U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

HRTD Human Resources Training & Development

ALARA

ALARA

- ALARA – "As Low As is Reasonably Achievable"
- It is both a concept and a philosophy, not a limit
- Since it is not a quantitative limit, it is subjective to a degree

ALARA

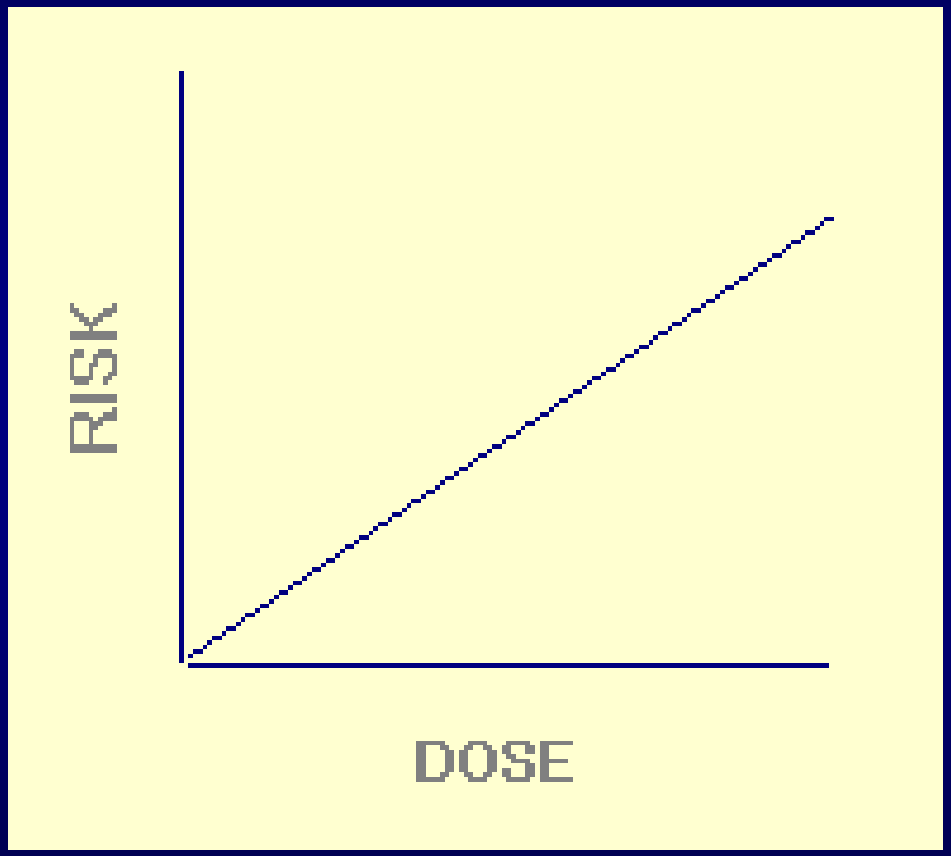
- Involves a lot of common sense
- Required by regulation as part of a radiation protection program – 10 CFR Part 20.1101(b)
- Required for Yucca Mountain during pre-closure period, since Part 20 applies

ALARA

- Part 20 (20.1101(d)) also has an ALARA dose constraint of 10 mrem/yr to any MOP from radioactive emissions to air
- Since NRC accepts linear no-threshold theory (LNT) of radiation risk, ALARA is necessary because it is assumed that every radiation exposure carries with it some risk
- Therefore, simply not acceptable to just comply with the quantitative dose limits

Linear-No Threshold (LNT)

Dose-Response Relationship for a Stochastic Effect



Elements of an ALARA Program

- Management commitment to ALARA
- Use TDS (time, distance, and shielding (both permanent and temporary))
- Setting of dose goals (both individual and collective) for year, major jobs, etc.
- Job planning (bring right tools, meet with various crafts, review previous experience, etc.)

Elements of an ALARA Program

- Use of administrative controls (stay time, dose limit for a job, surveys, etc.)
- Use of engineering controls (e.g. filtration, ventilation, glove bags and boxes)
- Use of training and mockups (practice the job in a radiation-free zone)
- Incorporation of ALARA principles into facility design

Elements of an ALARA Program

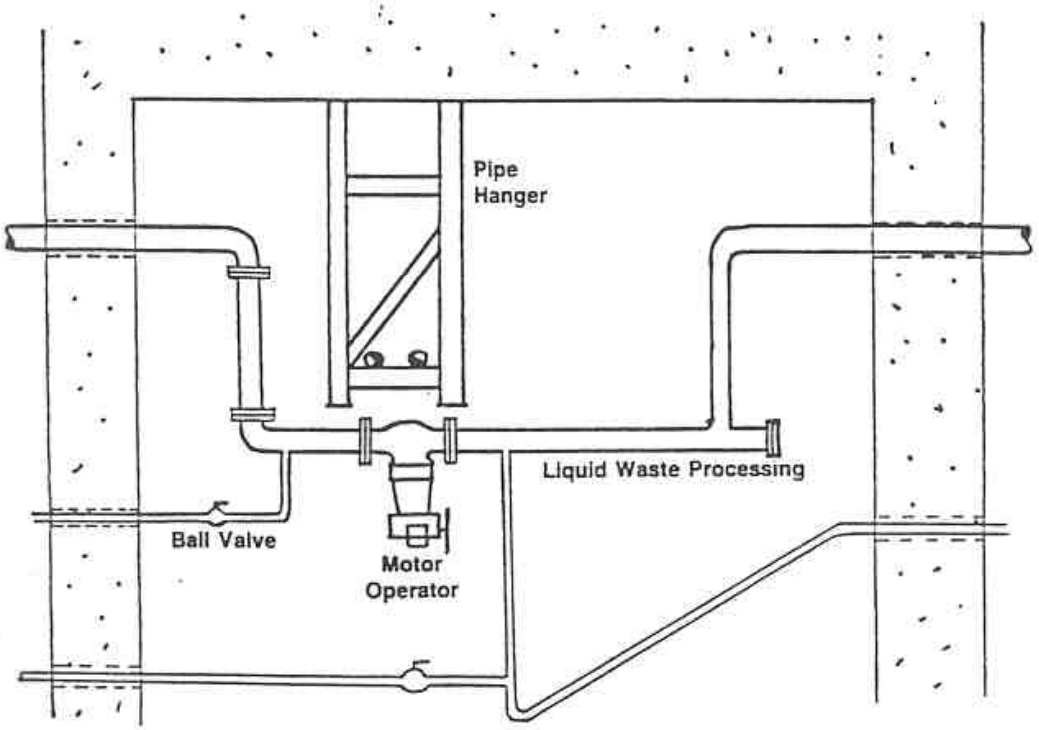
- Good cleanliness controls (minimization of contaminated areas and control of contamination at its source)
- Use of air monitors to detect airborne contamination

HEPA Air Filtration Unit

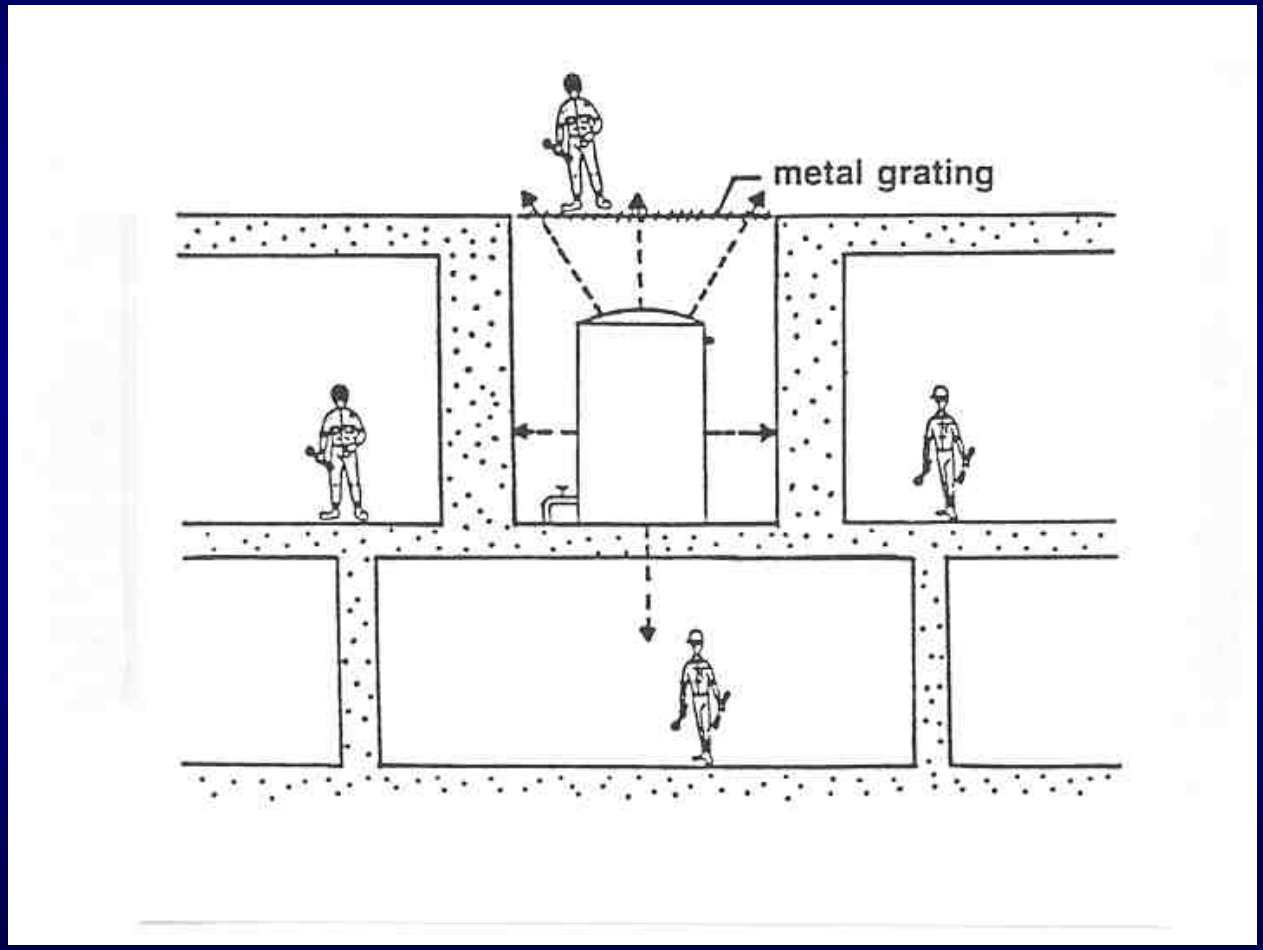
Area Decontamination System

Glove Box

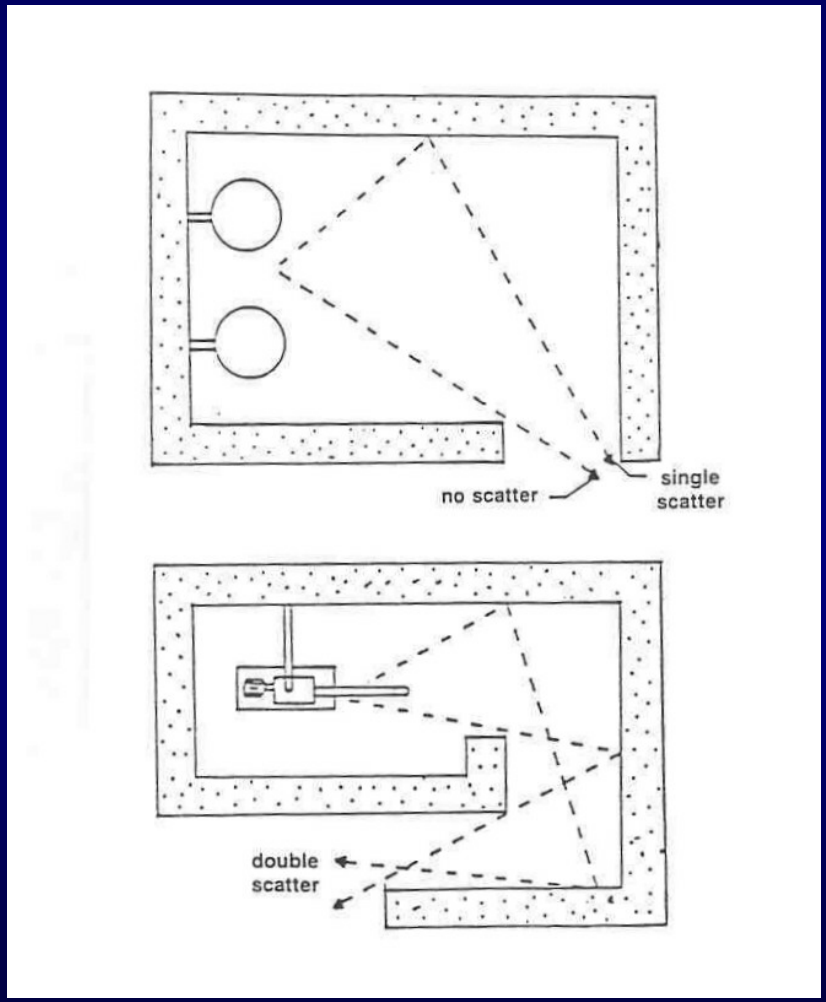
Crud Traps


Pipe
Hanger
Liquid Waste Processing
Ball Valve
Motor
Operator

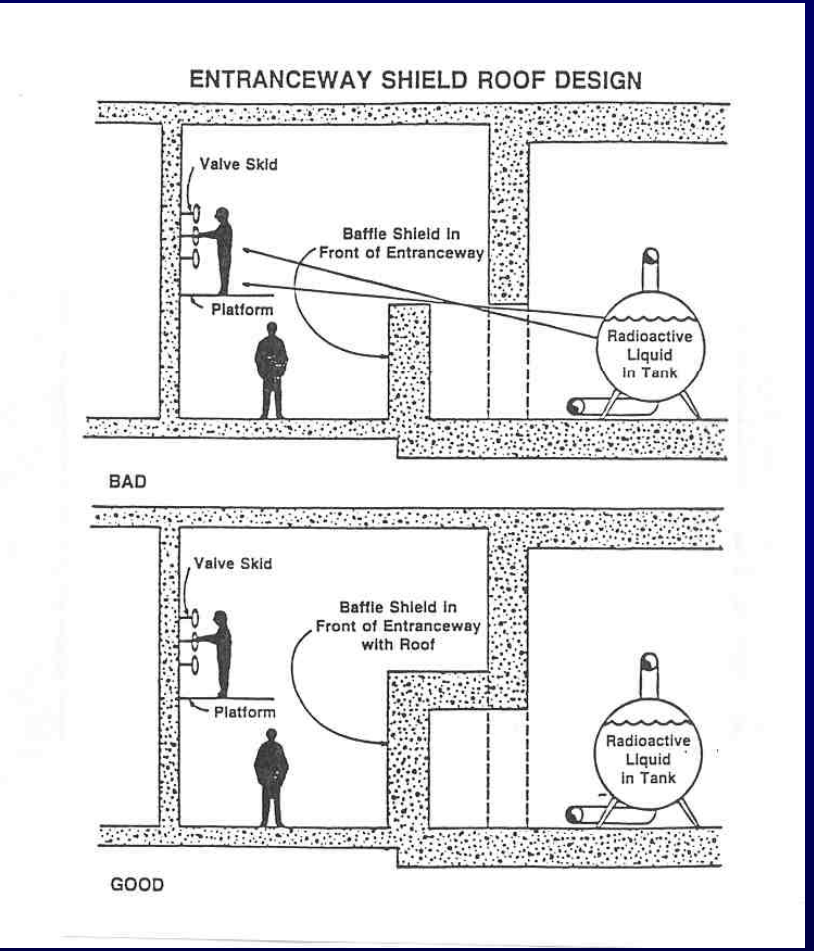
Floor Shielding



Entrance Shielding

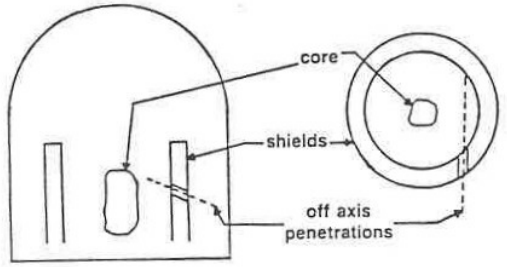


Entrance Roof Shielding

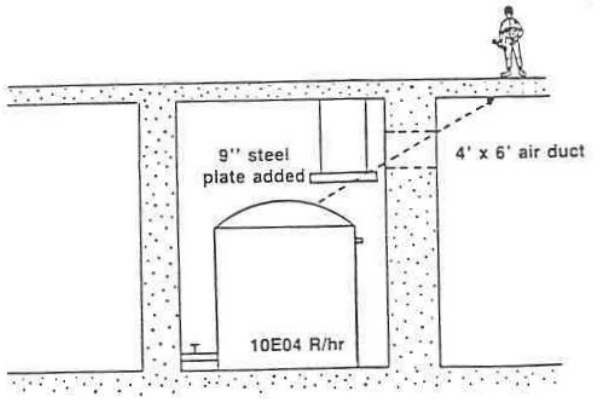


Duct Shielding

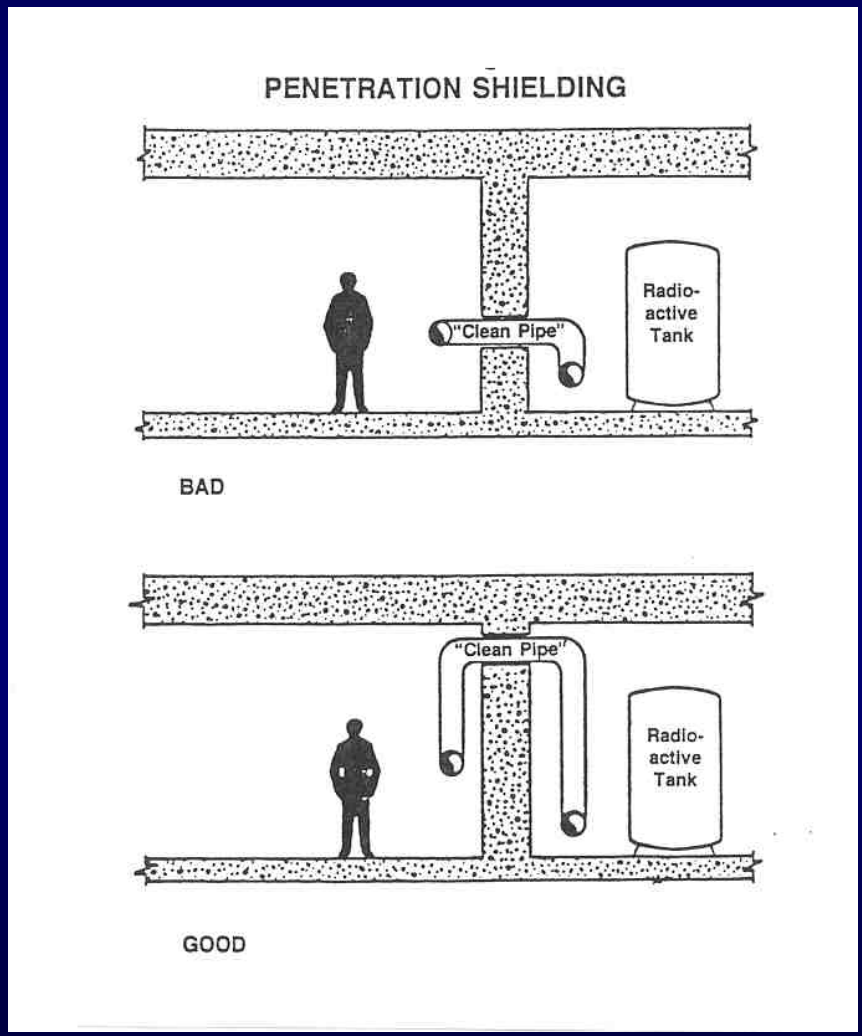
a. piping



b. ventilation ducts



Penetration Shielding



EXAMPLES OF DOE'S USE OF ALARA CRITERIA FOR THE GEOLOGIC REPOSITORY

Subsurface Contamination Control

- DOE uses the following ALARA criteria for control of worker doses:
- "For all workers entering radiological control areas of the repository, radiological exposure shall be maintained ALARA, in accordance with an approved radiological protection program."
- Their ALARA assessment of radioactive releases from the repository references the ALARA constraint of 10 mrem/yr TEDE to any offsite MOP (10 CFR Part 20.1101(d))

Subsurface Contamination Control

- "Any MGR system or process with an expected exposure to an individual exceeding 250 mrem/yr or an expected collective exposure exceeding 1 person-rem/yr TEDE, shall receive a formal assessment in accordance with the ALARA program."
- "Any MGR system or process where the dose to an individual member of the public is expected to exceed 10 mrem/yr TEDE from air emissions shall receive a formal assessment in accordance with the ALARA program."

Pre-Closure Radiological Impacts - Workers

Source (DOE Pre-Closure Safety Analysis)	Dose Rate (mrem/year)
External exposure (direct radiation) from unloading and handling CSNF/HLW – subsurface workers	380
External exposure (direct radiation) from unloading and handling CSNF/HLW – surface workers	2,200 (exceeds DOE's ALARA goal of *500 mrem/yr)

*DOE has stated that they have an ALARA goal of minimizing the number of workers with doses exceeding 500 mrem/yr.

THE END