V i s u a l

I n s p e c t i o n a n d

N u c l i d e

I n d e n t i f i c a t i o n

S y s t e m f o r

H i g h l e v e l r a d w a s t e

Waste Storage Facility

The waste storage facility (WSF) is a building, used for the interim storage of highlevel and mediumlevel radwaste. The radwaste is stored in drums in special basements, covered by thick steel and concrete leads. After a maximum period of five years, the radwaste is transported to the central organization for radioactive waste (COVRA) for final disposal. At the moment a clean-up programme has started which aim is to reduce and then to move the highlevel radwaste of the Netherlands Energy Foundation ECN to COVRA.

To have insight in the costs of clean-up of the WSF it is necessary to know the composition, filling rate and weight of the contents as well as the condition of the drums with highlevel radwaste stored in the WSF. For this purpose the so called 'measuring and inspection campaign' has been set up. With the obtained information of this campaign strategies, for reduction of the volume of the highlevel radwaste can be made.

For the measuring and inspection campaign a special device, the so called VINISH, was build. VINISH is a Visual Inspection and Nuclide Identification System for High level radwaste. It is equiped as follows:

- a CCD-camera and halogen lamps for visual inspection,
- a high purity germanium crystal for gamma spectrometry,
- 4 meters for doserate measurements,
- a collimator system for reducing the doserate on the germanium crystal,
- a rotation system which rotates the waste drums during the measurements and visual inspection.

The doserate measurements, gamma spectrometry and visual inspection are performed at the same time. The rotation of the waste drums is continuous during these operations. A waste drum is examined at 3 or 4 consecutive positions depending on the height of the waste drum.

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Given:

with instrument used, materials examined, ...

1600 drums filled with
high level radwaste.

Request:

γ-contents,
weight,
dose rate at surface,
condition,
filling grade.

Answer:

Visual
Inspection and
Nuclide
Indentification
System for
High level radwaste

definition: high level radwaste = HAVA
HAVA > 20 mSv/h at surface

Why?

1 nuclear part of ECN split off:
new company NRG.

NRG inherits ECN HAVA,
ECN pays inheritance:
clean-up of ECN HAVA.

question:
costs for clean-up?

facilities for storage of hig - level radwaste

2 HABOG at COVRA site.

ORDER: within 3 years after HABOG completion, all ECN HAVA -> COVRA.

question:
1600 drums of HAVA at NRG -> 500 positions for HAVA drums at HABOG?

load of ECN on HABOG capacity.

VINISH

Visual
Inspection and
Nuclide
Indentification
System for
High level radwaste

Visual inspection

- CCD-camera → drum surface + identification (in Pb glas shielded)
- PAL-monitors
- halogen lamps
- lead glass

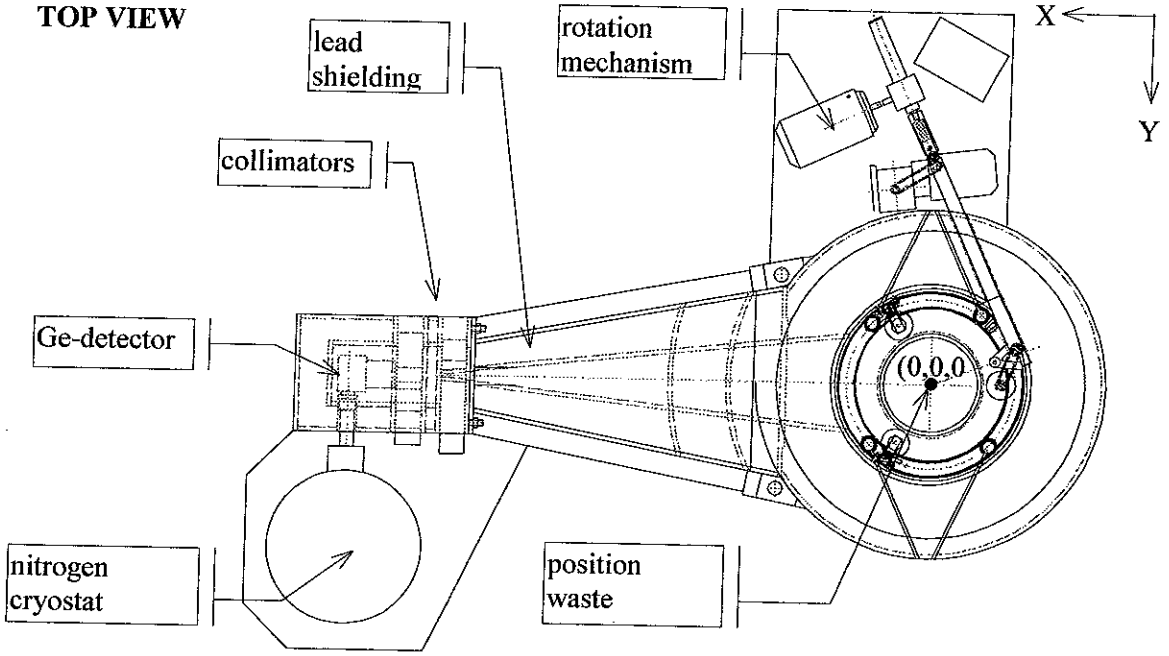
Nuclide indentification

- germanium crystal
- tungsten collimators

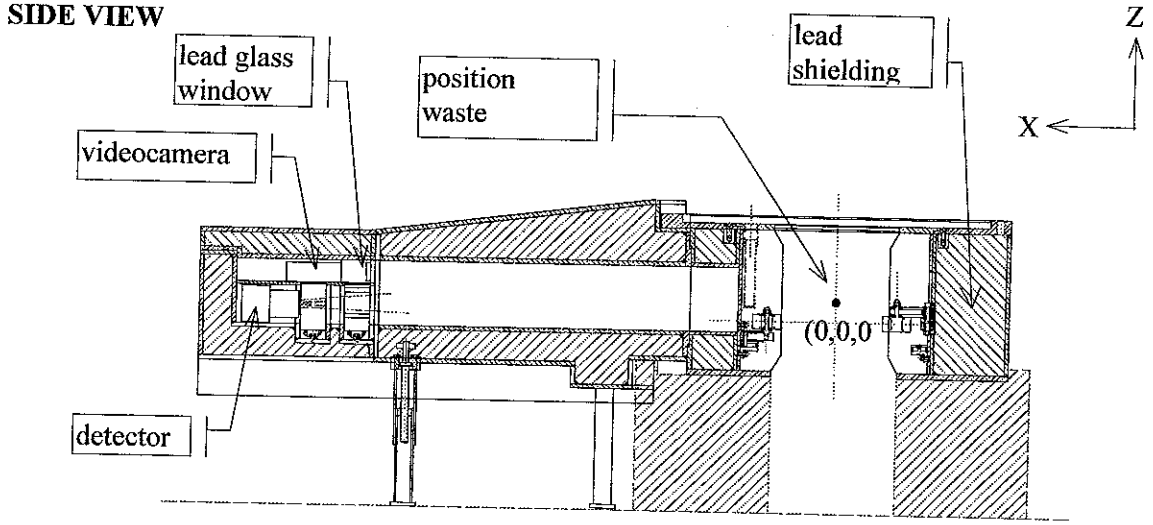
Additional

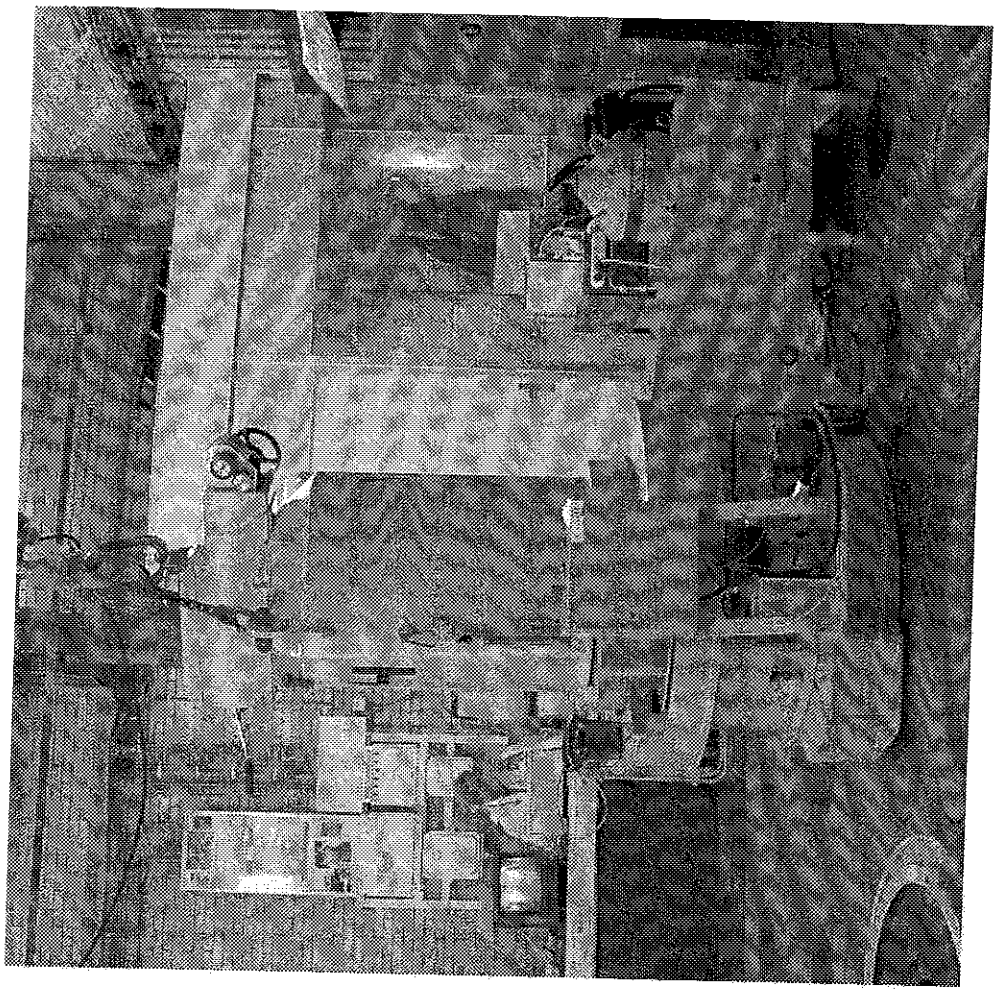
- dose rate meters
- container + weighbeam

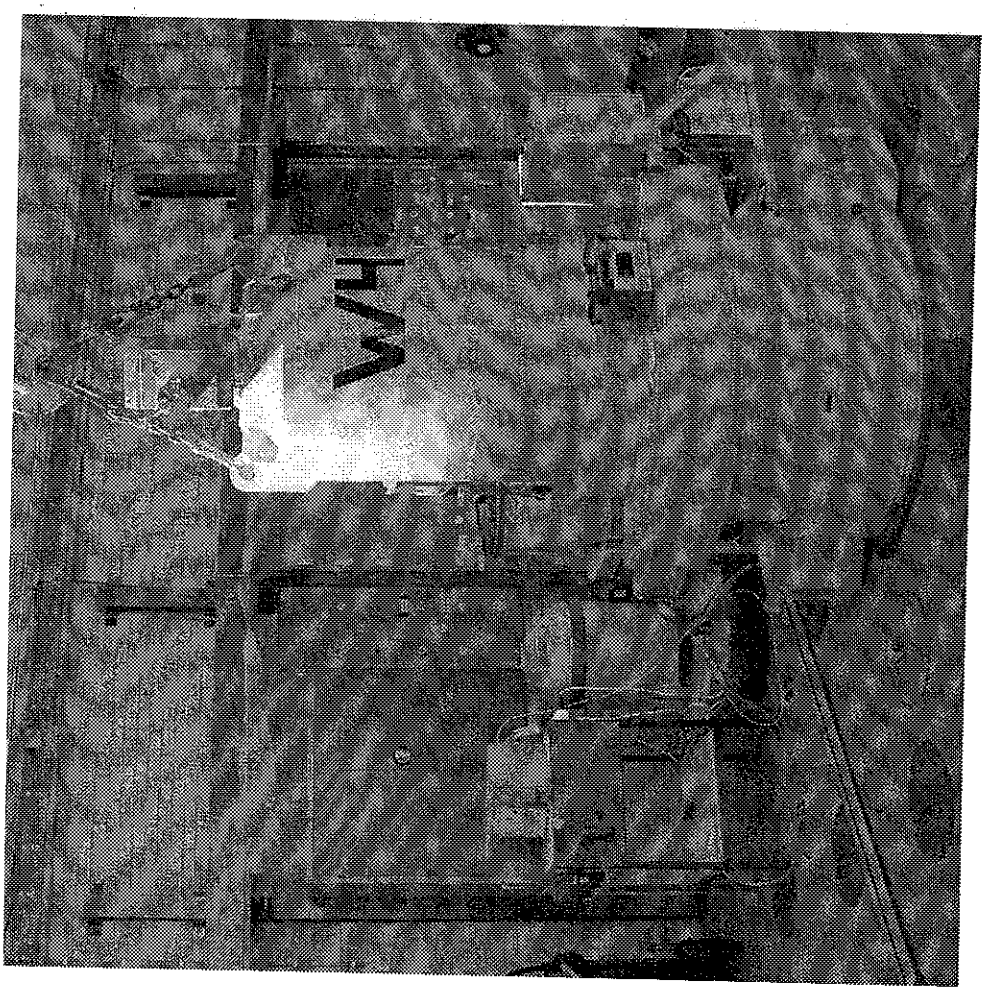
TOP VIEW



SIDE VIEW





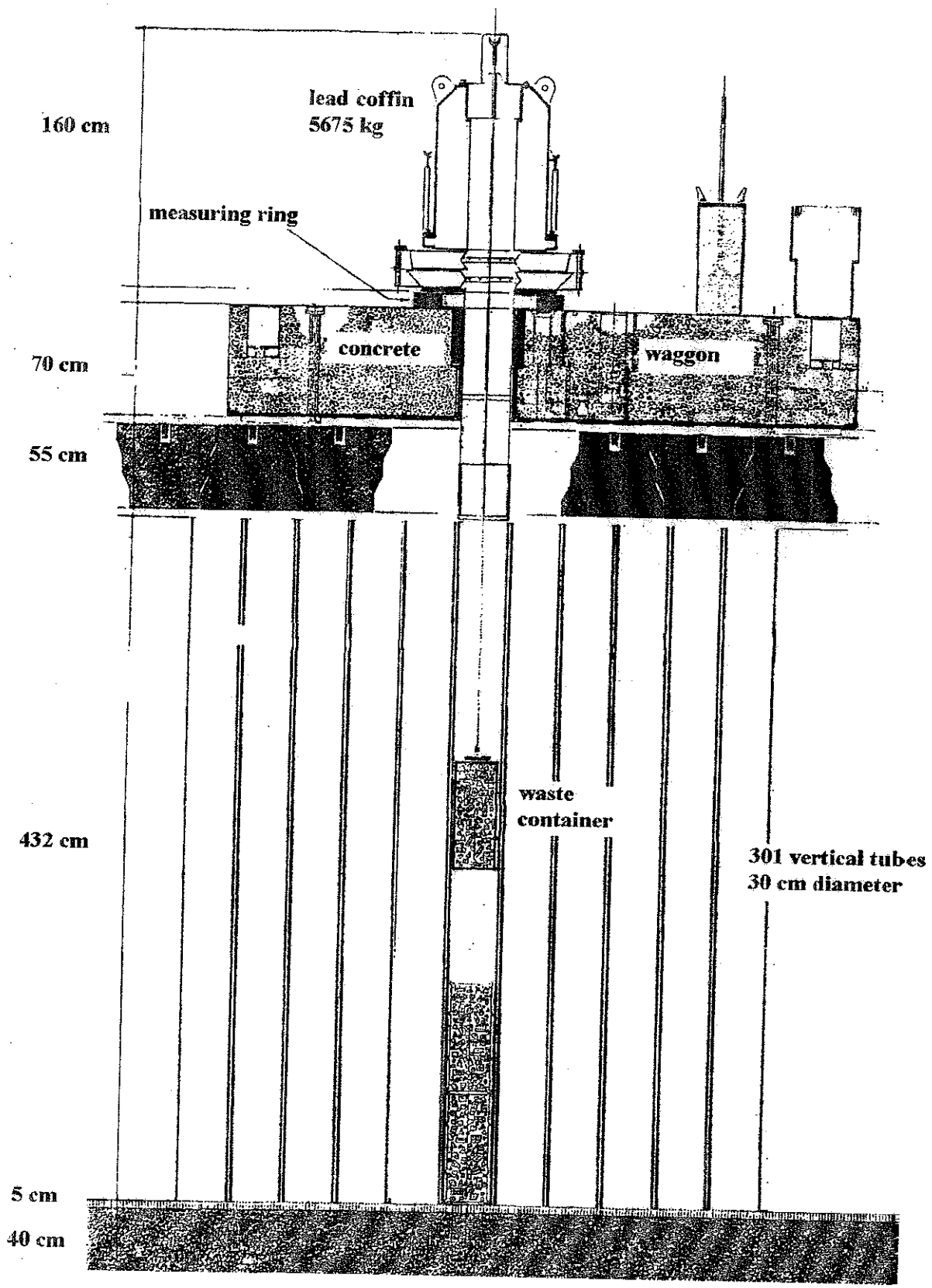


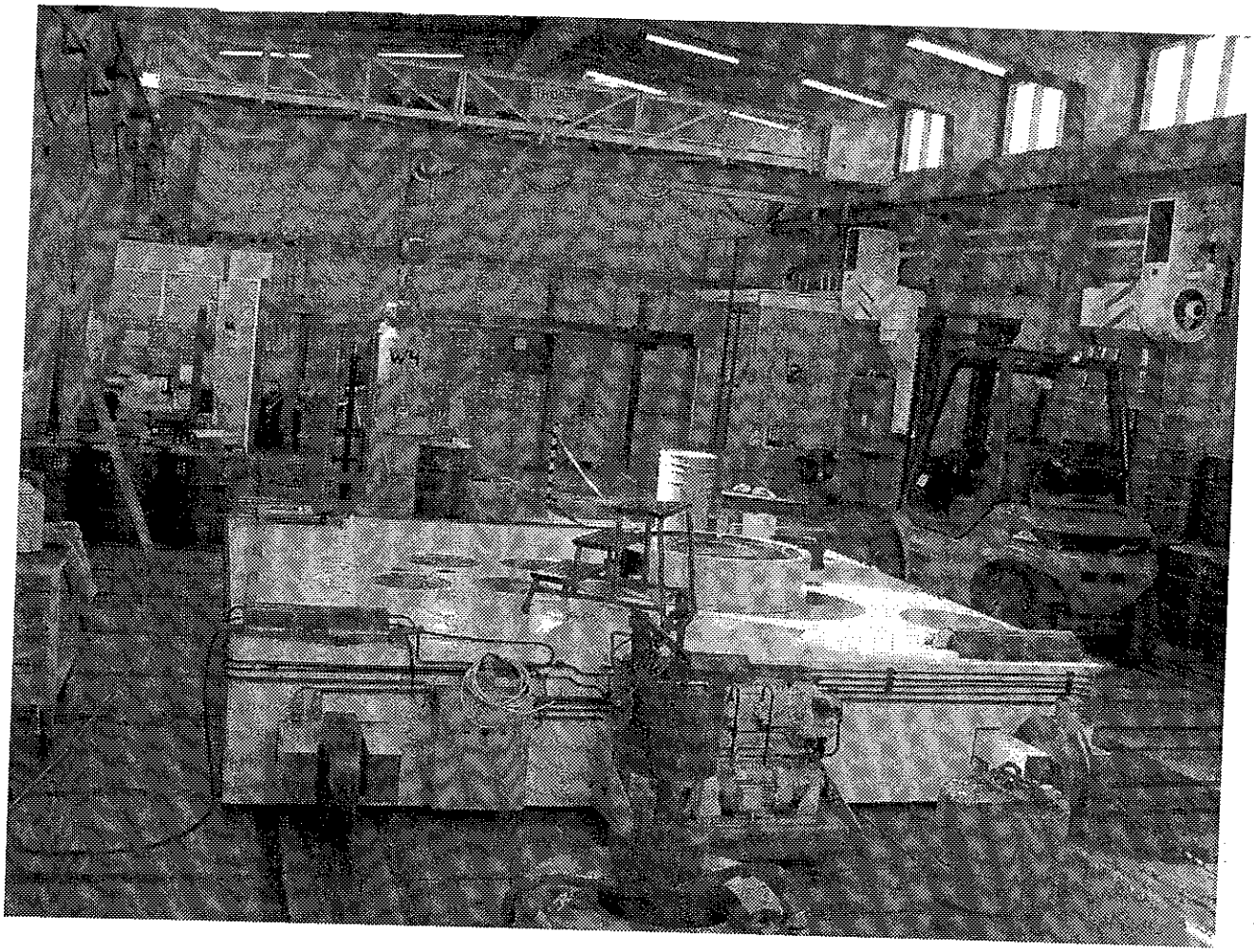
The work

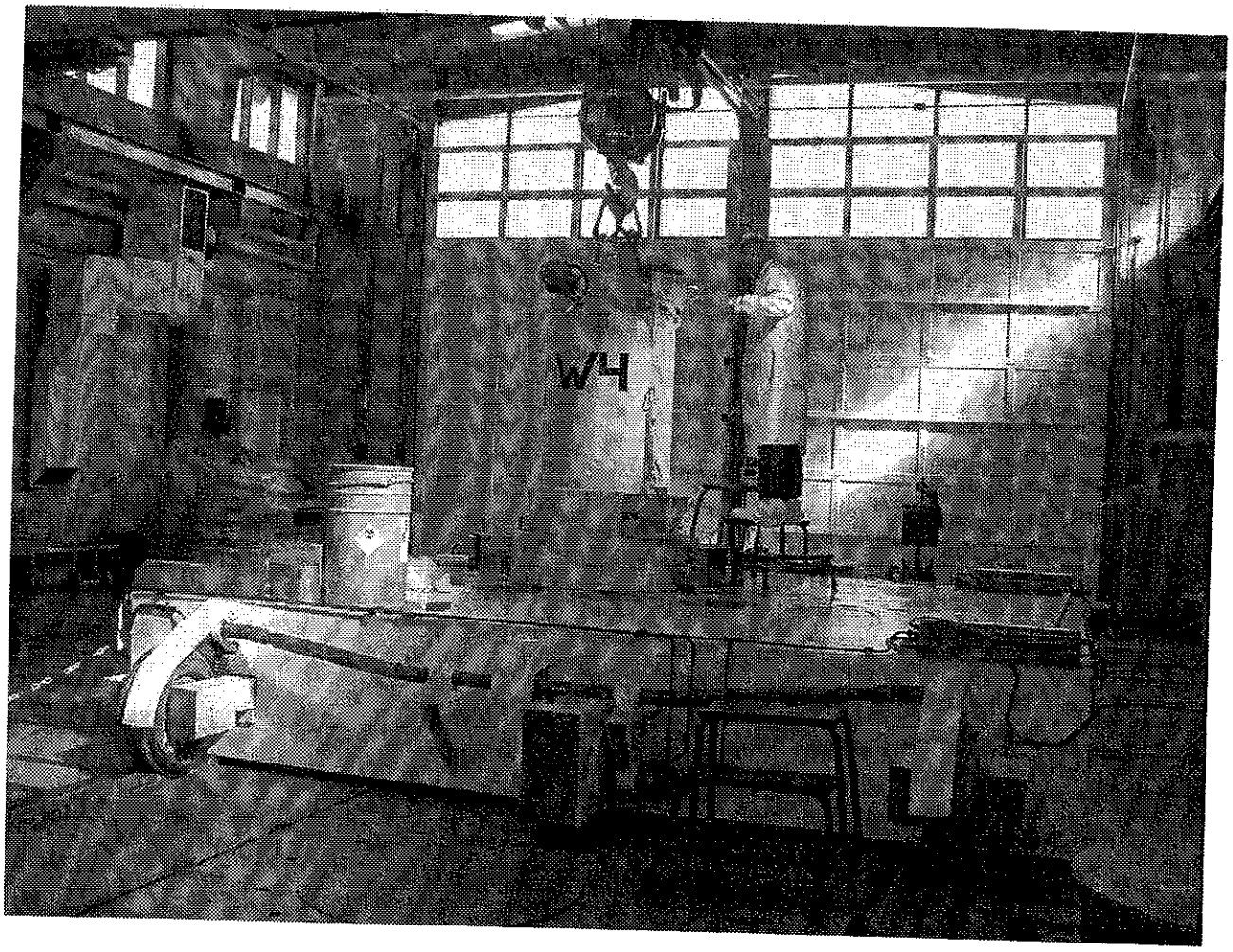
storage,
transport,
examinations.

Storage

pipes, plugs, hatches.
HAVA drums stored in pipes,
Pipes covered by plugs or hatches.


160 cm
lead coffin
5675 kg
measuring ring
70 cm
concrete
waggon
55 cm
waste
container
432 cm
301 vertical tubes
30 cm diameter
5 cm
40 cm

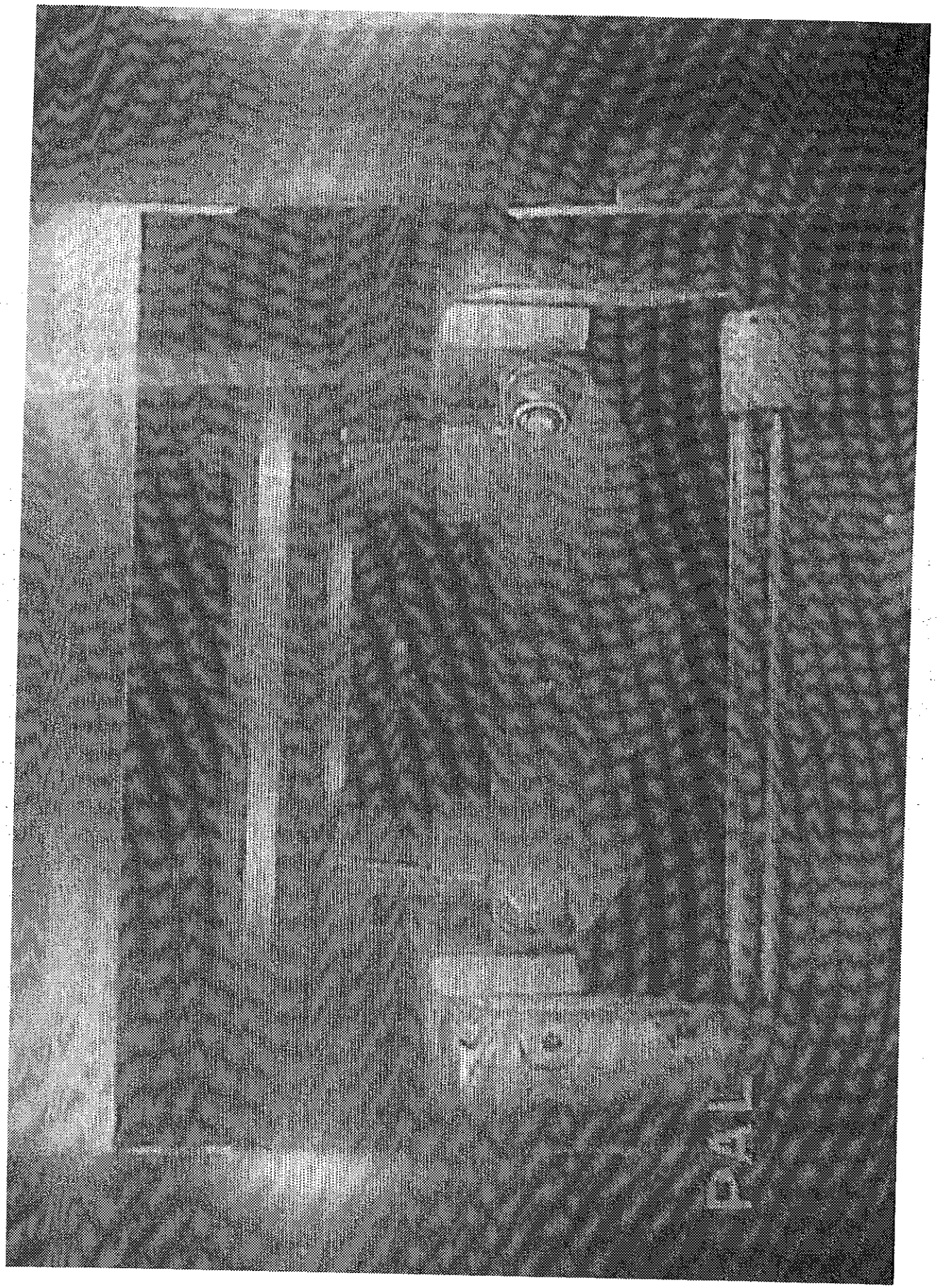



W4

Transport

crane: container, plugs
container: HAVA drums,
five finger gripper.

wagon: lifts hatches,
shielding of gammas.



Examinations

weight:
  weight of 1600 drums,
  to be reduced to 500 drums
    of 60 kg each

dose rate at surface:
  20 mSv/h < 1600 drums < 20 Sv/h
  finally 500 drums with 6 Sv/h each.

  dose rate ≤ 20 mSv/h: HAVA -> MAVA

condition:

HAVA drum rotates,
operator observes the surface of
the drum on the monitor.

PVC + γ -> HCl

HCl corrodes the drums

γ-contents:

3 or 4 measurements per drum
decay calculations
dose rate estimations

filling grade:

evaluation of gamma spectroscopy.
80% filling grade:
1600 x 0.8 = 1280 !

computerization:

- dose rate measurements,
- collimator advise,
- check of drum id. in data base,
- rotation of the drum,
- gamma spectrometry,
- storage of γ-spectrum,
- storage of dose rate,
- printed output per drum of max. dose rate per measurement, drum id., collimator used and date of measurment.

Conclusions:

- As a result of visual inspection about 120 corroded drums were separated.
- As a result of the dose rate measurements 50 drums could be transported as MAVA.
- The gamma spectra give a good indication of the filling grade of the drums.
- About 250 drums decay from HAVA to MAVA whithin 5 years.