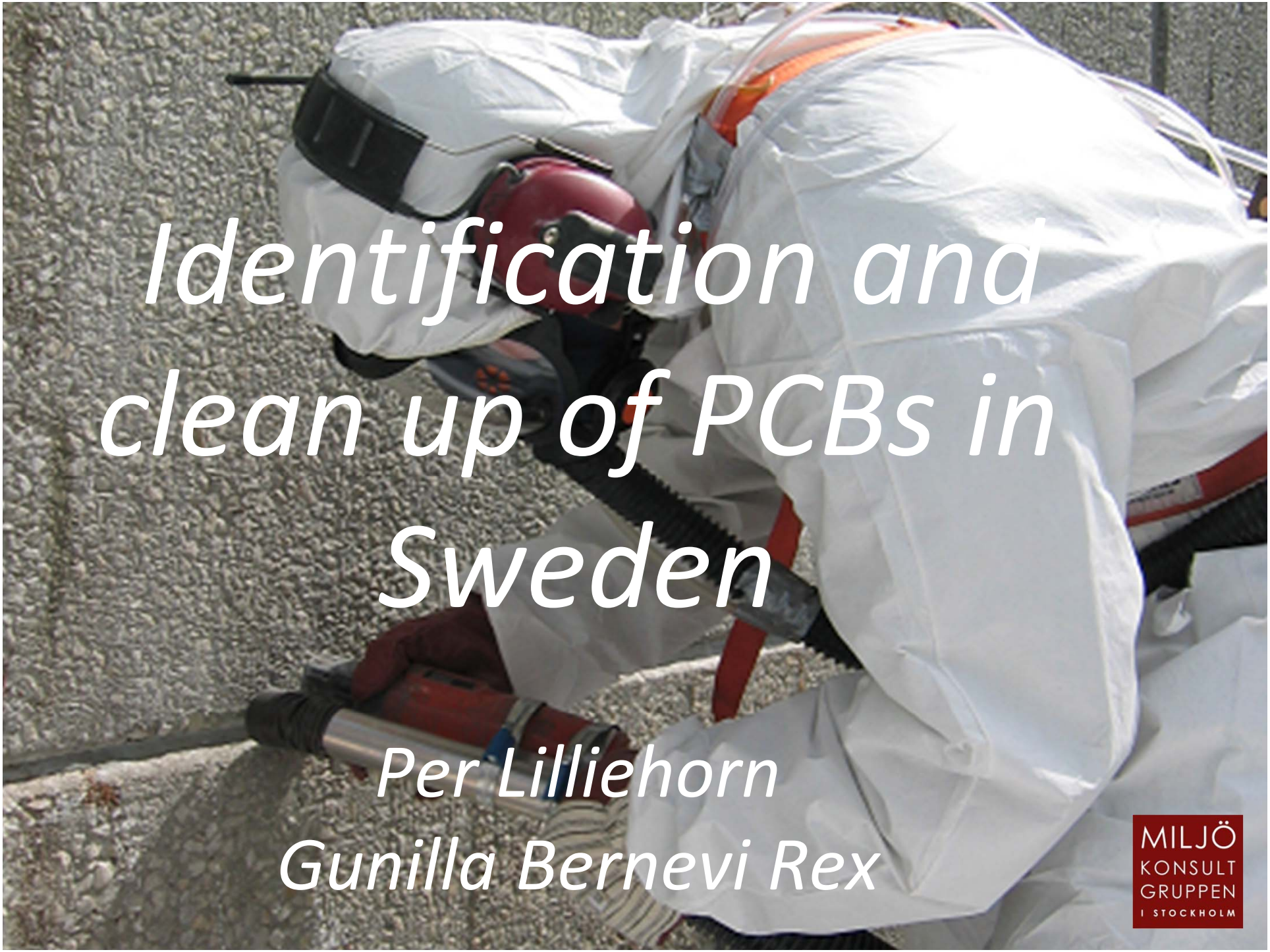


Identification and clean up of PCBs in Sweden

Per Lilliehorn
Gunilla Bernevi Rex

MILJÖ KONSULT GRUPPEN I STOCKHOLM

The Swedish Approach

Total removal of exposed PCB-laden materials on building surfaces (sealants and floor coatings)

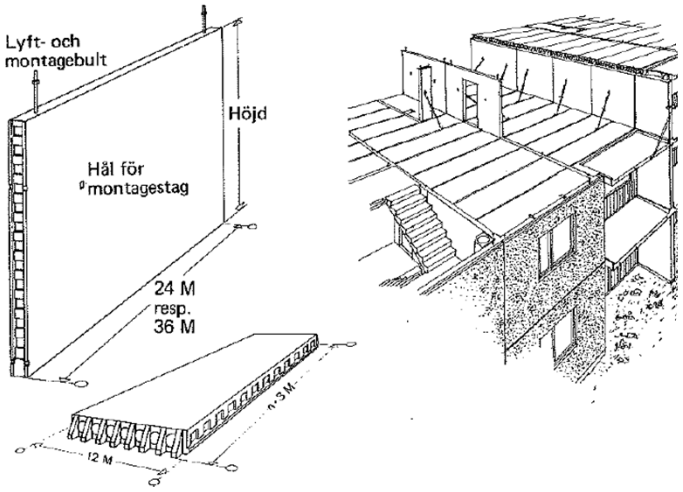
- PCBs are leaching into the environment and indoor air
- Food, especially wild oily fish, is the principal source of PCBs in Sweden
- An ordinance requires identification and remediation
- Removal of exposed deposits also leads to improvements of indoor air quality

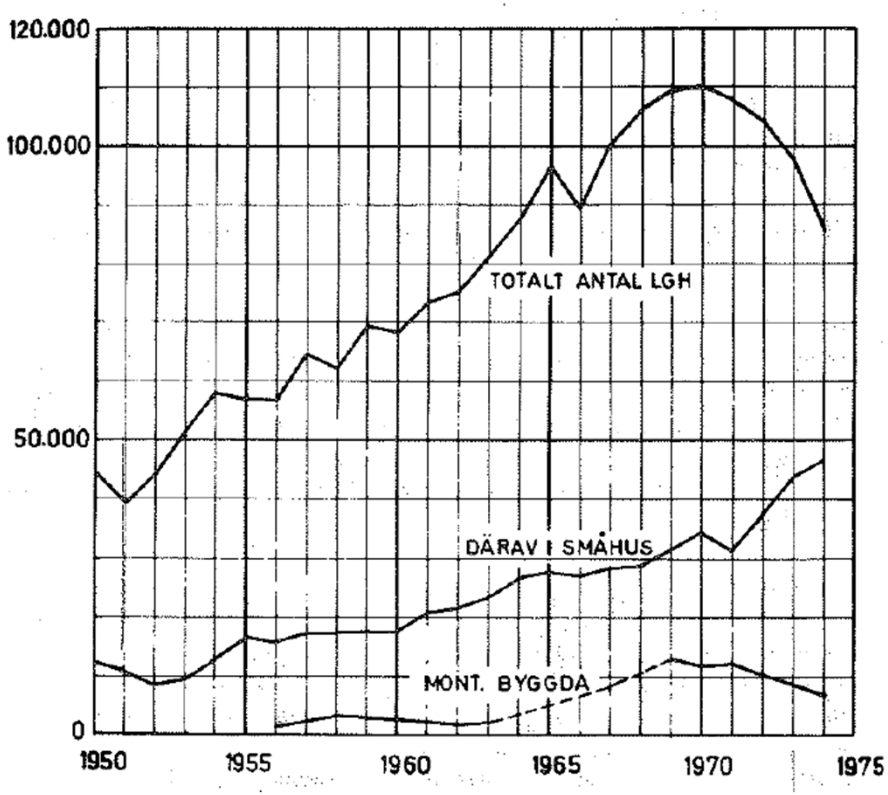
PCBs in the Baltic environment

- PCBs are found in wild, oily fish from the Baltic and the major Swedish lakes
- EU regulations on dioxins and PCBs prohibit the export of contaminated fish
- The National Food Agency has issued consumer advisories regarding oily fish
- The EU permits only domestic sale of the fish
- TDI can be exceeded for those who eat much wild, oily fish

”The Great Leap”

”One million apartments in ten years” (1965-75)



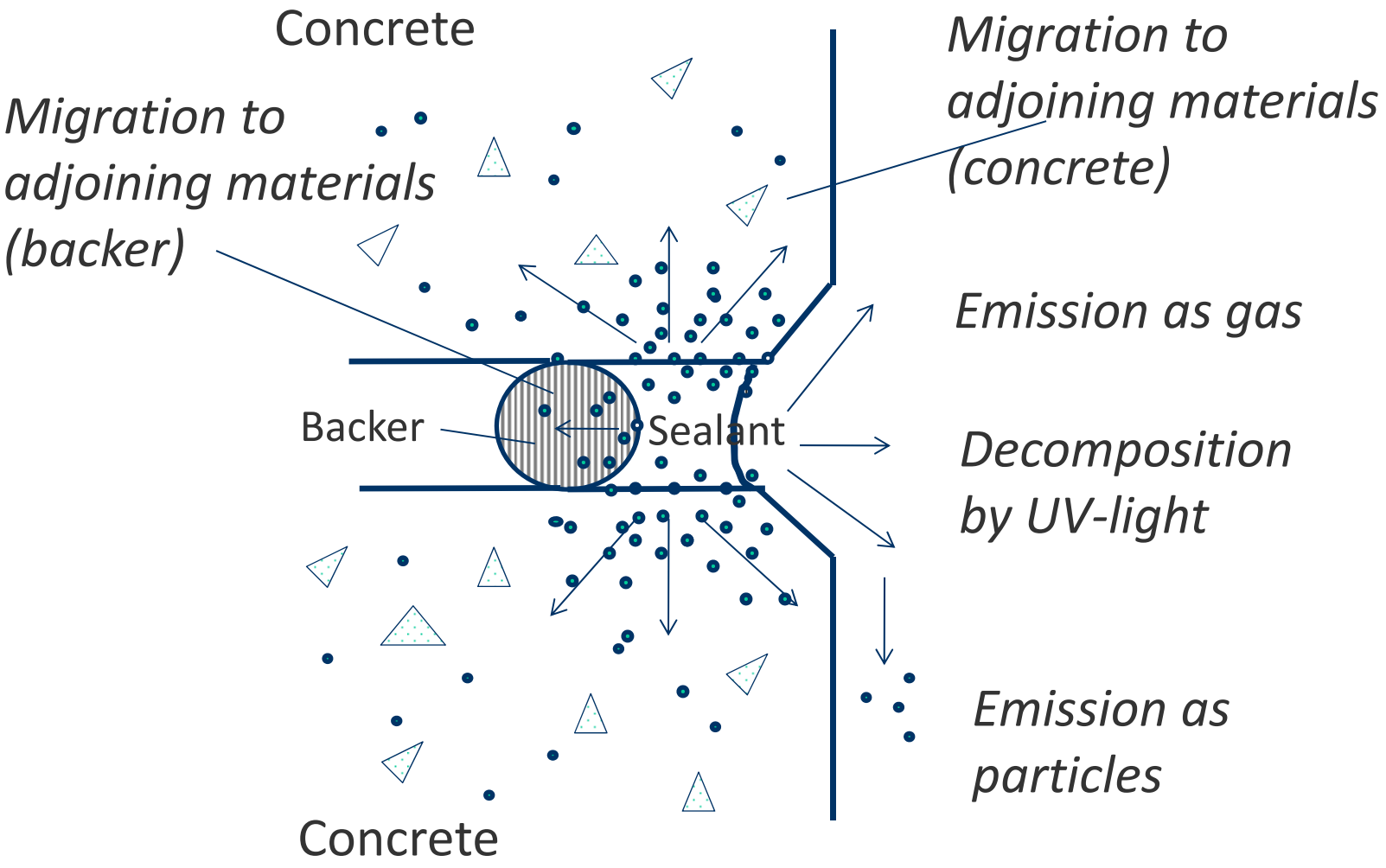


PCBs in buildings (Sweden)

Main uses:

- Sealants in buildings erected or renovated, 1956 – 1973
- Flooring, “Acrydur”, non-slip floor coating used for example in the food industry, 1956 – 1973
- Capacitors in electrical equipment, 1956 – 1980
- Sealants in insulated windows 1956 – 1973 (Swedish production)

PCBs in sealants



Timetable

1956 – 1972	Introduction of PCBs in buildings
1972/73	PCBs are forbidden in open applications
1997	Report “PCBs in sealants – big or small problem?” (for the Swedish EPA)
1998 – 2003	The Ecocycle Council-project
2002	EPA proposes an ordinance
2007/2010	The Ordinance comes into force
2016	Final year for the remediation of PCBs

The Ordinance - 2007:19/2010:963

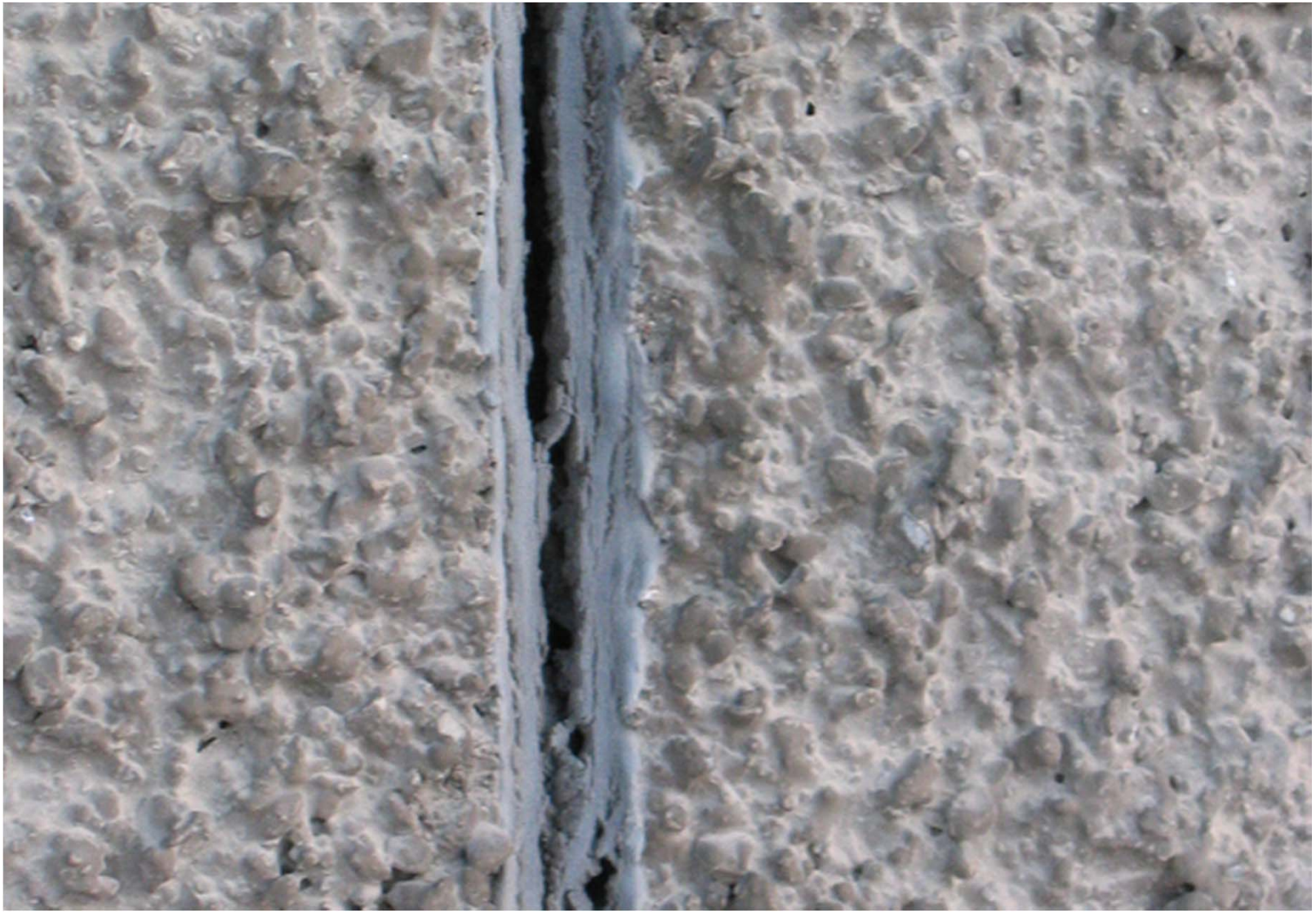
Property owners must

- Inspect and remediate buildings and structures erected (or renovated) 1956 –73
- This concerns PCBs in sealants and floor coatings, not capacitors and insulated windows
- Inspection must be completed by 2008-06-30
- Remediation must be completed by 2016-06-30

The 2007 PCB Ordinance, renewed 2010

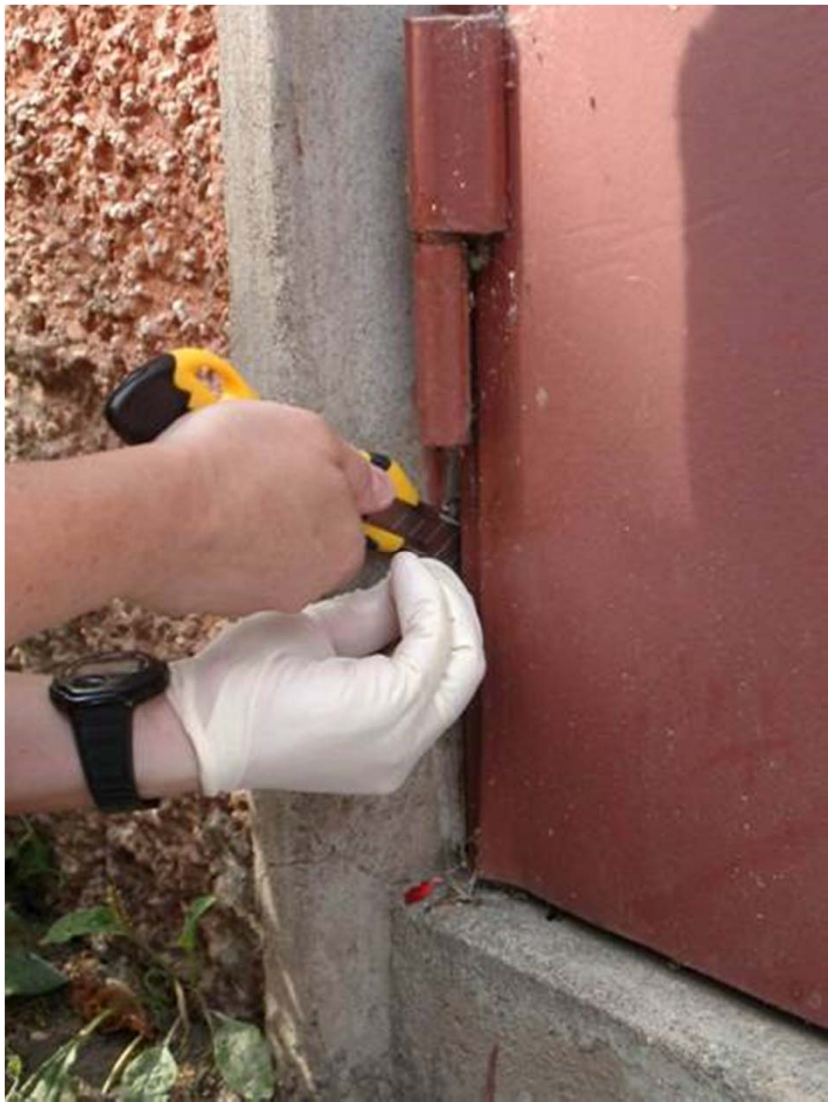
Equipment for taking samples

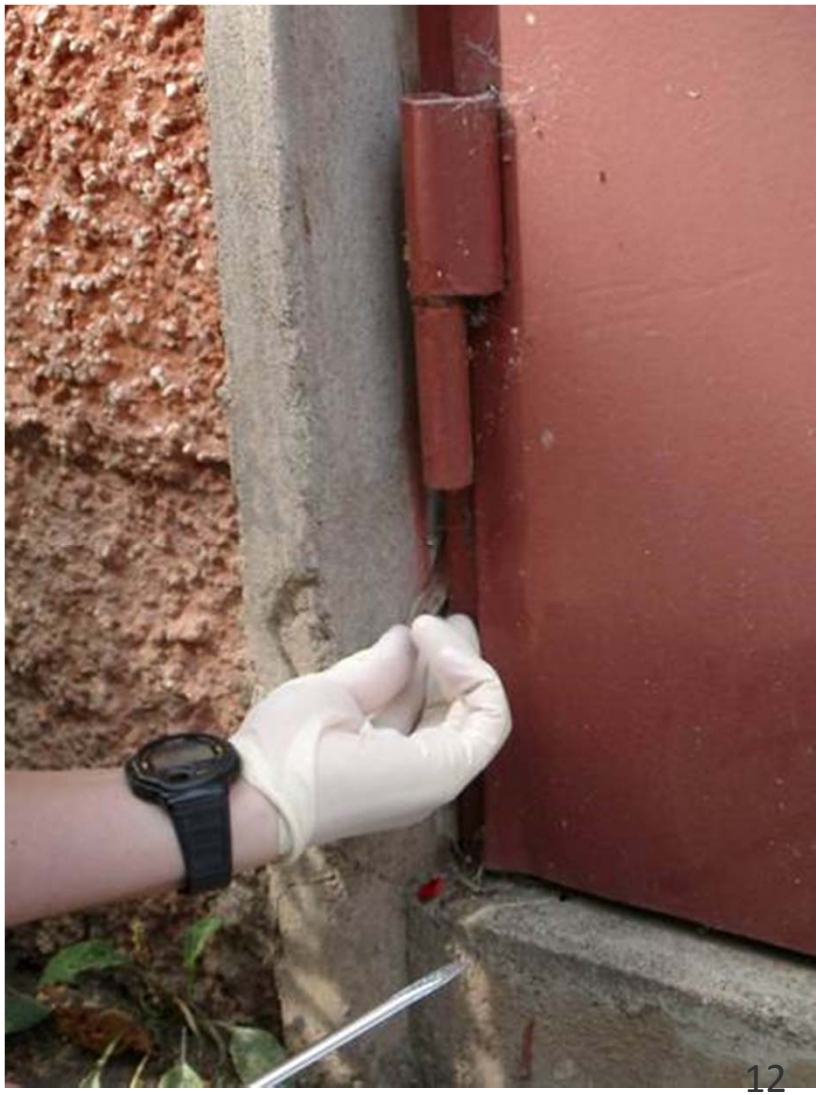
Old sealant



Between window and stone wall

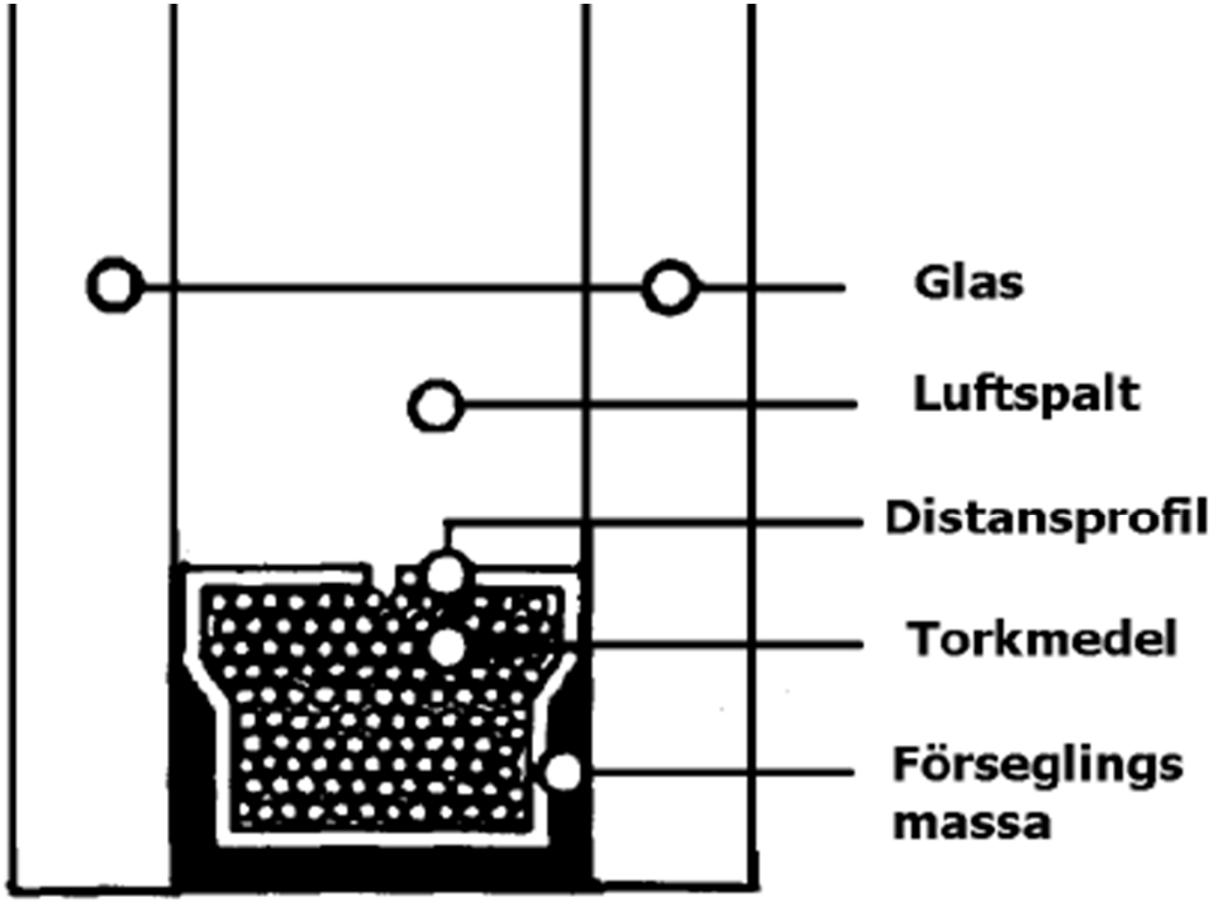
Taking samples





Floor coating

Insulated window



Organiskt förseglad isolerruta i genomskärning

Marking on an insulated window

Capacitor with PCB oil

Removal of sealants

- The sealants are removed and disposed of as hazardous waste
- The workers must have adequate training in safe remediation techniques
- The property owner must notify the municipality three weeks before the project starts
- The property owner is responsible for the safety and effectiveness of the remediation process
- The municipality shall carry out supervision

Critical factors

Important measures to minimize spread of PCBs are

- Collecting emitted particles and gas at the source
- Protecting the ground with a water-permeable geotextile
- Cleaning surfaces, protective covers and clothing contaminated by PCB-laden dust and debris
- Handling waste in a correct manner

The proficiency and commitment of the contractor is vital

Cutting sealants

Oscillating knife cutter from Fein

Cutting with an ordinary knife

Grinder with a dust-collecting hood

Cylinder grinding pin tool

The protective covering is cleaned

Protective equipment

- Protective mask with
  - Forced air supply
  - Particle filter
  - Gas filter
- Overall
- Gloves
- Ear protection

Powerful vacuum cleaner

More information about remediation

- The website www.sanerapcb.nu
- Clearance of PCB-laden sealants in buildings Operating guidelines recommended by the trade associations (2006) can be found here: www.sanerapcb.nu/web/page.aspx?refid=333

Study for Swedish EPA 2010

The aim of the study by Per Lilliehorn and Gunilla Bernevi Rex was to examine

- How far the process of identification and remediation of PCBs had come
- How had the municipalities reacted
- How many buildings/how much PCBs remained to be inventoried and remediated
- How well had the process worked
- What needed to be done to complete the work

Results on municipal efforts 2010

Responses from 65 municipalities

- More than 80 % had identified/informed owners of affected properties
- About 50 % had issued injunctions requiring PCB surveys
- About 70 % of the properties had been investigated
- 50-70 % of the PCBs, or about 100 tonnes remained in the buildings, and would probably not be removed until 2013

Changes in the PCB-ordinance 2010

- Based on the investigation, the EPA decided to postpone the final date for remediation with three years
- Rules for exemptions were introduced
- Properties cleared after 1998 don’t require a new remediation process

Study for the EPA 2015

A new study to investigate

- How many properties (with final date 30 June 2014) had been remediated?
- How the municipitalities had handled those that had not met the deadline
- How much work remained to be carried out before the new deadline of 30 June 2016?

Other objectives of the study

- If possible, determine how much of the PCBs is left to identify and remove
- If possible, estimate the number of exemptions granted by municipalities
- Assess problems and propose solutions for the work to be completed by the final deadline of 30 June 2016

Results – municipal actions

- Approximately 85 % of the interviewed municipalities have informed the property owners
- The work in the municipalities has generally been successful
- A few, mostly smaller, local authorities have not begun to process the property owners
- There are few exemptions, mainly in the larger municipalities

Results – inventories

- Identification of PCBs in buildings has mainly been completed in the municipalities interviewed, but ...
- ... there are some undetected cases, properties that have not been identified
- Some new surveys may be needed because of shortcomings in previous investigations
- In approximately 25 % of the surveyed properties, PCB was found in sealants or floor coatings

Results – remediation

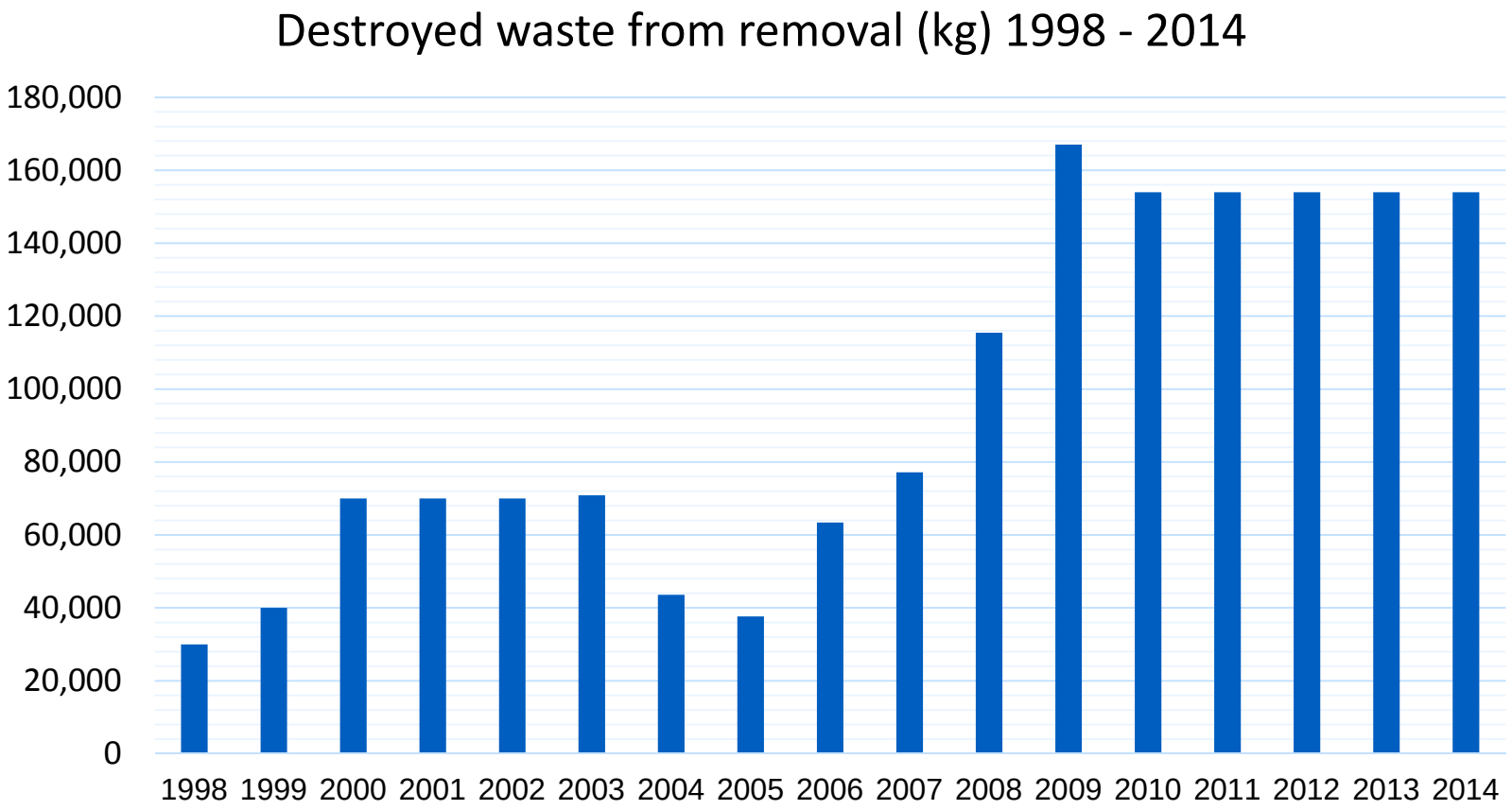
- About 70 – 85 % of the properties concerned were cleared by 2016
- 20 till 50 tonnes of PCBs estimated to remain in sealants and floor coatings
- Some unknown PCB deposits remain
- Sufficient capacity to carry out remediation
- Capacity can relatively quickly be enlarged

Assessment of remaining PCBs

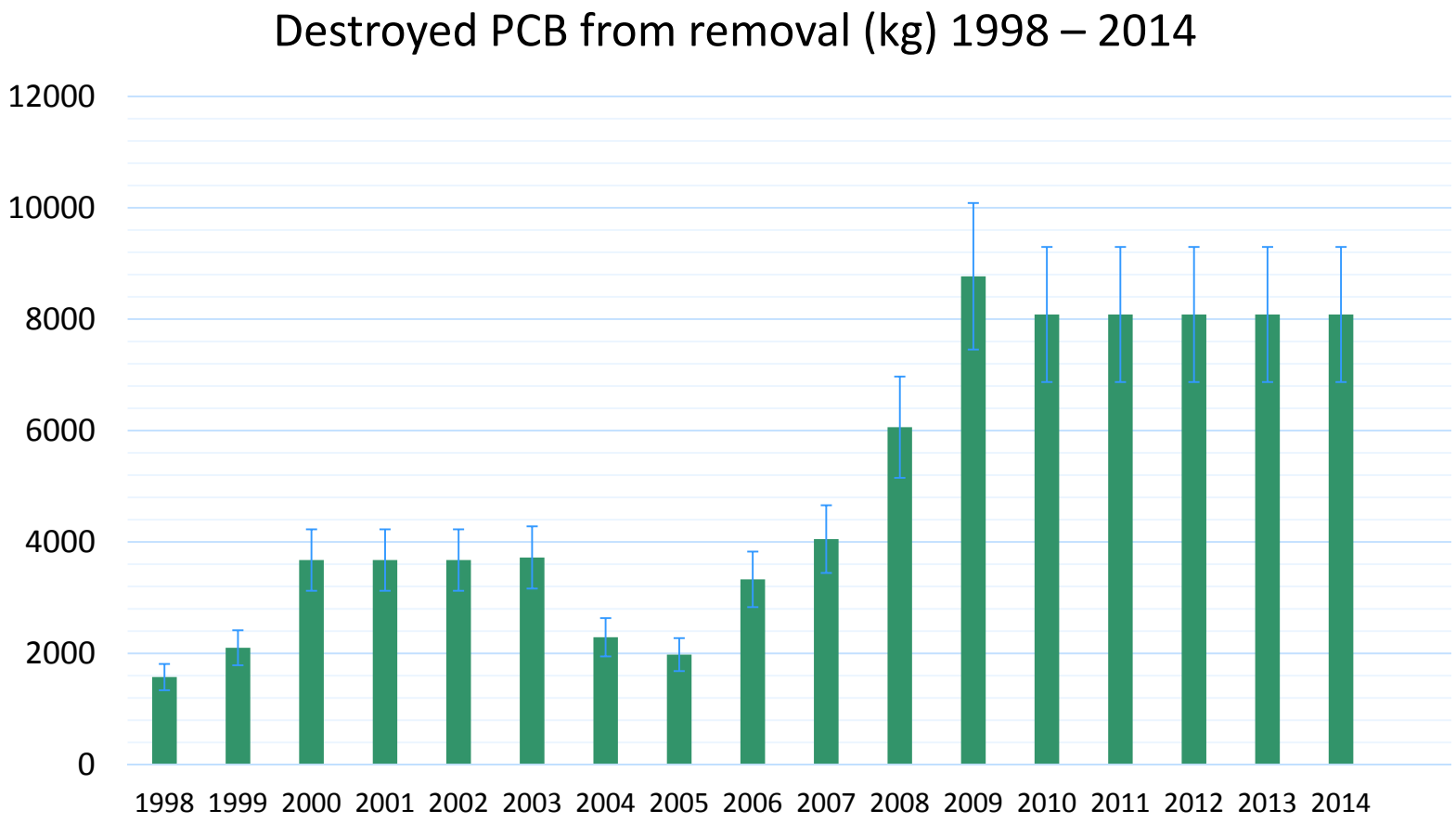
- Previous assessment in some earlier reports
- Local governments statistics
- Destroyed amounts of PCB waste according to licensed professional
- The waste has been assumed to contain 4,5 - 6 % pure PCBs
- Assumed continuous leaching to the environment, 1 % per year

Destroyed PCB waste

Statistics from former SAKAB (now Fortum)



Assumed amounts of destroyed PCB



Remaining PCB depots

Assumed quantity in 1997	150 tonnes
Dissemination to the environment 1997 – 2016	15 – 20 tonnes
Destroyed PCB	85 – 110 tonnes
Exported waste (insignificant)	?
Illegal disposal (hard to estimate)	?
PCBs remaining	20 – 50 tonnes
Unknown occurrence	?

Ideas from the authors

- Remediations that were not performed before 2016 can be handled as exemptions
- The final date should not be postponed again
- The EPA should give guidance to the municipitalities concerning
  - the long term handling of PCBs
  - requirements for additional remediation

Suggestions for the municipalities

The municipalities should

- Perform more reviews of remediation processes
- Test for PCBs in buildings where PCB remediation has been carried out early
- Check for PCBs before demolition
- Follow up the handling of PCBs in waste after demolition and removal


The environmental cost for late action is high!