

# Legal Consideration of Medium Pressure Helium Tanks

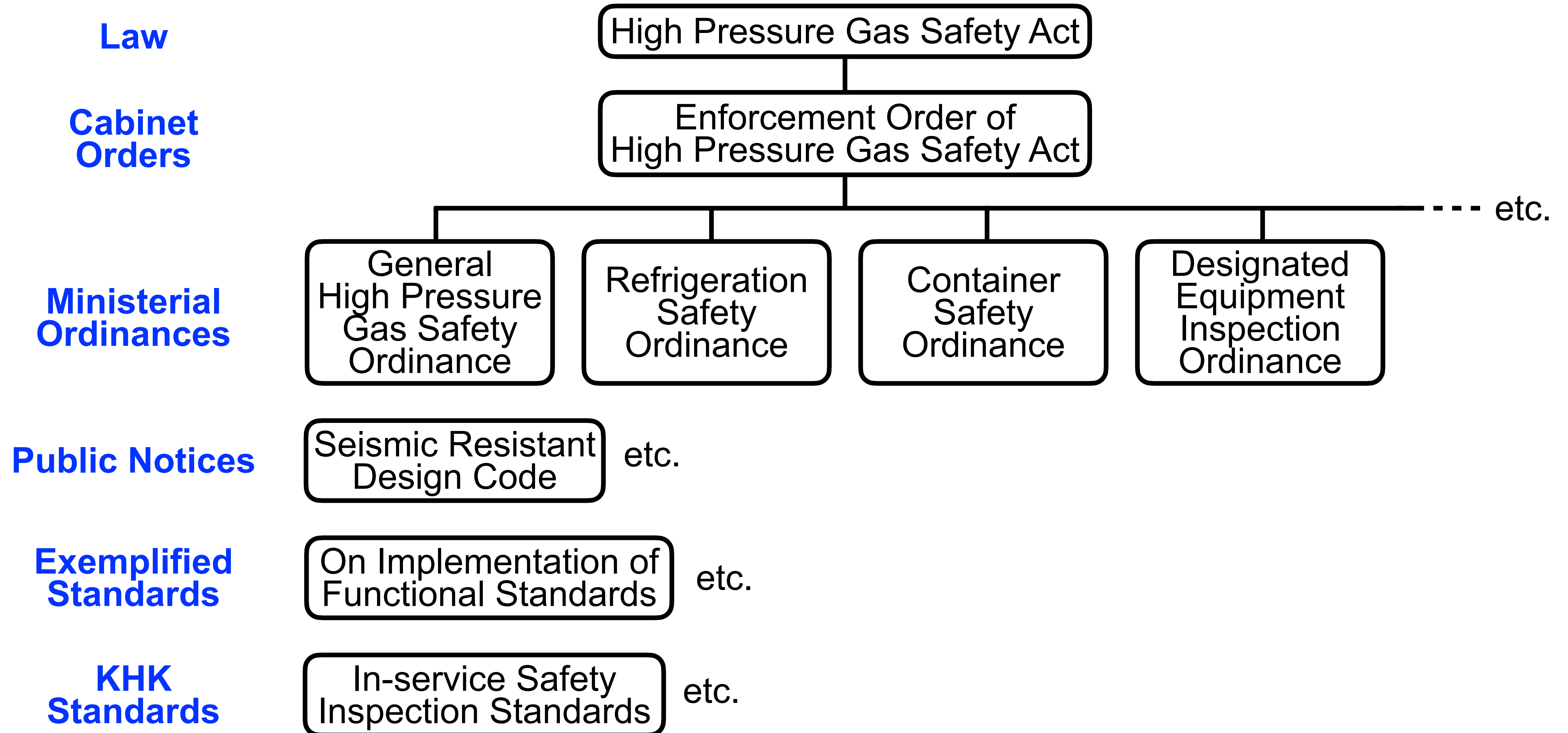
NAKAI Hirotaka, KEK

# Competent Authorities

- \* The Ministry of Economy, Trade and Industry (METI)
- \* The High Pressure Gas Safety Institute of Japan (KHK)  
under METI by the act
- \* Prefectural Government  
Ibaraki prefecture for KEK  
Iwate prefecture for ILC



# Legal Hierarchy



# General and Refrigeration Ordinances

- \* General High Pressure Gas Safety Ordinance
  - \* Open-loop system (liquified helium can be taken out)
  - \* Safety inspection and periodical self inspection (once a year each) required (inspections performed alternately every half year)
  - \* Supervisory safety workers on duty during operation
- \* Refrigeration Safety Ordinance
  - \* Closed-loop system (no gas escaped even if system stopped abnormally)
  - \* No Supervisory safety worker necessary during operation
  - \* Only periodical self inspection required once a year (safety inspection exempted for helium refrigerators)



# Designated Equipments

## Categories of Designated Equipment (Article 2 of the Equipment Ordinance)

- 1) Tower --- Tower-shaped equipment
- 2) Reactor --- Equipment to generate chemical reactions
- 3) Spherical tanks --- Spherical shaped storage tanks
- 4) Flat-bottom cylindrical tanks --- Cylindrical storage tanks with a flat bottom
- 5) Rock cavern storage --- Storage utilizing space in bedrock
- 6) Heat exchanger --- Equipment to exchange heat between two fluid bodies
- 7) Evaporator --- Equipment to vaporize liquefied gas
- 8) Condenser --- Equipment to liquefy compressed gas
- 9) Furnace --- Equipment to heat high pressure gas
- 10) Vertical cylindrical tanks --- Vertically placed cylindrical tanks
- 11) Horizontal cylindrical tanks --- Horizontally placed cylindrical tanks
- 12) Bulk storage tanks --- Storage tanks for LPG
- 13) Other pressure vessels --- Equipment other than 1), 2), 6) to 9).

10



Photo 1: Towers



Photo 2: Heat exchanger



Photo 3: Spherical tanks



Photo 4: Vertical cylindrical tanks



Photo 5: Horizontal cylindrical tanks

cited from KHK documents



# Medium Pressure Helium Tanks

- \* Medium pressure helium tanks are “designated equipments”
- \* Manufactured under the Designated Equipment Inspection Ordinance
- \* Inspection of tanks
  - \* Intervals of inspection
    - \* First inspection in 2 years after manufacture
    - \* Every 3 years after 1st inspection
  - \* Inspections
    - \* Visual inspection inside tanks
    - \* Non-destructive inspection for weld zone



# Exempt Case at KEK with Ibaraki-ken

- \* Inspections exempted for helium tanks at KEK by negotiation with Ibaraki prefecture
  - \* Helium is inactive gas (no rust formed inside)
  - \* To avoid performance degradation because of exposure to air
- \* Only leak test and safety valve check performed as self inspection for refrigeration facilities at KEK



# Summary

- \* Refrigeration Safety Ordinance applicable to ILC cryogenic systems, even helium gas storage tanks employed
  - \* Cryogenic system for the International Fusion Material Irradiation Facility (IFMIF) in Japan already approved under Refrigeration Safety Ordinance
- \* Helium tank inspection can be exempted by negotiation with relevant prefecture

