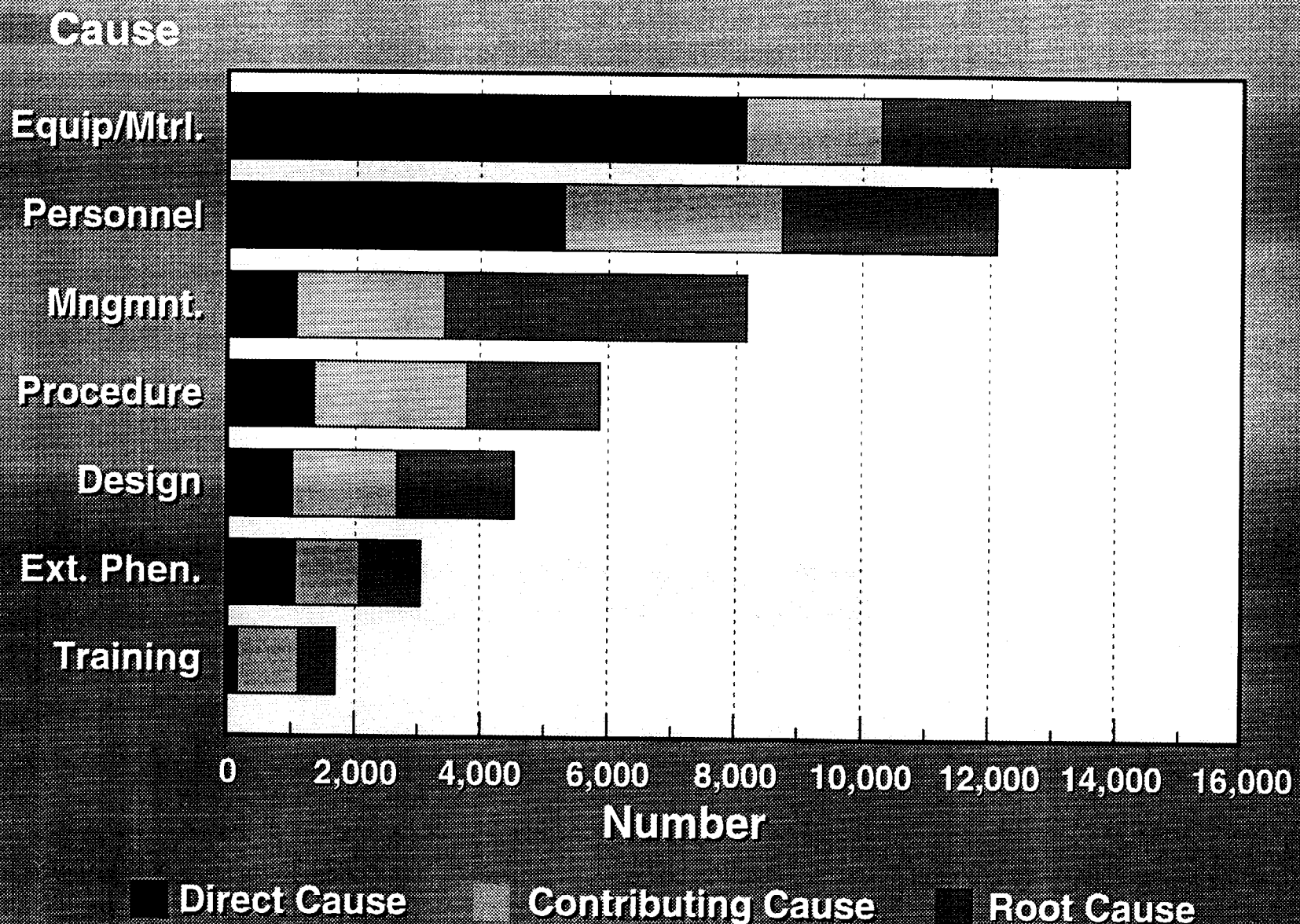
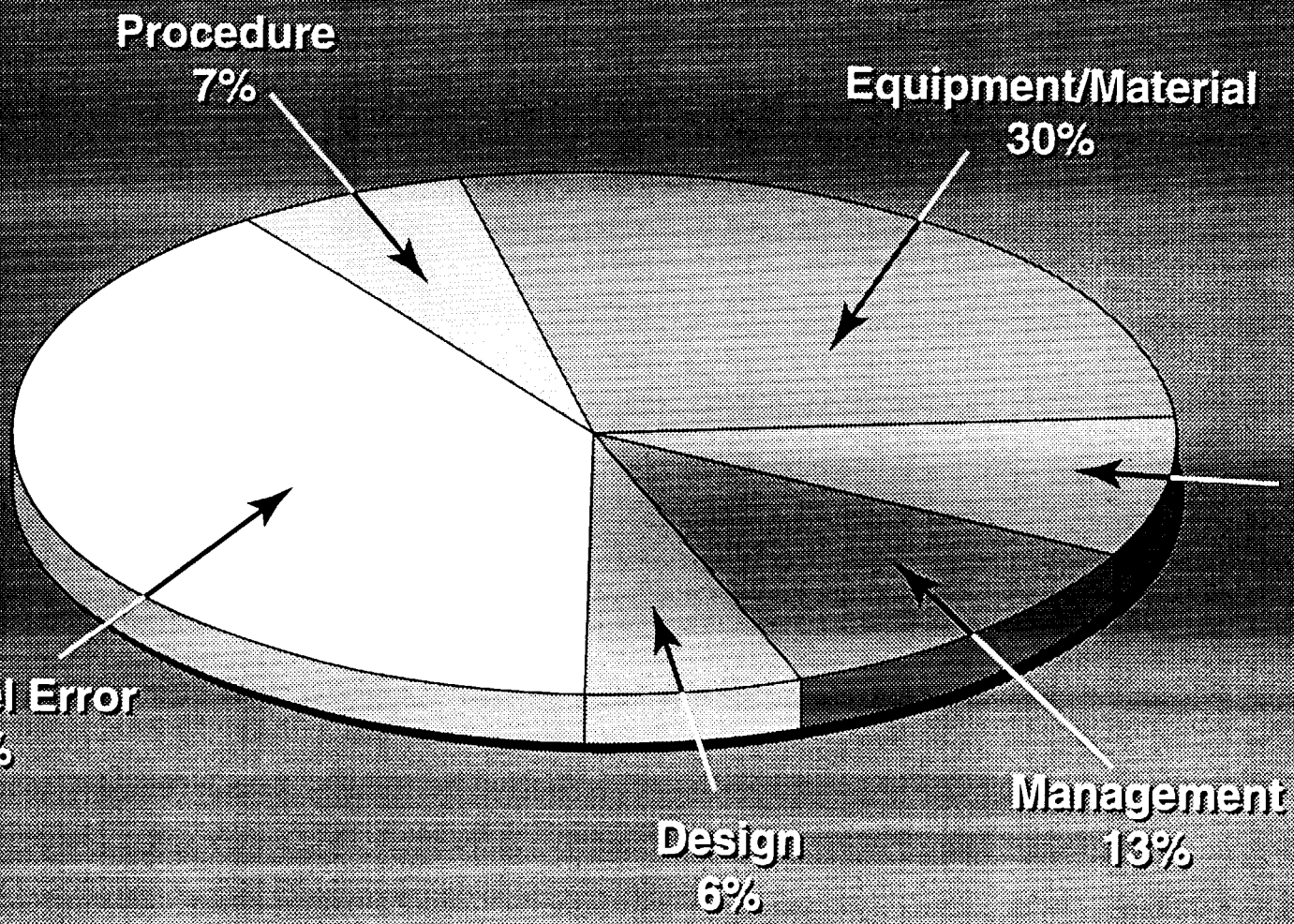
DOE Occurrence Causes

19,673 Occurrences as of November 8, 1993

Distribution by Cause Category

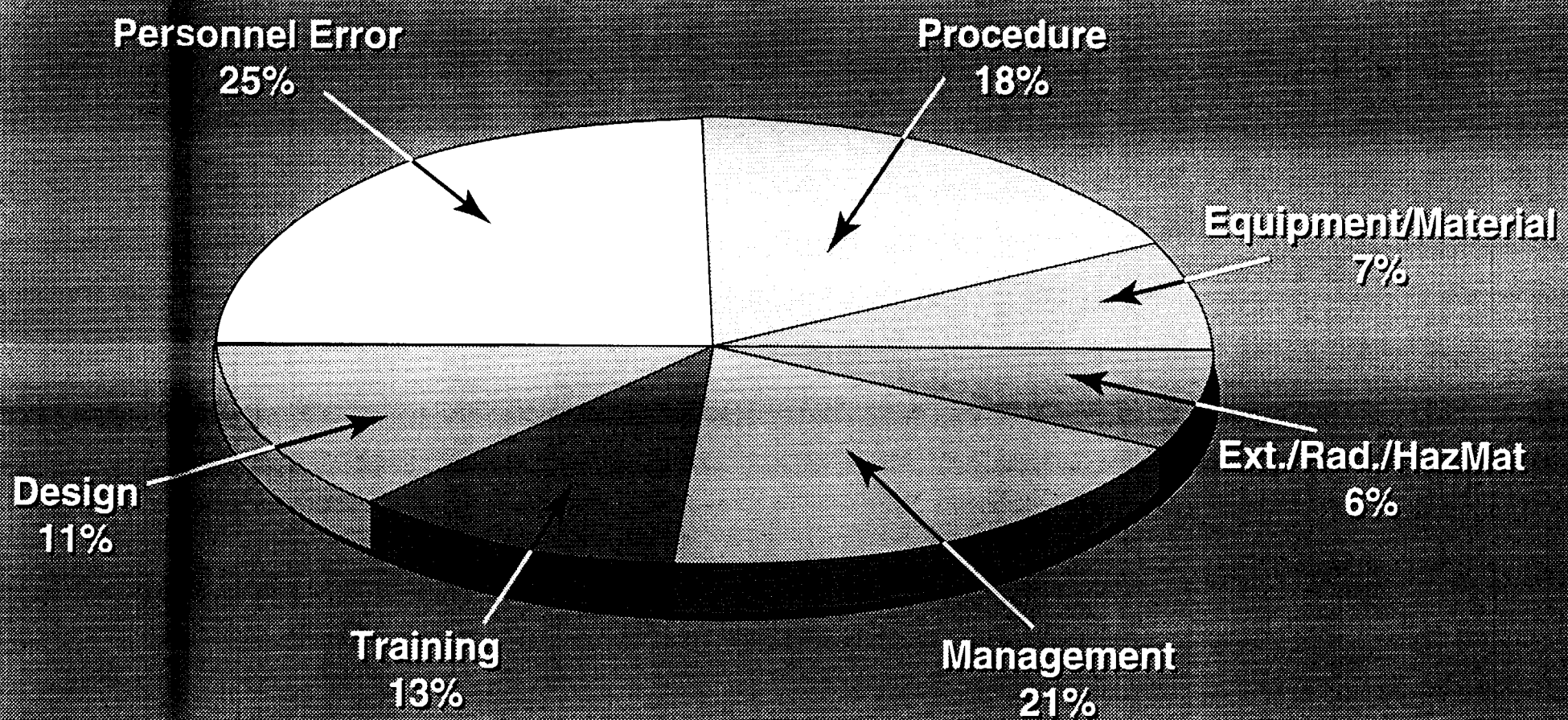


Direct Cause
Chemical Safety ORs



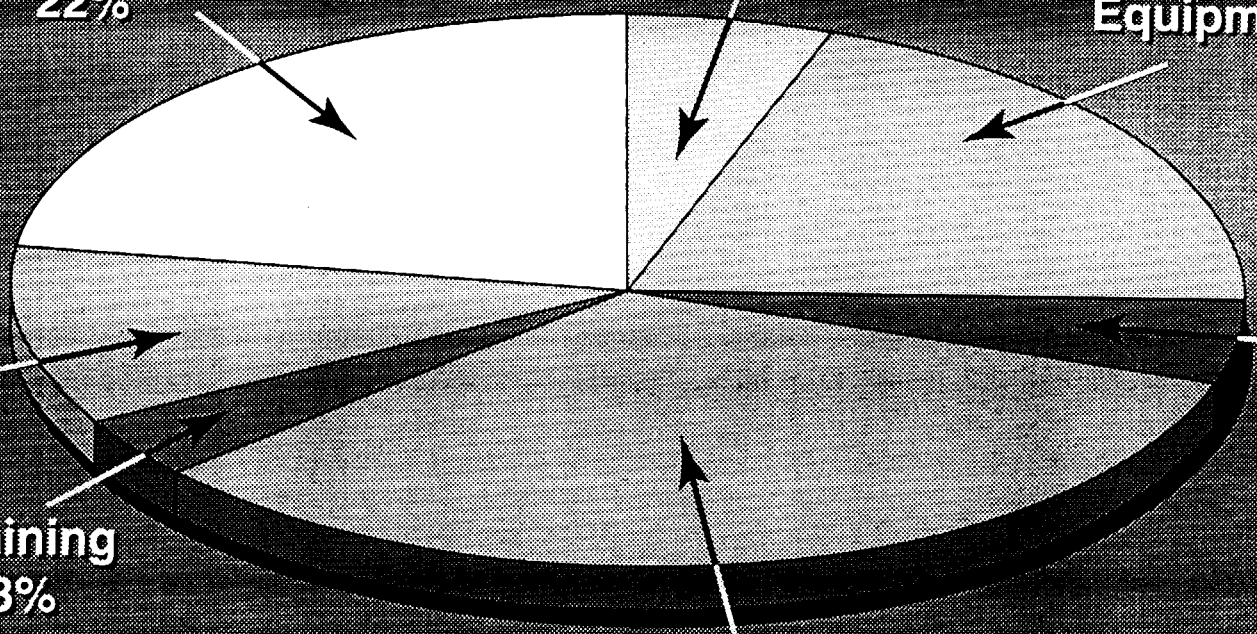
January - December, 1996

Contributing Cause
Chemical Safety ORs



January - December, 1996

Root Cause
Chemical Safety ORs



January - December, 1996

Basic Approaches to Reducing Human Error

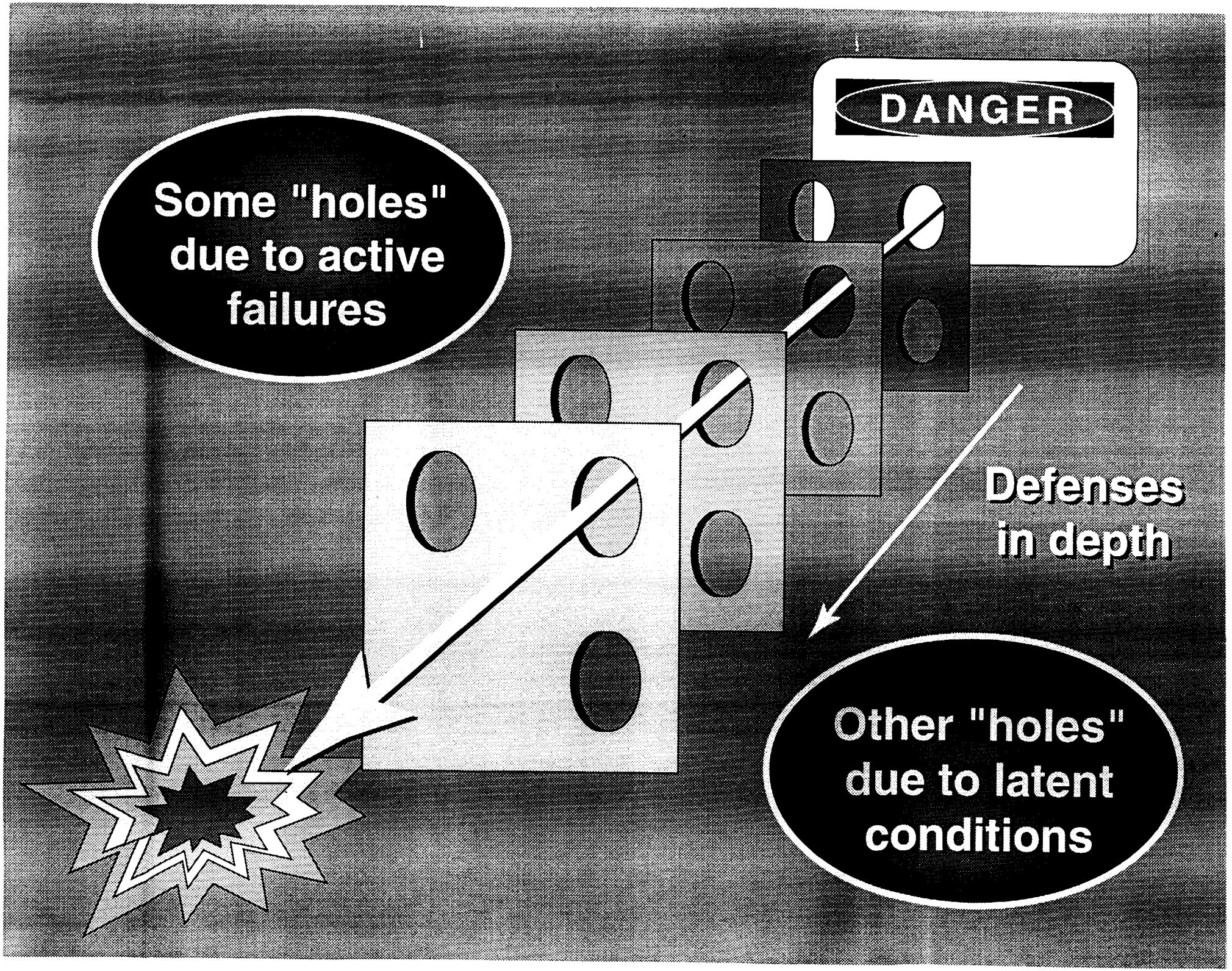
- Improve the human machine interface
  - build it in while building
  - find problems in existing plants and correct
- Improve the Tasks That People Have to Perform
  - DESIGN THEM BETTER
  - fix the current design
- Do a Better Job of Telling People How to do Their Jobs
  - IMPROVE YOUR PROCEDURES

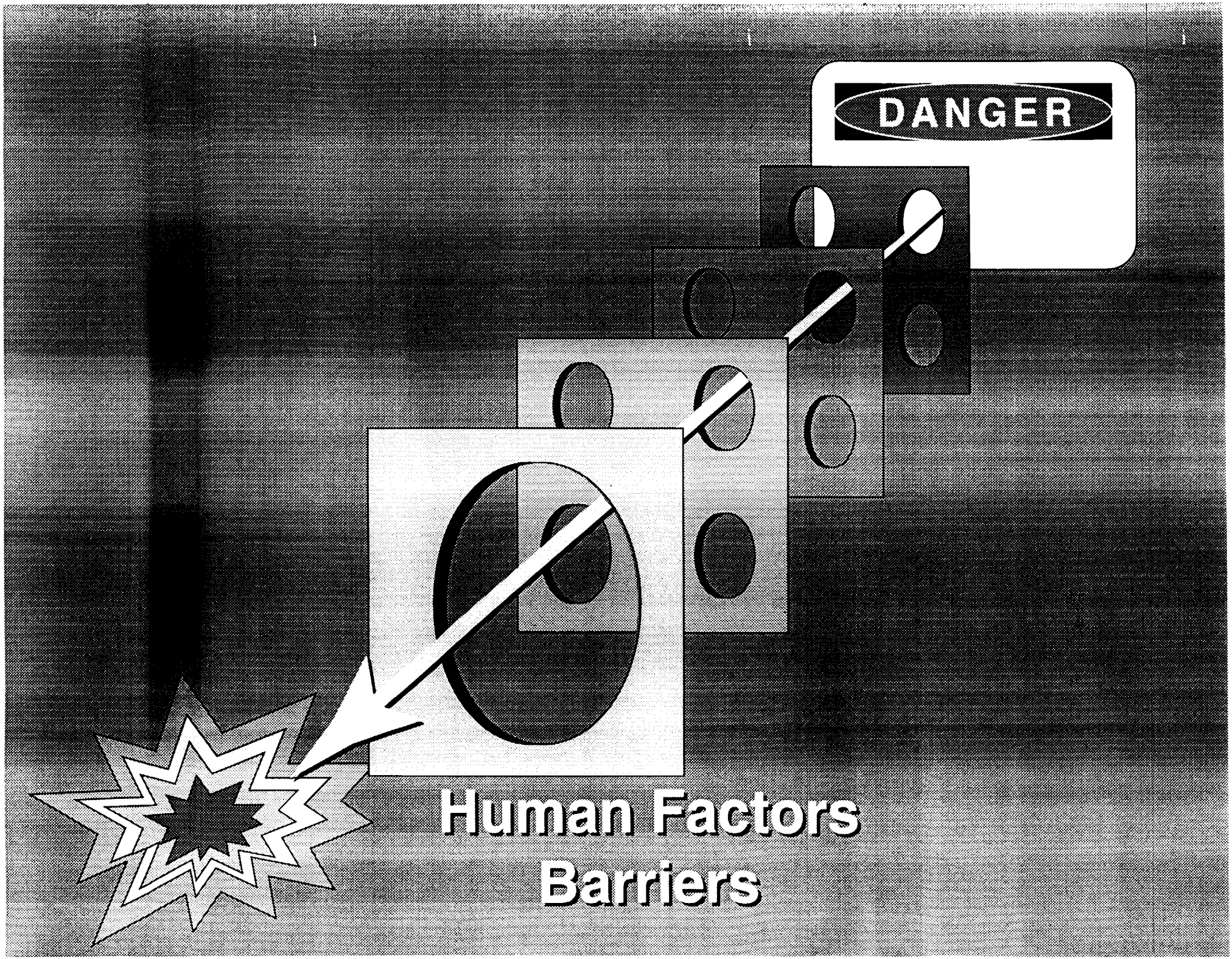
- Change People's Risk-Taking Behavior
  - safe acts
- Learn Your Lessons: *really find out why human errors are occurring*

Studies of Human Error in the CPI: Magnitude of the Human Error Problem

STUDY	RESULTS
GARRISON (1989)	Human Error accounted for %563 million of major chemical accidents
JOSHCHEK (1981)	80 - 90% of all accidents in the CPI due to human error
RASMUSSEN (1989)	Study of 190 accidents in CPI facility: Top 4 causes • insufficient knowledge 34% • design errors 32% • procedure errors 24% • personnel errors 16%
BUTIKOFER (1986)	Accidents in petrochemical and refinery units • equipment and design failures 41% • personnel & maintenance failures 41% • inadequate procedures 11% • inadequate inspection 5% • other 2%
UEHARA & HOOSEGOW (1986)	Human error accounted for 58% of the fire accidents in refineries • improper management 12% • improper design 12% • improper manuals 10% • misoperation 11% • improper inspection 19% • improper repair 9% • other errors 27%
OIL INSURANCE ASSOCIATION REPORT ON BOILER SAFETY (1974)	Human error accounted for 73% and 67% of total damage for boiler start-up and on-line explosions, respectively

From: "Guidlines for Preventing Human Error in Process Safety", CCPS, 1994


DANGER
Some "holes" due to active failures
Defenses in depth
Other "holes" due to latent conditions


DANGER
Human Factors
Barriers