels, frames, cable penetration connections in the mat have been locally distorted, deformed; few positions of deck surface, key bracket plate, keel, frame have been deformed; few positions of staircases, handrails have been deformed; helicopter deck has been deformed locally; living quarter structure has been deformed locally; and main structure of platform has been deformed slightly;

4 Severe damage: there is severe leaking at mat body; keels, frames, cable penetration connections in the mat have been severely distorted, deformed; column, bracing, bracket plate of mat shell have been deformed severely; column, bracing, skirt plate, bracket plate between mat and deck have been deformed severely; local helicopter deck has been deformed severely; local living quarter structure, staircases have been deformed severely; and main structure of platform have been deformed;

5 Collaps: main structure of platform has been severely deformed, tilted or have collapsed.

15.3 Jackup rig

15.3.1 The following shall be checked when a jackup rig suffer destruction from the earthquake:

1 Check components of jacking system for deformation, damage;

2 Check seals of jacking system for deformation, seepage;

3 Check pile shoe for sinking;

4 Check moulded depth and joints connecting with deck for destruction;

5 Check helicopter deck for deformation;

6 Check living quarter structure for destruction.

15.3.2 Earthquake destruction to jackup rig shall be classified according to the following:

1 Basically intact: jacking transmission system is in good conditions; seals of jacking system are in good conditions; there is no sinking of pile shoe; moulded depth and joints connecting with deck are in good conditions; helicopter deck is in good conditions; and living quarter structure is in good conditions;

2 Minor damage: jacking transmission system has been slightly deformed, damaged; hydraulic oil components of jacking system have been deformed slightly; there is slight sinking of pile shoe; moulded depth and joints connecting with deck have been damaged slightly; helicopter deck is basically in good conditions; and living quarter structure has been deformed slightly;

3 Moderate damage: operation of jacking transmission system has been stuck; seals of jacking transmission have been deformed, and there is seepage from the seals; there is obvious sinking of pile shoe; moulded depth and few joints connecting with deck have been destructed; local helicopter deck has been deformed; local living quarter structure has been cracked; and main structure of platform has been deformed slightly;

4 Severe damage: jacking transmission system has been deformed severely, and its operation has been stuck severely; few components of jacking transmission have been deformed severely, and their operation has failed; there is severe seepage from seals; there is severe sinking of pile shoe; moulded depth and few joints connecting with deck have been destructed severely; helicopter deck have been deformed severely; living quarter structure have been severely cracked, tilted; and main structure of platform have been deformed;

5 Collaps: main structure of platform has been severely deformed, tilted or have collapsed.

15.4 The main equipment

15.4.1 In addition to the relevant checks specified in Article 14.1 of this standard, the following shall be checked when the main equipment of offshore platform suffer destruction from the earthquake:

1 Check working derricks(including drilling derrick, workover derrick)and their bases connecting with platform for displacement, deformation;

2 Check cantilever beam rails and connections with deck for displacement, deformation;

3 Check platform ballast, fire fighting and power supply & distribution systems for destruction;

4 Check production facilities of platform for destruction;

5 Check equipment module supporting structure of platform for deformation;

6 Check natural gas flare boom(flare tower)and flare boom base for destruction.

15.4.2 Earthquake destruction to the main equipment of offshore platform shall be classified according to the following:

1 Basically intact: working derricks and their bases connecting with platform are basically in good conditions; cantilever beam handrails and their connections with deck are in good conditions; few pipes and lines of power distribution system are in good conditions; production facilities of platform are in good conditions; equipment module supporting structure is basically in good conditions; and natural gas flare boom and flare boom base are in good conditions;

2 Minor damage: working derricks and their bases connecting with platform have been deformed slightly; cantilever beam handrails and their connections with deck have been slightly displaced, deformed; few pipes and lines of ballast, fire protection and power supply & distribution systems have been deformed slightly; few positions of production facilities of platform have been destructed slightly; equipment module supporting structure has been deformed slightly; and natural gas flare boom and flare boom base has been deformed slightly;

3 Moderate damage: working derricks and their bases connecting with platform have been displaced, deformed locally; cantilever beam handrails and their connections with deck have been displaced, deformed locally; few pipes and lines of ballast, fire protection and power supply & distribution systems have been deformed locally; production facilities of platform have been destructed locally; equipment module supporting structure has been locally deformed, destructed; and natural gas flare boom and flare boom base have been deformed locally;

4 Severe damage: local working derricks and their bases connecting with platform have been severely displaced, tilted, distorted, deformed; local cantilever beam handrails and their connections with deck have been severely displaced, deformed; local pipes and lines of ballast, fire protection and power supply & distribution systems have been deformed severely; local production facilities of platform have been destructed severely; local equipment module supporting structure has been deformed severely; and local natural gas flare boom and flare boom base have been deformed severely;

5 Collaps: main equipment members of platform have been severely deformed, fissured or have collapsed; ballast, fire protection and power supply & distribution systems have lost their operating and control functions; production facilities of platform have failed completely; equipment module supporting structure has been fractured or has collapsed; and natural gas flare boom and flare boom base have been fractured or have collapsed.

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16 Ground production facilities

16.1 Beam pumping unit

16.1.1 The following shall be checked when a beam pumping unit suffer destruction from the earthquake:

- 1 Check foundation for displacement, crack;
- 2 Check support for deformation, displacement and collapse; and check welds for crack;
- 3 Check horsehead, walking beam, equalizer, pitman arm and their related components for deformation, displacement; check pitman arm for fracture; check counter weight for displacement or shedding; and check wire line and beam hanger for damage;
- 4 Check motor for displacement or loosening; and check drive belts for shedding;
- 5 Check reducer casing for crack; check lube oil for seepage; and check whether input and output shafts rotate smoothly;
- 6 Check wellhead seal for seepage; and check electric cabinet for damage.

16.1.2 Earthquake destruction to beam pumping unit shall be classified according to the following:

- 1 Basically intact: foundation is free from displacement, crack; samson post of pumping unit isn't obviously deformed and displaced; all of welds on the samson post is free from crack; horsehead, walking beam, equalizer, pitman arm and their related components aren't damaged; position of counter weight isn't changed; motor, electric cabinet and belt aren't damaged; and there is seepage from seal of wellhead;
- 2 Minor damage: slight displacement or cracking of foundation has been induced; few anchor bolts have been loosened; few welds on samson post have been cracked; position of counter weight has been changed; belt has been shed or fractured; wire line has been fractured; and there is slight leaking at seal of wellhead;
- 3 Moderate damage: differential displacement of foundation has been induced or foundation has been partly cracked; most of anchor bolts have been loosened; whole pumping unit has been displaced slightly; there is lube oil leaking at reducer casing; bearings between beam and samson post body, between walking beam and crank have been damaged; and motor and electric cabinet have been damaged;
- 4 Severe damage: severe differential settlement of foundation has been induced; few welds on samson post have been fissured; pitman arm has been deformed; walking beam and horsehead have been shed; and bearings of input and output shafts have been damaged;
- 5 Collaps: severe differential settlement of foundation has been induced; base has been fissured severely; reducer casing has been fissured; samson post has been deformed or has collapsed; and crank has been fractured.

16.2 Blue elephant

16.2.1 The following shall be checked when a blue elephant suffer destruction from the earthquake:

- 1 Check foundation for displacement, crack;

2 Check frame and its related components for deformation, displacement and collapse; check welds for crack; and check guide pulley, roller for damage or shedding;

3 Check balance mechanism, reversing mechanism, steel rope, belt, chain and their related components, wire line and beam hanger for damage;

4 Check motor for displacement or loosening; and check belts for shedding or fracture;

5 Check reducer casing for crack; check lube oil for seepage; and check whether input and output shafts rotate smoothly;

6 Check wellhead seal for seepage; and check electric cabinet for damage.

16.2.2 Earthquake destruction to blue elephant shall be classified according to the following:

1 Basically intact: foundation is free from displacement, cracking; samson post body of pumping unit isn't deformed and displaced; all of welds on samson post body are free from crack; guide pulley, roller, balance mechanism, reversing mechanism and their related components aren't damaged; motor, electric cabinet and belt aren't damaged; and there is seepage from wellhead;

2 Minor damage: slight displacement or cracking of foundation has been induced; a few anchor bolts have been loosened; balance mechanism has been damaged slightly; motor belt has been shed or fractured; and there is slight leaking at wellhead;

3 Moderate damage: differential displacement of foundation has been induced or foundation has been partly cracked; most of anchor bolts have been loosened; few welds on samson post body have been fissured; whole pumping unit has been displaced; input and output shafts cannot be rotated; there is lube oil leaking at reducer casing; and motor and electric cabinet have been damaged;

4 Severe damage: severe differential settlement of foundation has been induced; bearings of input and output shafts have been damaged; reversing mechanism has been damaged; wire line, steel rope, belt, chain have been severely deformed or fractured; and guide pulley, roller have been shed;

5 Collaps: severe differential settlement of foundation has been induced; reducer casing has been fissured; and samson post body has been tilted severely or have collapsed.

16.3 Oil wellhead assembly

16.3.1 The following shall be checked when oil wellhead assembly suffer destruction from the earthquake:

1 Check casing head spool, tubing head spool, tubing head adapter, tee, spool, top connector for deformation or seepage; and check connecting bolts for loosening, deformation;

2 Check casing hanger, polished rod sealing device for deformation, seepage;

3 Check master valve, wing valve, choke valve, swab valve for malfunction;

4 Check pressure gauge for malfunction or damage.

16.3.2 Earthquake destruction to oil wellhead assembly shall be classified according to the following:

1 Basically intact: casing head spool, tubing head spool, tubing head adapter, tee, spool, top connector aren't deformed; there is no seepage from casing hanger, polished rod sealing device; master valve, wing valve, choke, swab valve are free from malfunction; and few connecting bolts have been loosened;

2 Minor damage: casing head spool, tubing head spool, tubing head adapter, tee, spool, top connector aren't deformed; there is no seepage from casing hanger, polished rod sealing device; wing valve, choke cannot be opened/closed properly; pressure gauge has failed or have been broken; and part

of connecting bolts have been loosened;

3 Moderate damage: casing head spool, tubing head spool, tubing head adapter, tee, spool, top connector aren't deformed; there is slight seepage from polished rod sealing device, tubing head; master valve, swab valve cannot be opened/closed properly; and most of connecting bolts have been loosened;

4 Severe damage: casing head spool, tubing head spool, tubing head adapter, tee, spool have been deformed; there is leaking at polished rod sealing device, tubing head; master valve, swab valve have failed; and part of connecting bolts have been fractured;

5 Collaps: wellhead assembly has been buried; casing head spool, tubing head spool, tubing head adapter have been deformed severely; and there is jet leakage.

16.4 Gas wellhead assembly

16.4.1 The following shall be checked when gas wellhead assembly suffer destruction from the earthquake:

1 Check casing head spool, tubing head spool, upper flange, connector for deformation or gas leakage; and check connecting bolts for loosening or deformation;

2 Check casing hanger for deformation, gas leakage;

3 Check master valve, wing valve, choke for malfunction;

4 Check pressure gauge for malfunction or damage.

16.4.2 Earthquake destruction to gas wellhead assembly shall be classified according to the following:

1 Basically intact: casing head spool, tubing head spool, upper flange aren't deformed; connector and casing hanger are free from leakage; master valve, wing valve, choke are free from malfunction; and few anchor bolts have been loosened;

2 Minor damage: casing head spool, tubing head spool, upper flange have been deformed slightly; there is slight seepage from connector and casing hanger; opening and closing of wing valve, choke are basically normal; operation of pressure gauge is basically normal; and few connecting bolts have been loosened;

3 Moderate damage: casing head spool, tubing head spool, upper flange have been deformed obviously; there is leaking at connector and casing hanger; master valve cannot be opened/closed properly; and most of connecting bolts have been loosened;

4 Severe damage: casing head spool, tubing head spool, upper flange have been deformed obviously; there is leaking at connector and casing hanger; master valve has failed; and part of connecting bolts have been fractured;

5 Collaps: wellhead assembly has been buried; casing head spool, tubing head spool, upper flange have been deformed severely; and there is jet leakage.

Appendix A Estimate of direct economic loss for earthquake destruction in petrochemical engineering

A.0.1 Estimate of direct economic loss for earthquake destruction in petrochemical engineering, excluding the damage resulted from other reasons before the earthquake, shall comply with the following basic principles:

- 1 Basically intact: estimate shall be performed according to the actual maintenance cost required;
- 2 Minor damage: estimate shall be performed according to the actual rehabilitation cost required;
- 3 Moderate damage: estimate shall be performed according to the costs required by actual rehabilitation and the costs for replacing few parts;
- 4 Severe damage: for the engineering requiring a great deal of replacements, repairs, estimate shall be performed according to actual replacement, overhauling costs;
- 5 Collaps: for the engineering without rehabilitation value, its net value shall be estimated by its current price multiplying by a depreciation factor. The value of the depreciation factor shall be determined based on the related regulations of the nation. For the engineering in use exceeding its depreciation life, the lower limit or salvage value should be used.

A.0.2 Count of direct economic loss and authentication of earthquake destruction classification of single structure or equipment in petrochemical engineering shall be performed according to the format requirements in Table A.0.2-1; and direct economic loss of earthquake destruction of por unit shall be summarized according to the format requirements in Table A.0.2-2.

Table A.0.2-1 Authentication of earthquake destruction classification and count of direct economic loss

Name of the unit:

Unit: Ten thousand RMB

Name of plant(workshop)		Name of earthquake	Time	Earthquake magnitude		Actual local earthquake intensity		
Name and tag number of unit	1	2	3	4	5	6	7	8
Quantity								
Overview of earthquake destruction								
Authentication of destruction classification	Basically intact							
	Minor damage							
	Moderate damage							
	Severe damage							
	Collaps							
Total direct economic loss								
Supervisor:		Prepared by:			Checked by:		Date of completion:	

Notes: 1 Site and building shall be in m²;

2 Others may be in pc(s), set(s) or m², etc. according to the actual situations.

Table A.0.2-2 Summary of direct economic loss for earthquake destruction in petrochemical engineering

Unit: Ten thousand RMB

Name of plant	Name of earthquake		Earthquake magnitude				Actually local earthquake intensity									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Name of classification	Site and soil foundation	Processing equipment	Process piping	Universal machine	Dynamic equipment	Chemical fibre equipment	Instrument, apparatus and computer (control) system	Electric and telecommunications equipment	Building	Other special structures	Onshore drilling platform	Offshore platform	Ground production facilities	Others		
Total														Total		
Quantity of basically intact																
Quantity																
Direct economic loss																
Quantity																
Direct economic loss																
Quantity																
Direct economic loss																
Quantity																
Direct economic loss																
Quantity																
Direct economic loss																
Quantity																
Direct economic loss																
Supervisor:	Prepared by:										Checked by:				Date of completion:	

Notes: 1 Site and building shall be expressed in m²;

2 Others may be expressed in pc(s), set(s) or m², etc. according to the actual situations.

Explanation of wording in this standard

1 Words used for different degrees of strictness are explained as follows in order to mark the differences in implementing the requirements of this standard.

1) Words denoting a very strict or mandatory requirement:

"Must" is used for affirmation, "must not" for negation.

2) Words denoting a strict requirement under normal conditions:

"Shall" is used for affirmation, "shall not" for negation.

3) Words denoting a permission of a slight choice or an indication of the most suitable choice when conditions permit:

"Should" is used for affirmation, "should not" for negation.

4) "May" is used to express the option available, sometimes with the conditional permit.

2 "Shall comply with..." or "Shall meet the requirements of..." is used in this standard to indicate that it is necessary to comply with the requirements stipulated in other relative standards and codes.

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