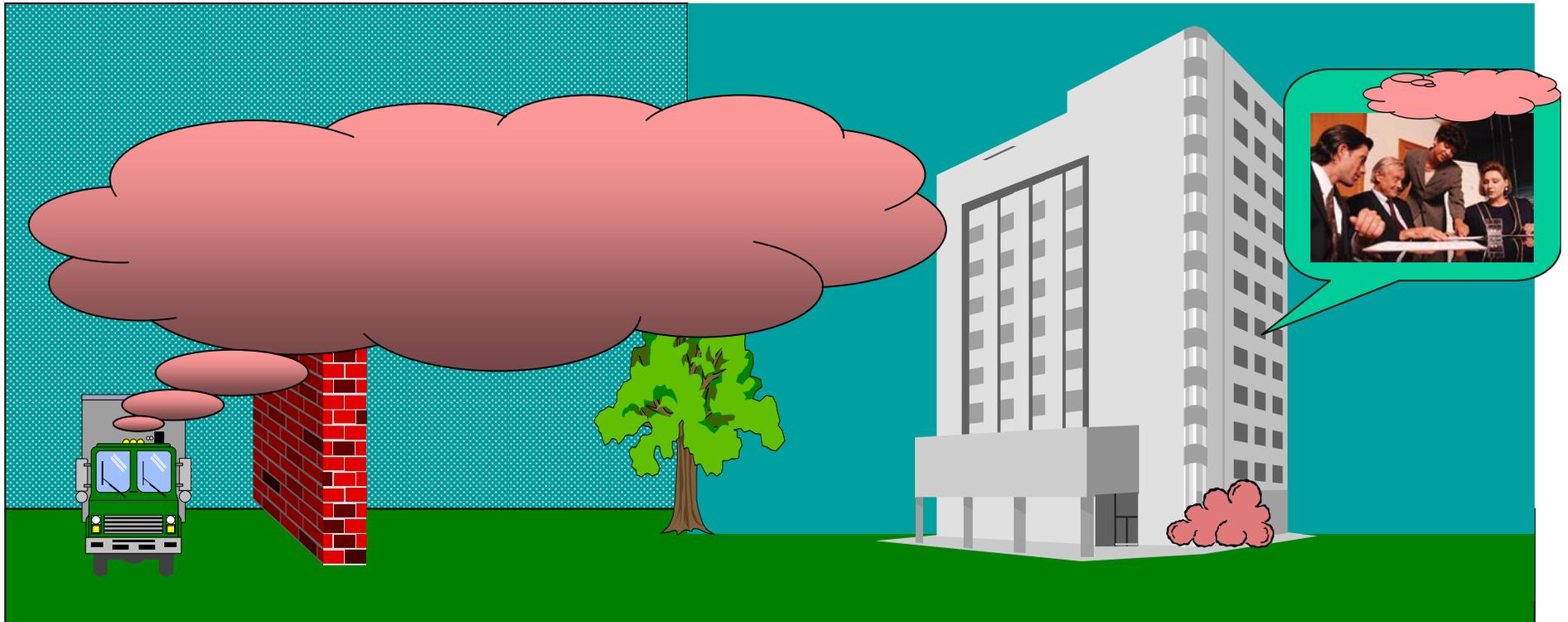


DOS Environmental Security

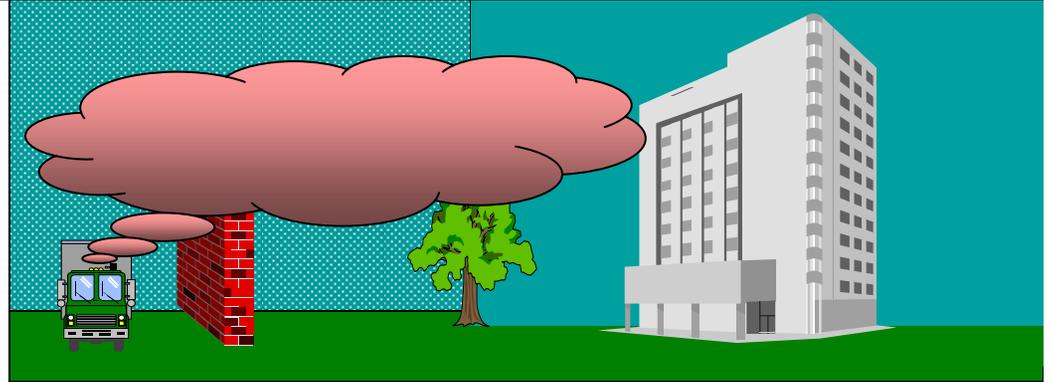
Protecting DOS Personnel from
Chemical-Biological (CB) Threats



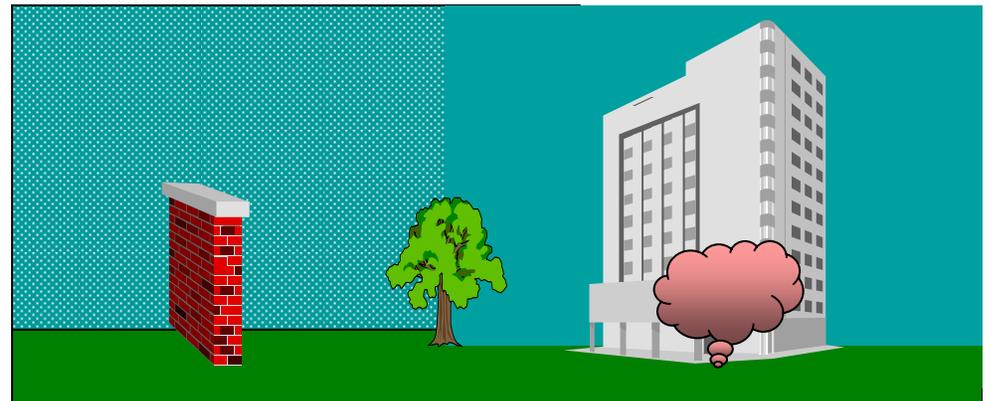
10/19/2006

Types of CB Attacks

- External plume outside compound perimeter



- Proximate external release inside compound perimeter



- Internal building release

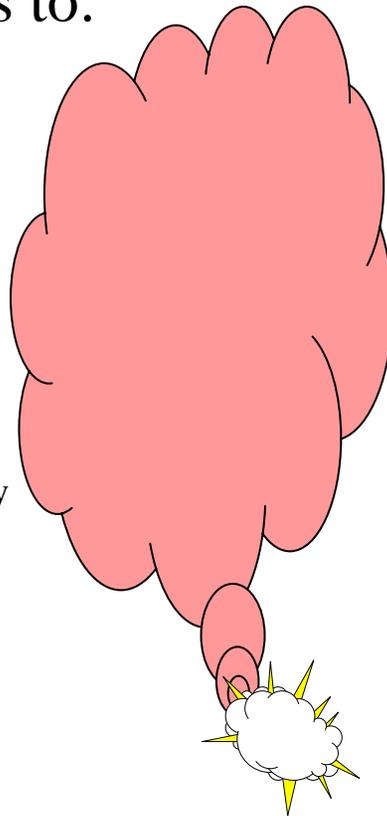


Chemical Biological Threat Environments

- **Airborne threat is the focus**

Excludes threats to:

- Food Supply
- Water Supply
- Other Threats
 - Blast
 - Fragments
 - Nuclear
 - Forced entry



Includes:

- Building / HVAC Design
- DS Escape Mask Strategy
- DS Decontamination Strategy

Note: CB protection for EOBs is added during renovation of blast-resistant “Inman” buildings.

Chemical Biological (CB) Threats

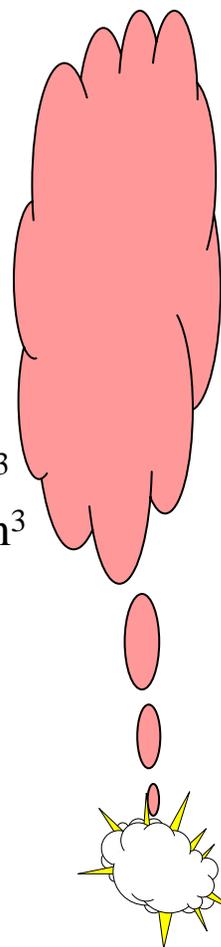
DOS Protection Approach

- **Military Nerve Agents**

- Most dangerous exposure time factors: $<35 \text{ mg-min/m}^3$ (thimble)
- Heavy molecular weight
- Preferentially adsorbed by activated carbons in small reaction zone of adsorption bed

- **Toxic Industrial Chemicals, Blister Agents**

- Exposure time factors: $>1000 \text{ mg-min /m}^3$ (shot glass); and most $>10,000 \text{ mg-min /m}^3$ (coffee mug)
- Physical screening and stand-off reduces much of the threat



- **Military Blood/Choke Agents**

- Most difficult agents
- Requires ASZM-TEDA impregnation of adsorption media for chemisorption
- Requires specific residence time at specified flow rate to capture agents

- **Biological Agents**

- Toxic levels: micrograms
- Filtered by conventional HEPA filters

- **Radiological Agents**

- Radioactive dust from “dirty bomb”

CB Protection Research and Development

Partners for Establishing Requirements

TSWG Partners:

- TSWG co-chair DOS S/CT
- OBO Chairs CB Bldg Protection members: SBCCOM(Army), GSA, DOE, NSWC (Navy) USSS, USPHS, NIST

Academic

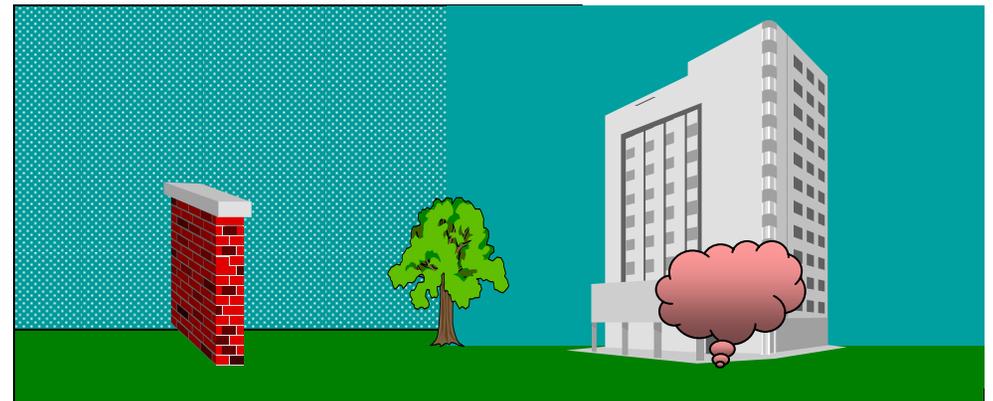
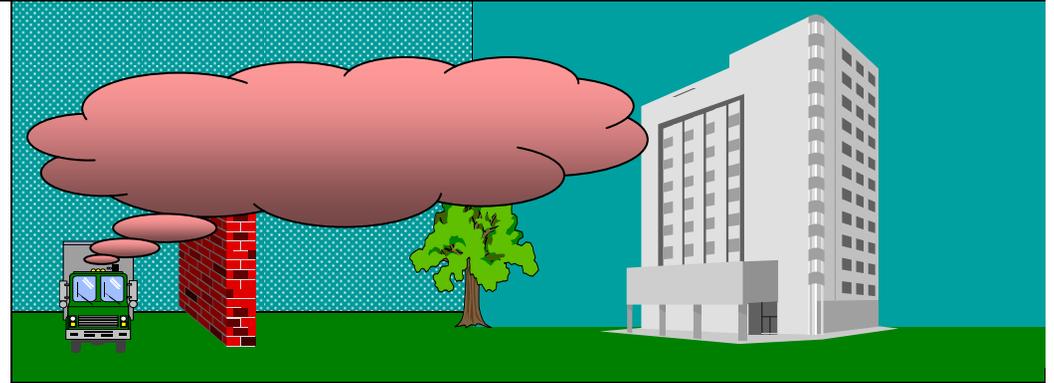
MIT/Lincoln Labs
Georgia Tech Research Inst.
Auburn/ University of Missouri
Research Triangle Inst. (NC)

Commercial:

Battelle, ASHRAE,
CSC Flanders, Camfil-Farr,
Barnebey-Sutcliffe, PURAFIL,
future IDQ design firm

Summary of SED HVAC Protection Strategies

- Positive Pressurization of Building
- Location of Air Intakes above Roof-line
- Particulate and Adsorption Filtration of Outdoor Air by HVAC system
- Differential Pressurization and Zoning by HVAC system
- Particulate and Adsorption Filtration of Recirculated Air by HVAC system



10/19/2006

CB Protection Criteria by OBO

<u>Technology</u>	<u>Criteria</u>	<u>Design</u>
1. HVAC Inside (recirculated) & Outside (make up) Air Filtration to remove CB agents	>99.97% removal of all particles greater than 0.3 microns >90% removal of volatile organic compounds, toxic industrial chemicals and military chemical agents	HEPA filters per ASHRAE standard 52.2; ~750 Pa total clean filter pressure drop for combined HEPA / gas filters; 0.1 sec residence time at ≤ 0.25 m/s bed velocity using ASZM-TEDA carbon
2. HVAC Positive Pressure to minimize infiltration of CB agents	2.5 minimum Pascal difference between public (-) and non-public (+) zones, and between non-public (-) and core area (+); Transients permitted.	Pressure monitors between zones to control return dampers; Variable frequency drive fans; Fan power increases; but no fan size increase since ventilation air yields pressurization; Distributed air handler units;
3. Elevate Intakes to minimize uptake of external CB agents	Intakes above roof line and away from exhaust and other pollution sources	
4. Containment of releases to prevent migration; particularly in public areas	Provide separate HVAC air handling units for public, non-public and core areas to contain the release of CB. Some areas may be negative to adjacent space.	General mailrooms, bathrooms, kitchen may be designed to be negative to adjacent interior space. Kitchen and other hoods need to provide makeup air.
5. Detectors	Not available at this time	Inadequate response time. Limited ID capability. Too many false alarms.
6. HVAC Shutdown and restart at MSG Post 1.	Consistent with fire protection design criteria	Inadequate response time & stops building + pressure and filtering

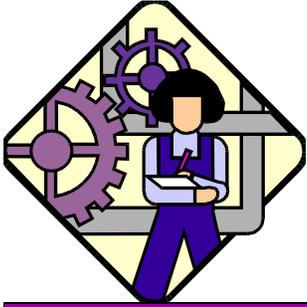
HVAC / Building:

DESIGN

- Filter Strategy
- Pressurization Levels
- Pressurization Air
- Slab-to-Slab Construction
- HVAC Control
- Pressurization Control
- Redundancy

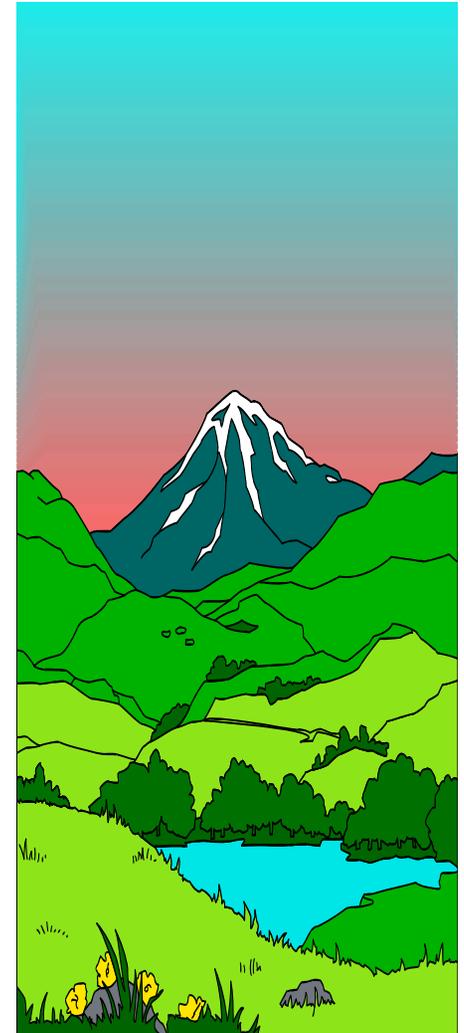
OPERATIONS

- Commissioning Tests
- Maintenance
- Filter Replacement
- HVAC Setback Levels
- Thermal Massing for Reduced Peak Load
- Humidity Control



OBO: Indoor Air Quality (IAQ)

- Issue: High temperature and humidity & high TB populations are risk to staff health; 1/3 of world's population exhibit exposure to TB Bacillus
- Objective: Provide better IAQ at Posts
- Strategy: Install C/B protection in NOB, MSGQ and EOB Inman renovations
- Action: The SED includes positive building pressurization (including from consular windows to public area), gas-particulate filtration, monitored ventilation, and strict 24 hour humidity control.



Cost and Maintenance

- As in current system, prefilters will be changed at least annually (*when indicated by pressure drop gage*)
- HEPA and Adsorption filter will have operational life of ~5 years when prefilters are properly maintained
- Housings are designed for ease of access to filters:
 - side access, hinged, removable, bolt-free doors
 - slide track filter rail with simple fluid seal (knife edge) gaskets for HEPA and adsorption filters
 - standard 2' x 2' filter sizes with no more than four filters wide and three filters high;
- 2' x 2' Filter replacement cost: Prefilter - \$19. HEPA - \$177. Adsorption Filter - \$ 2500.