

# **Maintenance of House Pipes in Japan's City Gas Industry: Regulations and Voluntary Initiatives by Gas Utilities**

October 2015

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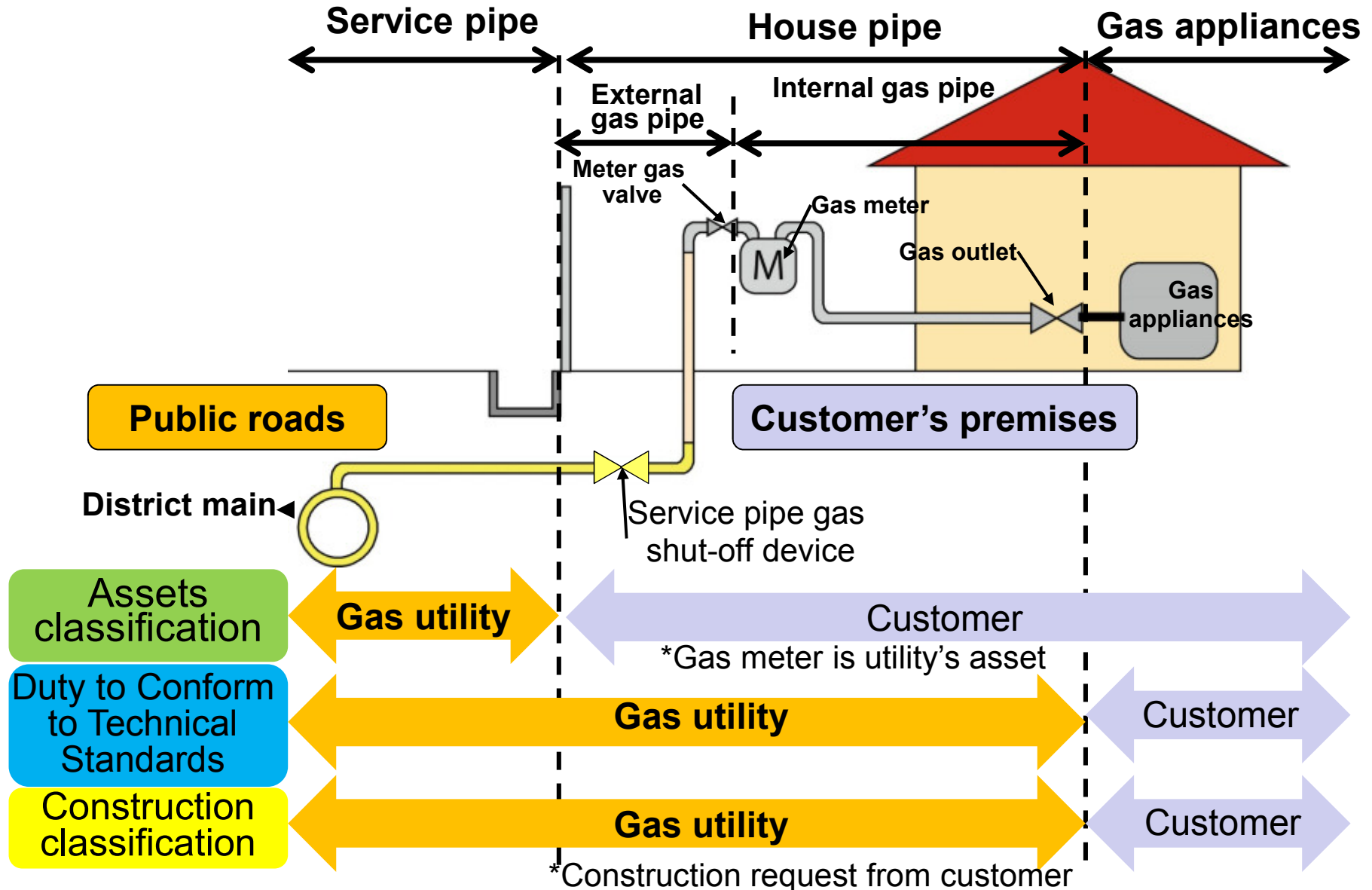
# I. Overview of Customer's Gas Facilities (House Pipes): Types of Pipe

- General gas utilities in Japan: 206 utilities
- No. of general gas utility users (no. of installed meters): approx. 29 million
- No. of laid gas pipes: approx. 14 million

## Main types of pipe used for gas pipes

Type of Pipe	Photo	Joining Method	Main Areas of Use
Polyethylene pipe		Fusion joint Mechanical joint	Underground buried sections
Polyethylene-coated pipe		Mechanical joint Welded joint	Underground buried sections Exposed sections in corrosive atmospheres
PVC-coated steel pipe		Screwed joint Mechanical joint	Buried sections/outdoor exposed sections Exposed sections in corrosive atmospheres
Galvanized steel pipe		Screwed joint	Indoor exposed sections (including concealed sections) (also used for buried sections until the 1980s)
Stainless steel flexible pipe (flex pipe)		Mechanical joint Screwed joint	Internal gas pipes (sheathed pipe is used if buried)

# 1. Outline of customer's gas Facilities (house pipe) <division of duty>



## I. Overview of Customer's Gas Facilities (House Pipes): Maintenance

House pipes are maintained through the installation of safety equipment/facilities and leak detection tests based on regulations and voluntary initiatives by gas utilities.

### I. House Pipe Maintenance-Related Regulations

#### ◆ Installation of safety equipment

Intelligent meters, various gas shut-off devices, etc. (including equipment not stipulated by regulations)

#### ◆ Leak detection tests

Leak detection tests based on stipulated frequency and method

### II. Voluntary Initiatives by Gas Utilities

**The following are two essential issues relating to house pipe maintenance in Japan:**

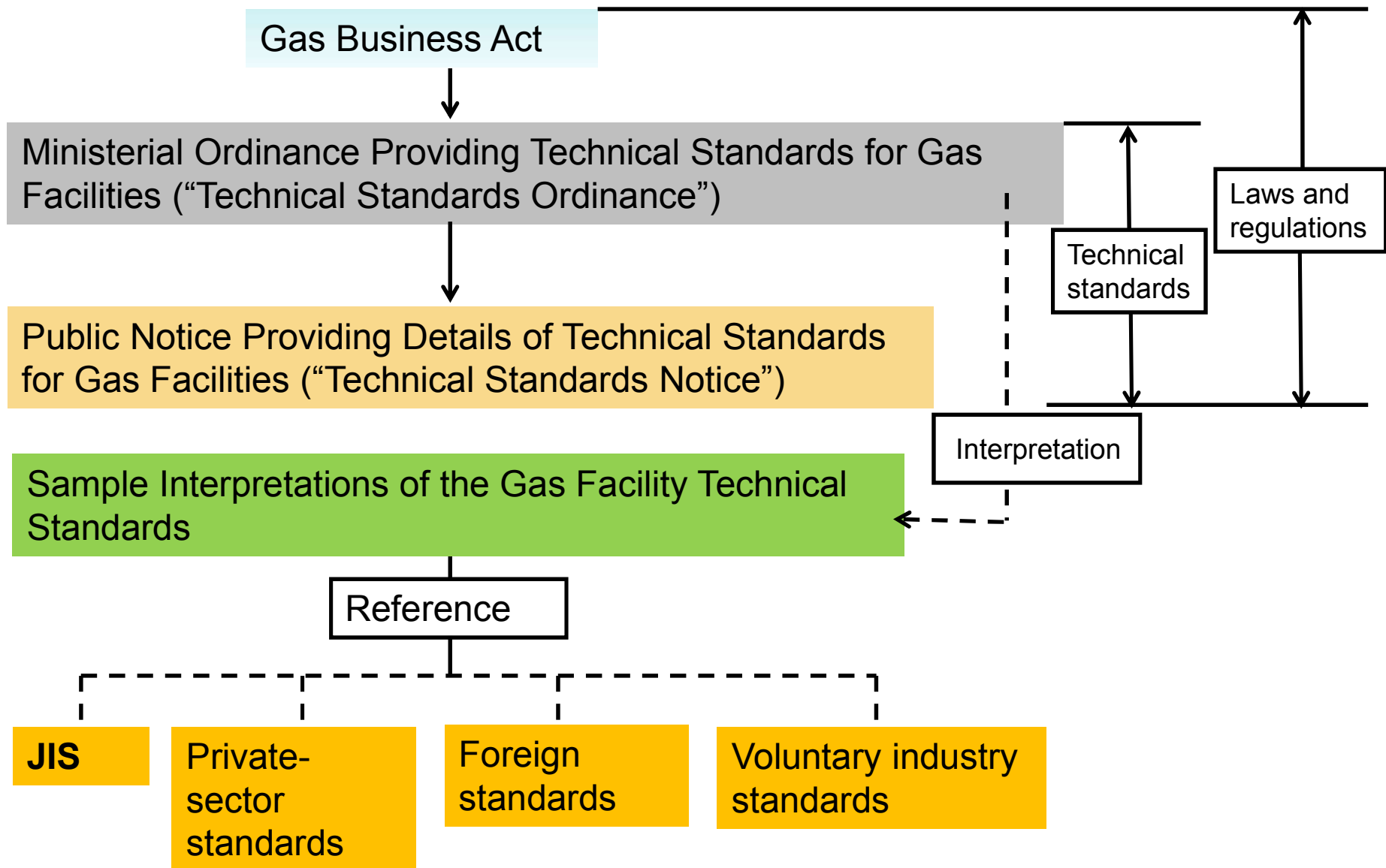
#### ◆ Countermeasures for aged buried house pipes

Promoting improvement of pipelines at risk of corrosion on user property

#### ◆ Countermeasures to prevent damage from third party construction on user property

Preventing damage to gas pipes due to construction work, etc., by companies other than gas utilities on user property

## II. Legislation concerning pipeline maintenance



## II. House Pipe Maintenance-Related Regulations: Building Classification

Safety measures are implemented based on user characteristics (building purpose, type of gas usage, etc.), and for the purpose of ensuring safety, buildings that use gas are divided into 11 Classifications.

Building Classification		Overview	Safety Priority Ranking
1	Specified underground mall	Large-scale underground malls, semi-underground malls, etc. (basement areas only)	1
2	Specified basement	Large-scale basement, etc. (basement areas only)	2
3	Skyscraper	Building exceeding 60 m in height (including residential skyscrapers)	3
4	High-rise building	Building exceeding 31 m in height (including residential high-rise buildings)	5
5	Specified large building	Building used for specific business purposes with converted total Qmax gas meter reading of 180 m <sup>3</sup> /h or more	4
6	Specified medium building	Building used for specific business purposes with converted total Qmax gas meter reading of 30 m <sup>3</sup> /h or more	6
7	Specified public building	Building used for specific public purposes with converted total Qmax gas meter reading of 30 m <sup>3</sup> /h or more	7
8	Industrial building	Building used for industrial purposes with converted total Qmax gas meter reading of 90 m <sup>3</sup> /h or more	8
9	General commercial building	Building used for business purposes with gas meter	9
10	General housing complex	Building used for residential purposes only with 2 or more gas users	10
11	General housing	Building used for residential purposes only with 1 gas user	11

## II. House Pipe Maintenance-Related Regulations: Safety Equipment

- Installation of safety equipment based on the building category is mandatory.

Building Classification		Micon meter	Service pipe gas shut-off device	Emergency gas shut-off device	Gas alarm, etc.
1	Specified underground mall	○	○	○	○
2	Specified basement	○	○	○	○
3	Skyscraper	○	○	○	○
4	High-rise building	○	○	—	—
5	Specified large building	○	○	○	○
6	Specified medium building	○	○  (Service pipe with aperture of 70 mm or more, pipe supplying underground room, etc.)	—	—
7	Specified public building	○		—	—
8	Industrial building	○		—	—
9	General commercial building	○		—	—
10	General housing complex	○		—	—
11	General housing	○	—	—	



# Main Functions of Intelligent Meters (for Reference)

Installation became compulsory in 1997. 100% installation rate for low-pressure users (excluding some special cases).

## 1. Gas shut-off functions

**Excess flow rate shut-off function** (Designated by law)

Shuts off **the gas if excess flow** due to a damaged gas pipe or the like is detected

**Seismic shut-off function** (Designated by law)

Shuts off the gas if **an earthquake with an intensity equivalent to a strong 5** (approx. 200 gal+) or more is detected

**Pressure reduction shut-off function** (Designated by law)

Shuts off the gas if an **abnormal gas pressure** reduction (approx. 300 Pa or less) is detected

**Continued usage shut-off function**

Shuts off the gas if **it detects that gas is being used continuously for an abnormally long time with no variation in flow rate**



## 2. Warning functions

**Gas leak warning function**

If **gas continues to flow for 30 days in a row**, this function will deem that there is a risk of a gas leak and a display light will flash.

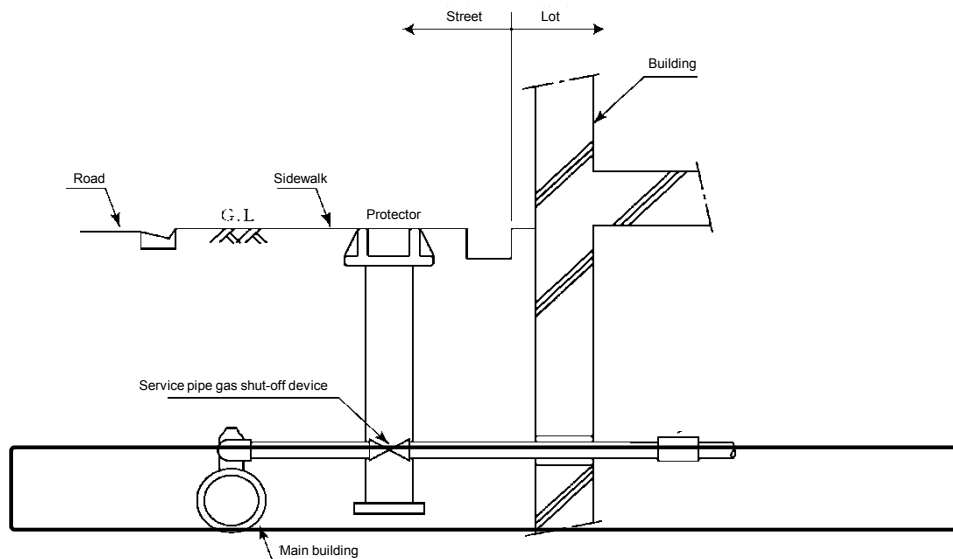
## 3. Other safety functions

**Safety restoration function**

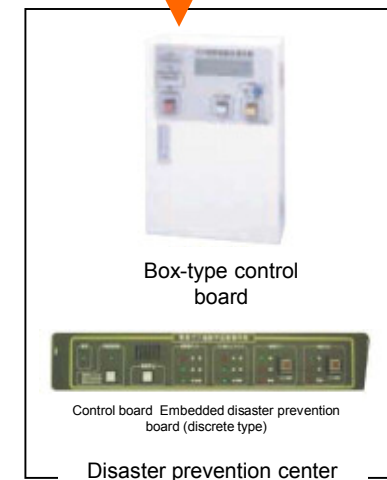
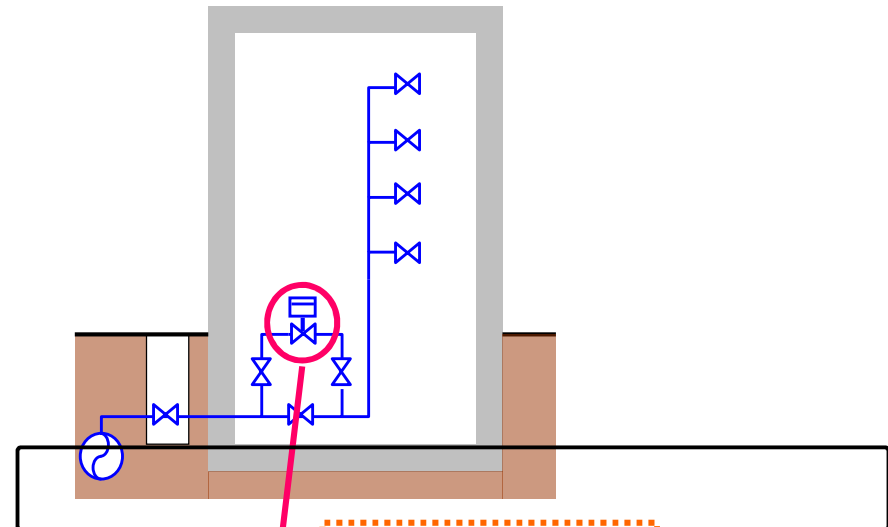
**Customers may easily restore micon meters for which the above cut-off functions were activated** by pressing the restore button. At this time, it will **take about 2 minutes to check** whether there is a gas leak, whether the indoor gas valve has been left open, etc.

Service Pipe Gas Shut-Off Devices and Emergency Gas Shut-Off Devices (for Reference)

Service pipe gas shut-off device



Emergency gas shut-off device



## II. House Pipe Maintenance-Related Regulations: Leak Detection Tests

It is obligatory to check pipelines (house pipes) laid from pipelines buried under roads to gas valves for leaks at the following frequencies, using an appropriate method, starting from the day they are laid.

Category	Frequency
Class 1 buildings (Specified underground mall) Class 2 buildings (Specified basement )	At least once per 14 months
Other than the above	At least once per 40 months

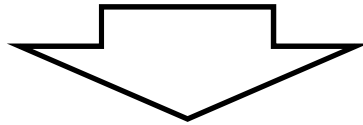
- ◆ **Stipulated leak detection tests include using a gas detector, boring, and pressure retention.**
- ◆ **The main methods used in practice are pressure retention or a gas detector (semi-conductor type)**

\*Leak detection test does not apply in the following circumstances:

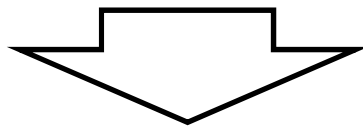
- ✓ Areas within the range of an appropriate leak detector (intelligent meter)
- ✓ If entry is refused by the owner or occupant
- ✓ Sections where polyethylene pipe is used
- ✓ Outdoor sections that are not buried

III-1. Countermeasures for Aged Buried House Pipes (Galvanized Steel Pipes): Chronology

From the 1950s through the 1980s, many gas utilities used “Galvanized steel pipes” for buried sections



In the 1990s, the possibility of serious accidents due to leaks from corroded galvanized steel pipes became apparent and received significant attention as a social issue  
◆ In 1996, the use of white gas pipes for buried sections was prohibited



This is a key safety-related issue in the city gas industry, and countermeasures for aged buried gas pipes supplying high-risk buildings are underway with the aim of completing implementation by the end of fiscal 2015

### III-1. Countermeasures for Aged Buried House Pipes: Risk Management

- There is a huge number of buried Galvanized steel pipes (approx. 3 million)
- The corrosion environment and degree of impact in the event of an accident vary depending on the building



**Necessary to carry out improvement work effectively for reasonable cost**

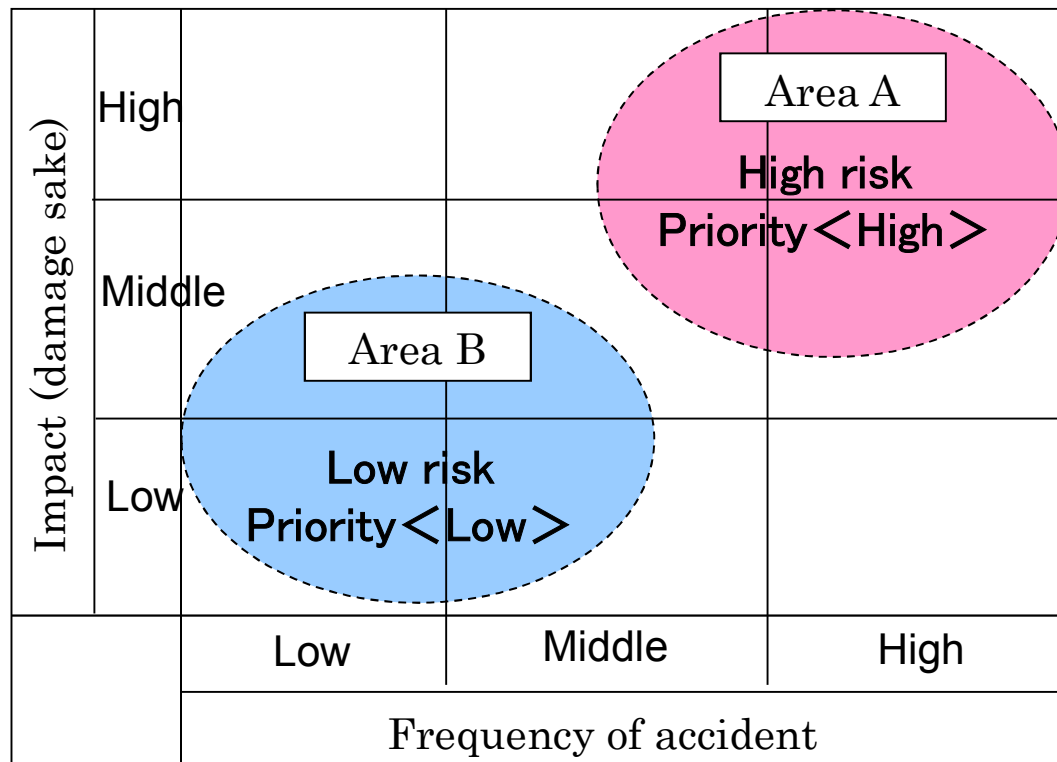


**Important to prioritize pipelines for action**

As the degree of corrosion varies widely according to the underground environment, improvement work needs to be targeted at pipes that have deteriorated more or whose failure would have a greater impact.

III-1. Countermeasures for Aged Buried House Pipes: Basic Approach to Assigning Priority Rankings

For house pipes for which countermeasures will be implemented, the order of priority and implementation timeline are determined by **considering the frequency of gas leak accidents and impact of accidents.**



★ Approach to risk of accident

$$\begin{aligned}
 & \text{(Risk of accident)} \\
 & = \text{(Frequency of accident by gas leak)} \\
 & \quad \times \text{(Impact of accident)}
 \end{aligned}$$

### III-1. Countermeasures for Aged Buried House Pipes: High-Risk Buildings and Issues

Buildings in Class 1 to 7, schools, and reinforced steel-structure buildings in Class 8 to 10 are considered high-risk buildings for which safety is essential, and efforts are being made to address them. Issues include improving users' understanding of the asset classification of gas facilities and improving the upgrade cost burden borne by users.

Building Category	Reinforced steel-structure buildings	Wooden-structure buildings
1	<b>High-risk buildings</b>	
2		
3		
4		
5		
6		
7		
8		
9	*Includes wooden-structure schools, etc.	
10		
11		

#### Issues

##### ◆ Gas pipes are a user asset

Low recognition of the asset classification of gas facilities.  
 →PR relating to gas pipe asset classification via various business opportunities.

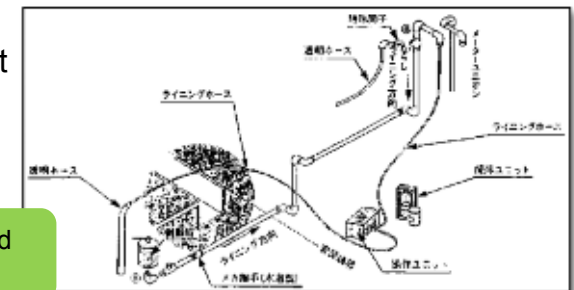


##### ◆ To make improvements, users' understanding and co-operation (sharing upgrade cost burden) is vital

The cost burden is an impediment that stops users agreeing to improvements.

→Encouraging improvement based on national subsidy program.

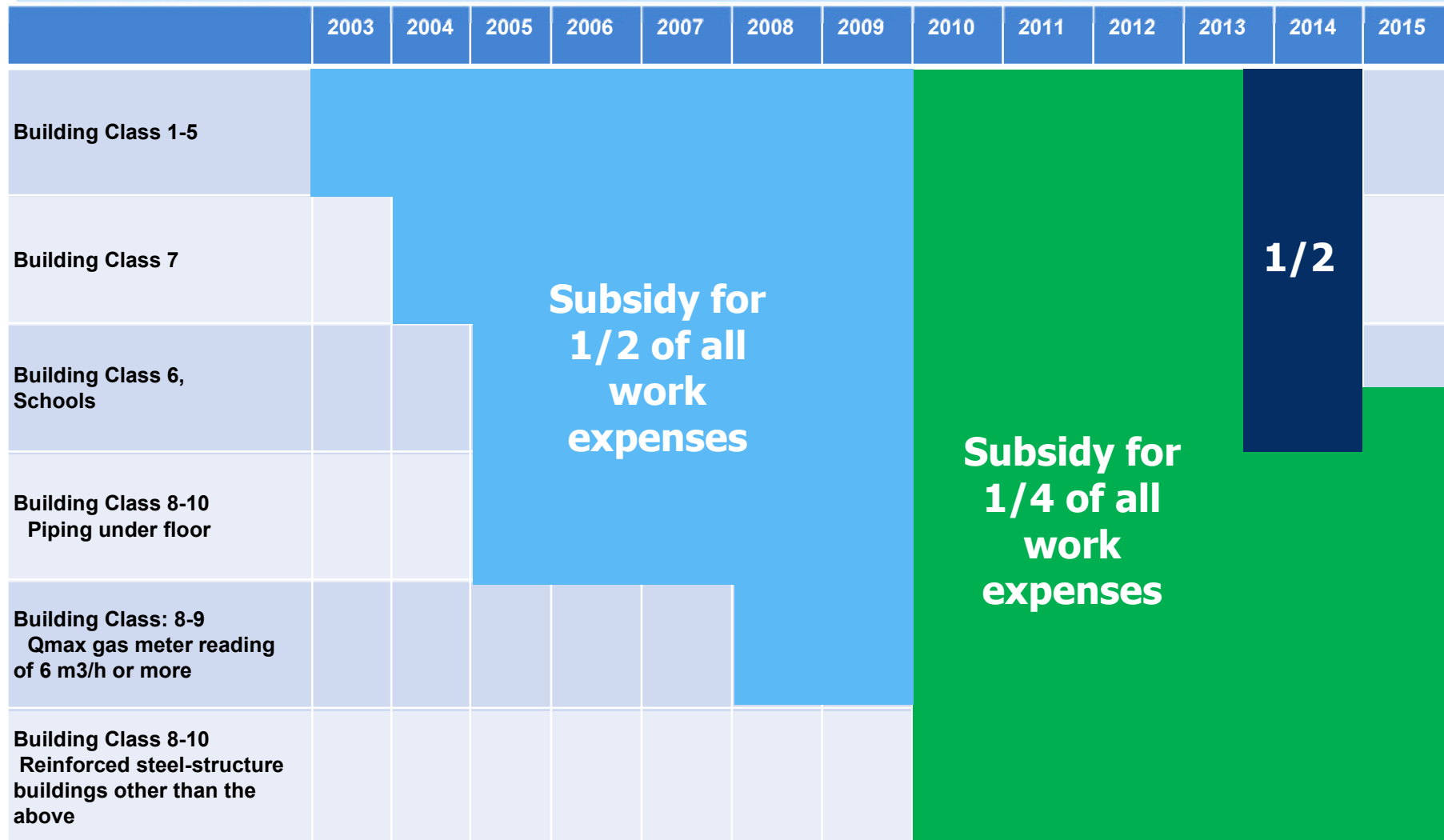
→Proposing methods that minimize the cost to users (e.g., rehabilitation and repair method)



Example of rehabilitation and repair method

# Changes in National Subsidy Program (for Reference)

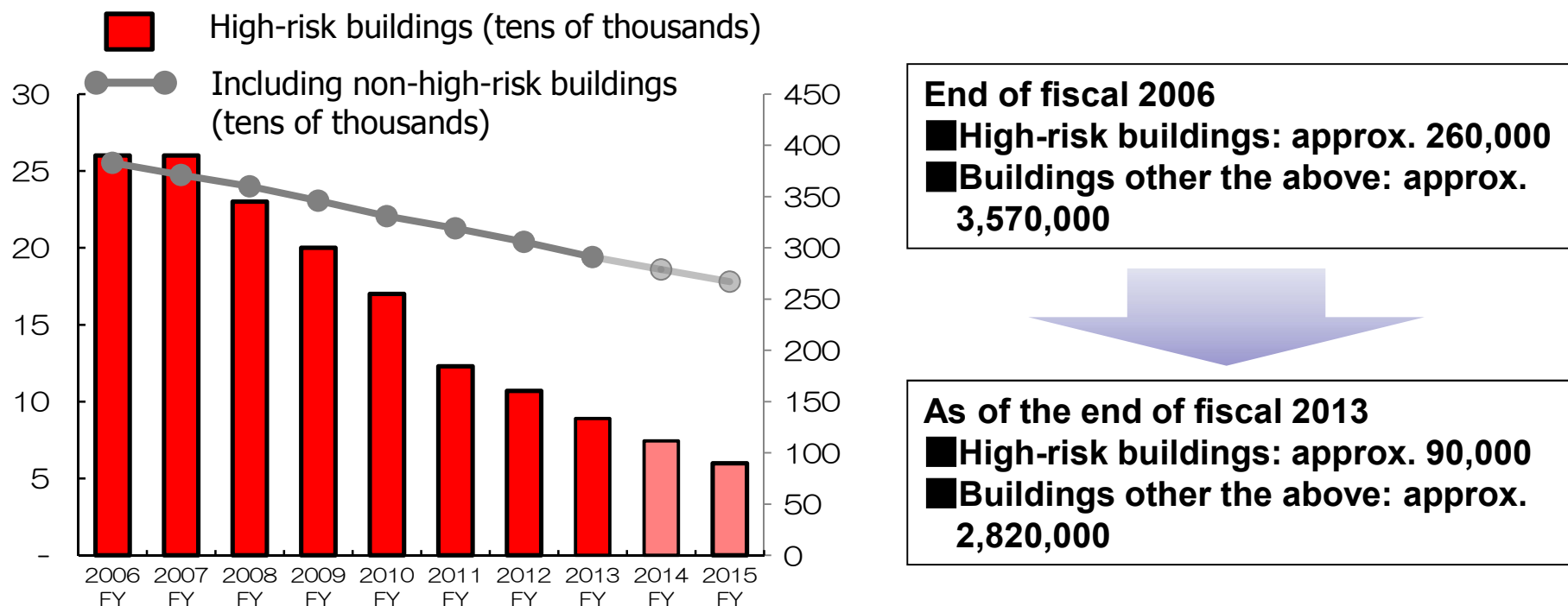
In 2003, a national subsidy program was introduced to cover upgrading work costs for aged buried house pipes, and it has gradually increased in scope. Utilities encourage customers to make improvements using these subsidies.





## III-1. Countermeasures for Aged Buried House Pipes: Changes in Remaining Amount

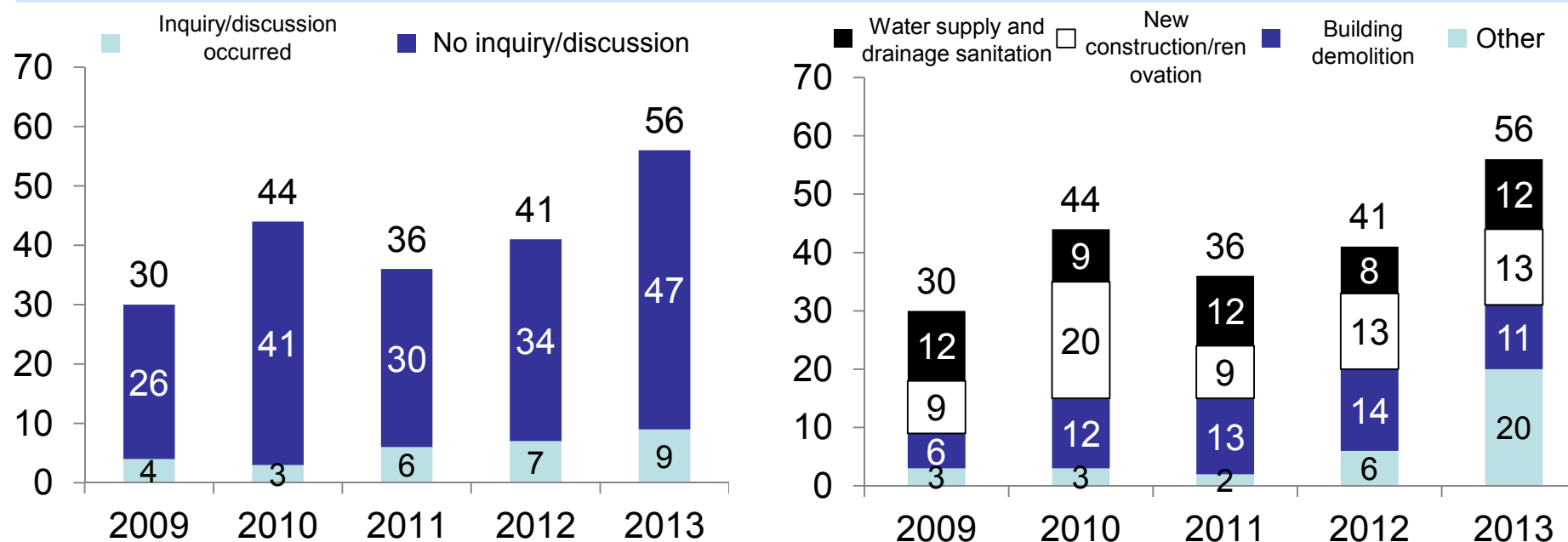
Issues include improving users' understanding of the asset classification of gas structures and improving the upgrade cost burden borne by users.



- The aim is to upgrade as many buildings as possible by the end of fiscal 2015.
- For buildings where users' understanding and co-operation in upgrades has not been obtained, utilities will conduct appropriate maintenance with a view to proactive prevention of accidents while continuing to take advantage of various business opportunities to pursue publicity and PR activities.

III-2: Countermeasures for Damage from Third Party Construction on User Property:  
Accident Incidence Conditions

In recent years, incidence of gas pipe damage due to work by companies other than city gas utilities on user property has remained at the same level. These projects are of various kinds.



◆ Looking at the past 5 years, the ratio of damage-causing accidents where there was no advance inquiry/discussion with the gas utility is high.

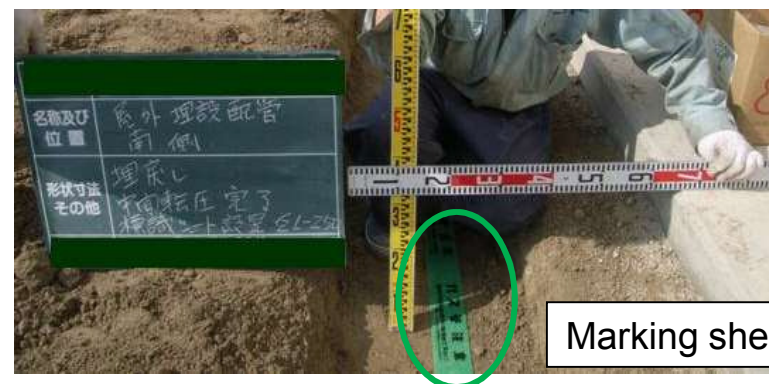
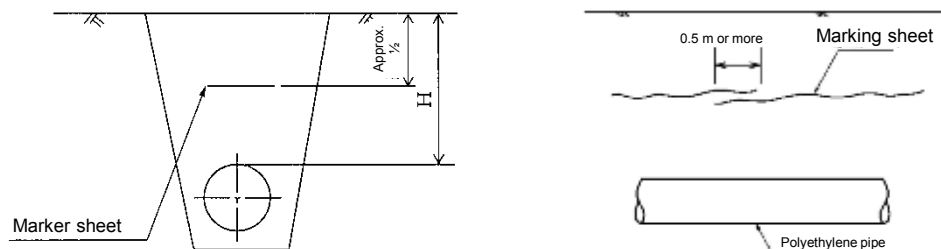


◆ In addition to implementing preventive countermeasures when laying gas pipes, it is necessary to encourage construction contractors and the like to make inquiries to gas utilities in advance and implement visible countermeasures that promote awareness of gas pipes in the field.

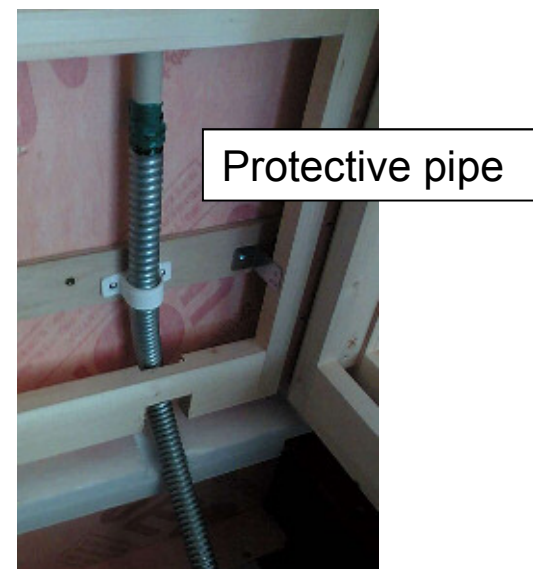
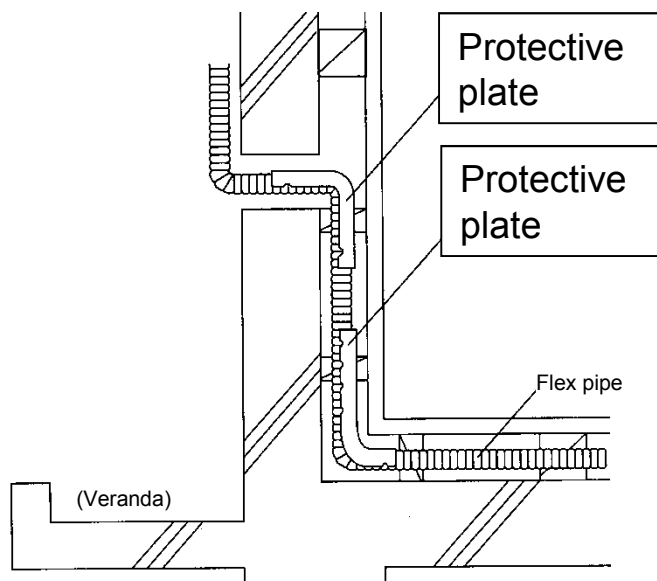
III-2: Countermeasures for Damage from Third Party Construction on User Property:  
Accident Prevention Initiatives—Preventive Countermeasures

- Laying of marking sheets directly above PE pipes in order to prevent damage during excavation work, etc.
- Laying of protective metal plates/pipes in places where flex pipe is liable to be damaged by nailing

Marker sheet (PE pipeline)



Protective plate/pipe (flex pipe)



III-2: Countermeasures for Damage from Third Party Construction on User Property:  
Accident Prevention Initiatives—Encouraging Inquiries/Clearly Marking Gas Pipes

Utilities are proceeding with a combination of invisible countermeasures (encouraging inquiries before work, collecting information about projects by other companies) and visible countermeasures (promoting awareness of gas pipes in the field).

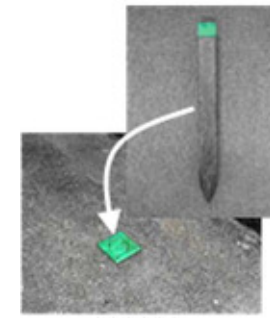
Initiatives to encourage inquiries

- Asking construction contractors and organizations to make inquiries in advance
- Asking customers to inform us about planned large-scale renovation work, etc.
- Proactively identifying construction projects for which no inquiries have been made



Visible countermeasures to promote awareness of gas pipes in the field

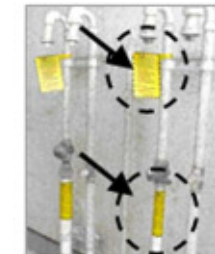
- Gas pipe indicator tape (in areas where gas pipes and other facilities are crowded together, etc.)
- Installing marking stakes, marking pins, marking plates, marking stickers, etc.



Marking stake



Marking sticker



Tag, label

In future, utilities will continue to make diligent efforts.

## Conclusion

### Countermeasures for aged buried house pipes

- ◆ The aim is to upgrade as many buildings as possible by the end of fiscal 2015.
- ◆ For buildings where users' understanding and co-operation in upgrades has not been obtained, utilities will conduct appropriate maintenance with a view to proactive prevention of accidents while continuing to pursue publicity and PR activities.

### Countermeasures to prevent damage from third party construction on user property

- ◆ Utilities will continue to make diligent efforts to prevent house pipe damage.

Thank you for your attention.

October 2015

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The following pages are reference materials.

# Example of Factors Considered in Priority Ranking (for Reference)

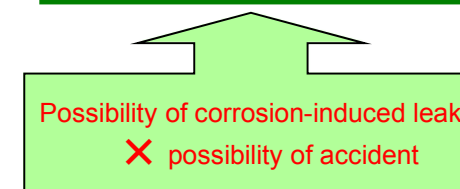
Indicators are divided into three categories: “possibility of corrosion-induced leak,” “possibility of accident after leak,” and “extent of impact if an accident occurs.”

Indicator		Factor
Likelihood of accident occurring	Possibility of corrosion-induced leak	No. of years buried underground
		Type of Pipe
		Accident (corrosion-induced leak) history
		Burial environment
		Macrocell corrosion diagnostics result (categorization based on maximum corrosion depth and original thickness of pipe)
Possibility of accident after leak	Possibility of accident after leak	Likelihood of leaked gas build-up (high priority for pipes buried under buildings)
		Likelihood of leaked gas build-up (high priority for highly air-tight reinforced concrete-structure buildings)
Extent of impact if an accident occurs		Building Classification
		Building use
		No. of meters

## ★ Approach to accident risk

(Accident risk)

$$= \underline{\underline{(\text{Likelihood of accident occurring})}}$$



$$\times (\text{extent of impact if accident occurs})$$



Countermeasure Implementation Priority Ranking: Example of Establishing Specific Priority Ranking

Establishing priority ranking by focusing on building classification, building use, building structure, and conditions of pipe buried under building

- ✓ Building classification: 1-5
- ✓ Building use: highly frequented public building
- ✓ Building structure: highly airtight reinforced concrete building
- ✓ Building where leaked gas is likely to build up with pipes buried under it

**Treated as priority building for implementing countermeasures**

		Pipes buried under building	
		Yes	No
(1)	Building Class 1-5	Priority ranking = I	
(2)	Building used as school or hospital in building class 6-10	Priority ranking = III	Priority ranking = II
(3)	Reinforced concrete building in building class 6-10, excluding (2)	Priority ranking = IV	Priority ranking = III
(4)	Other than the above	Priority ranking = VI	Priority ranking = V

## Preventing Damage from Third Party Construction on User Property: Example of Initiatives by Ministry of Economy, Trade, and Industry (for Reference)

### Inter-ministry collaboration

Submission of written requests via the Ministry of Health, Labour and Welfare and the Ministry of Land, Infrastructure, Transport and Tourism to relevant industry groups asking them to help prevent gas pipe damage.

### Gas safety information PR activities

Running newspaper, magazine, radio, and Internet advertisements aimed at gas users, etc., and providing education relating to city gas safety in order to reduce gas accidents.

Along with this, utilities analyze past accidents and aim to promote further understanding through timely, appropriate dissemination of safety information to users with respect to initiatives by the government and gas utilities (e.g., gas supply/restoration conditions in the event of a disaster).



[http://www.meti.go.jp/policy/safety\\_security/industrial\\_safety/sangyo/citygas/aikotobademinaoshitai/use/koji/index.html](http://www.meti.go.jp/policy/safety_security/industrial_safety/sangyo/citygas/aikotobademinaoshitai/use/koji/index.html)

Ministry of Economy, Trade and Industry “Gas Safety Review Team” website (for reference)

## Prevention of Damage from Third party construction on User Property: Example of Initiatives by Gas Utilities (for Reference)

### Initiatives to encourage inquiries before work

Asking contractors and organizations to make inquiries in advance

- Distribution of notification stickers and holding of damage prevention education sessions aimed at construction sector and demolition companies
- In-person visits to relevant companies for damage prevention education sessions immediately after damage occurs
- Requesting that condominium management associations, education committees, etc., make inquiries in advance of undertaking work

Requests to customers

- Notices sent via direct mail to educational facilities before long vacation periods explaining the need to contact gas utilities in advance of work
- Similar notices via direct mail to buildings where large numbers of people come and go

Proactively identifying construction projects for which no notification has been received

- Patrolling areas where an accident would have a major impact
- Collecting information via various business opportunities (sales opportunities, etc.)



Flyers and posters



Safety education DVD