Seismic Measures for Gas Pipelines
Measures in Shizuoka Gas

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Shizuoka Gas Company
Production & Supply Department
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Basic policy for enhancing gas safety:

Establish safety systems based on new concept by 2010, reduce fatal accidents to minimal level and create a society where citizens can use city gas with peace of mind.

Main direction of discussions for rationalizing safety measures:

- Rationalization of gas safety measures based on principle of self-responsibility
  - In principle, gas suppliers and appliance manufacturers should be responsible for safety.
    - Obligation to submit, observe and disclose the safety regulations
    - Obligation to ensure that all gas facilities comply with technical standards
  - Minimization of the Government’s involvement
  - Mobile and effective use of ex post facto regulations
  - Ensuring information disclosure
Two approaches to city gas safety: technical standards & safety regulations

Regulations under the Gas Business Act

- **Regulations on gas facilities**
  - Obligation to conform to technical standards
  - Applicable to the construction, maintenance and operation of gas facilities

- **Regulations on gas utilities**
  - Obligation to submit and observe the safety regulations
  - Safety-related functional requirements applicable to the construction, maintenance and operation of gas facilities
Two approaches to city gas safety: technical standards & safety regulations

Obligation to conform to technical standards

To promote voluntary efforts to improve safety and quickly incorporate new technological findings, technical standards are formulated as a set of performance requirements for ensuring safety.

Article 28 of the Gas Business Act requires gas utilities to ensure their gas facilities comply with the technical standards established by ministerial orders.

An interpretation example is an example of technical specifications that are expected to result in a performance level required by the technical standards. These examples are useful when choosing actual technical specifications from available choices.

The seismic performance of gas pipelines is addressed by the interpretation examples provided for technical ministerial orders.
### Two approaches to city gas safety: technical standards & safety regulations

#### Obligation to submit and observe the safety regulations

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Two approaches to city gas safety: technical standards & safety regulations

Obligation to submit and observe the safety regulations

Safety regulations: “measures to emergencies including disaster”

**Measures to emergencies including disaster:**
- Establishing an organizational framework for disaster prevention
- Communication with counter-disaster organizations
- Public relations
- Education and training
- Decision-making about shutting off the supply in case of earthquake
- Request for rescue and support in case of emergency or disaster . . . etc.
Recent earthquake damages in Japan

Hyogo Nanbu Earthquake
Jan. 17, 1995
Depth: 14 km
Magnitude: Mj7.2
Gas supply stopped at:
approx. 8.57 million households
Recovery after: 85 days

Niigata Chuetsu Earthquake
Oct. 23, 2003
Depth: 13 km
Magnitude: Mj6.8
Gas supply stopped at:
26,000 households
Recovery after: 39 days

(Reference)
Niigata Chuetsu-oki earthquake
July 18, 2007
Depth: 17 km
Magnitude: Mj6.8

SHIZUOKA GAS
METI’s The Study Group Report on seismic measures for city gas

Improvement of seismic measures in the gas industry by gathering new findings, identifying challenges and discussing possible measures
Evaluation of the effectiveness of seismic measures for city gas after major recent earthquakes such as the Hyogo-ken Nanbu Earthquake

- The Study Group Report on seismic measures for city gas
  - published in January 1996 after the Hyogo Nanbu Earthquake

- The Study Group Report on seismic measures for city gas in the Niigata Chuetsu Earthquake
  - published in July 2005 after the Niigata Chuetsu Earthquake

• In October 2007, The Study Group regarding City Gas Industry and City Gas facilities was established after the Niigata Chuetsu-oki Earthquake.
The Japan Gas Association guidelines: the Earthquake Disaster Prevention Guidelines, etc.

Earthquake Disaster Prevention Guidelines (revised in March 2007)
A guideline for gas utilities to plan and review their seismic measures

Revised to incorporate recommendations from the Chuetsu Earthquake report

Seismic engineering guidelines
Aseismic design guidelines provided as interpretation examples
Guidelines for Emergency Measures for Gas Pipelines in Case of Earthquake
Guidelines for the Recovery of Gas Pipelines after an Earthquake
Seismic Measures in Shizuoka Gas

Three focuses of earthquake disaster prevention measures

1. Facility measures
   - Incorporation of aseismatic design for new installations
   - Replacement of existing screw-connection steel pipes

2. Emergency measures
   - Installation of intelligent gas meters
   - Configuration of an emergency shutoff system
   - Balanced implementation of the three measures

3. Recovery measures
   - Providing alternative heat sources
   - Establishing recovery blocks
   - Introducing a mapping system
Seismic Measures in Shizuoka Gas
Shizuoka gas supply area

Company profile:
Established: April 16, 1910
Number of customers: 317,441
(end of September, 2007)
Total gas pipeline length: 3,728 km
  High-pressure: 94 km
  Medium-pressure: 648 km
  Low-pressure: 2,986 km
Seismic Measures in Shizuoka Gas

1. Facility measures

- Earthquake-proof polyethylene pipes are used for many low-pressure main pipelines.
  - Reached 37% by the end of 2006.
- All high- and medium-pressure conduit pipes are weld-joined steel pipes.
- Existing screw-connection steel pipes without a coating layer are gradually being replaced.
  - We replaced 18.7 km of such pipes in FY2006.

* Pressure designation
- Low: less than 0.1 MPa
- Medium: 0.1 to 1.0 MPa
- High: 1.0 MPa and higher
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2. Emergency measures

- Installation of intelligent gas meters
  - Installed at 99.6% of customers (the end of June 2007)
- The supply area is divided into six emergency shutoff blocks.
- If seismic motions of 60 kinas (SI unit) or more are detected in any of the blocks, the supply to that block is shut off by remote operation.
- Seismometers are installed at 39 locations.

Remote monitoring and control by dedicated communication lines and satellite radio

Remote shutoff valve
Seismic Measures in Shizuoka Gas

2. Emergency measures – Installation of intelligent gas meters

- If the seismic sensor detected an earthquake; or
- an abnormally large amount of gas has leaked out; or
- gas is used over an abnormally long period; or
- gas pressure decreased:

Gas is shut off automatically.
When there is a major earthquake, Shizuoka Gas shuts off the gas supply by remote operation at high-pressure governor stations and at gas holders.
Seismic Measures in Shizuoka Gas

2. Emergency measures – Emergency shutoff blocks

Emergency shutoff blocks at present

- Shizuoka block
- Shimizu block
- Okitsu block
- Kanbara block
- Fuji/Fujinomiya block
- Numazu/Mishima block

Seismometer locations

Shizuoka Branch Office
Head Office
Sodeshi Base
Fuji Branch Office
Kanbara Governor Station
Okitsu Governor Station
Kanbara Sales Office
Okitsu Sales Office
Fuji/Fujinomiya Sales Office
Numazu Branch Office
Mishima Branch Office
Substitute Sales Office
Susono Sales Office
Fushimi Holder
Yoshiwara Plant
Kanbara Plant
Shizuoka Plant
Seismic Measures in Shizuoka Gas

2. Emergency measures – Configuration of a new emergency shutoff system

- Shutoff of supply only to affected areas
- Quick and reliable shutoff method
- Continuation of medium-pressure supply
Seismic Measures in Shizuoka Gas (2. Emergency measures)

Configuration of a new emergency shutoff system – Installation of seismometers

- Installation of seismometers at 479 locations (at all low-pressure governors) in the Shizuoka Gas supply area
- Each seismometer automatically shuts off the supply when it has detected seismic motions of a preset intensity level or higher.
- Shutoff by remote operation is also possible.

Example:
Shizuoka block (Number of customer is 134,293)

The Japan Metrological Agency has installed seismometers (including seismic intensity monitors) at 25 locations in Shizuoka Prefecture.
Seismic Measures in Shizuoka Gas

3. Recovery measures

- Provision of alternative heat sources
  - For important facilities that should recover quickly from disaster

- Establishment of recovery blocks
  - Dividing the total of about 300,000 customer sites into 620 blocks

- Introduction of a mapping system
  - Prompt supply of gas pipelines information to rescue JGA and gas utilities
Seismic Measures in Shizuoka Gas

3. Recovery measures – Portable gas production units

- Identifying emergency hospitals and other customer sites that are important to society
- Quickly offering a means for emergency gas supply such as portable gas production units

- Propane and air type units: 22 units are available.

- Compressed natural gas type units: 7 units are available.

- Portable stoves: 1,200 units are available.
Seismic Measures in Shizuoka Gas

3. Recovery measures – Introduction and maintenance of a mapping system
Seismic Measures in Shizuoka Gas

3. Recovery measures – Establishment of recovery blocks

- Portioning of low-pressure pipeline networks
- Registration of recovery block boundaries
- A system for creating and updating lists of customers by recovery blocks

Recovery block lines
Low-pressure mains and branches
Service pipe and house pipe
Thank you for your attention.

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