SAND2011-1159P

Storage Bunker Concepts For China Center of Excellence

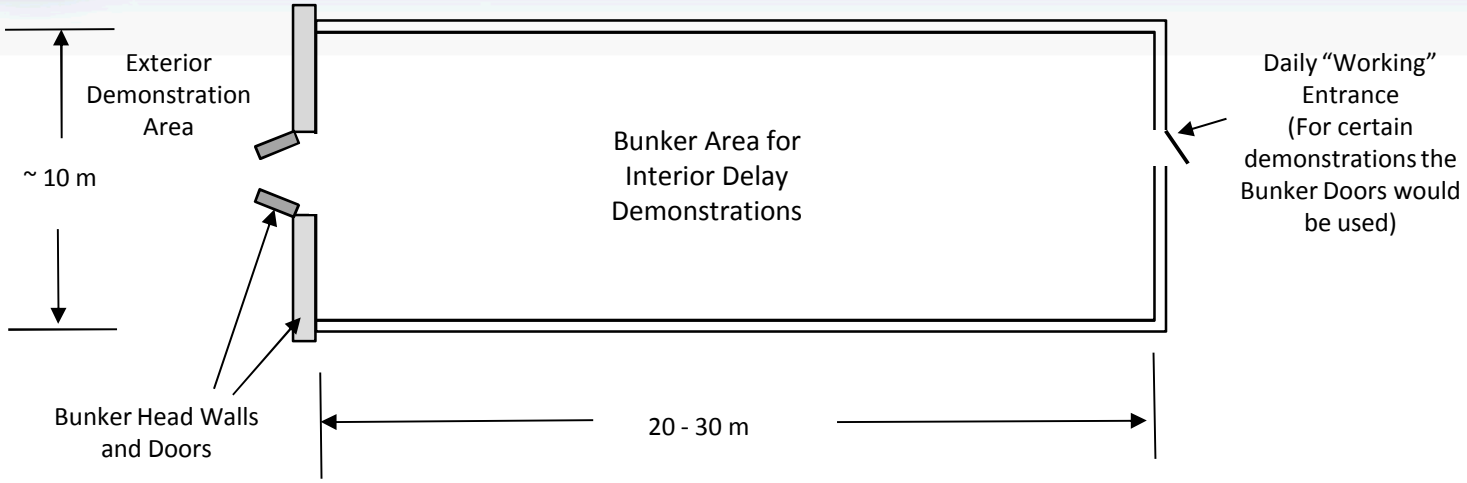
Sandia National Laboratories
Tommy Goolsby
Timothy Malone
February 18, 2011

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2011-XXXX P

National Nuclear Security Administration

Sandia National Laboratories

Option 1 Concept
Bunker for Delay Demonstrations

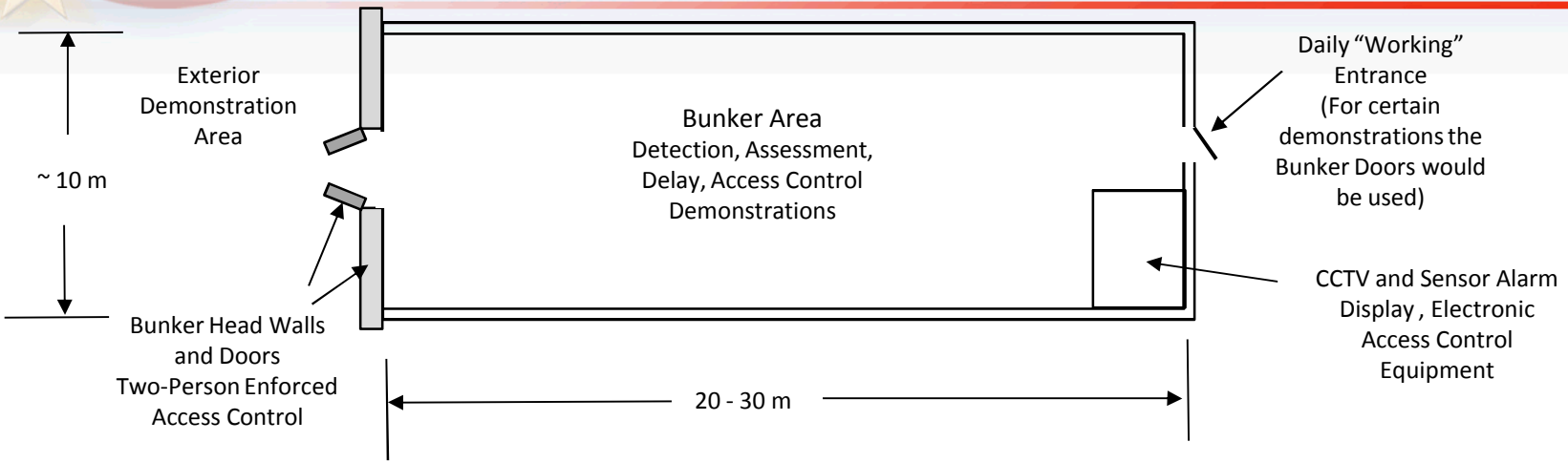


Exterior Physical Delay Equipment
- Bunker Perimeter PIDAS Example (short section)
- Massive Modular Blocks
- Bunker Doors
- Bunker Headwalls
- Bunker Overburden Examples
- Exterior Concrete Pad in front of Bunker
  - Small Modular Vault with Stackable Delay Blocks
  - Vehicle Barriers
    - Fixed examples
    - Moveable examples
  - Structural Elements with Delay Barrier Examples
    - Windows, Utility Ports, etc.
  - Access Control Barrier Examples
    - Turnstiles, etc. with Bypass Protection
  - Small Covered Display Area
    - Posters
    - Monitor for exterior delay related videos

Interior Physical Delay Equipment
- Concertina Blanket System
- Concertina Portcullis System
- Floor Vault/Plug
- Tiedown Examples
  - Multiple Can Chain Tiedown
  - Single Can Chain Tiedown Using Chain Pots
  - Single Can Rigid Frame Rigid Frame Tiedown
  - Single Can Rigid Frame Tiedown with Hinged Top Lid & Removable Front Grate
  - Rigid Frame Tiedown with Expanded Metal Grate & Interior Rigid Frame
  - Delay Concrete Blocks for in floor storage

Interior Activated Dispensables
- Glycol Fogger System
- Aqueous Foam Generator System

Option 2 Concept
Bunker with Detection, Assessment, Delay and Access Control Demonstrations



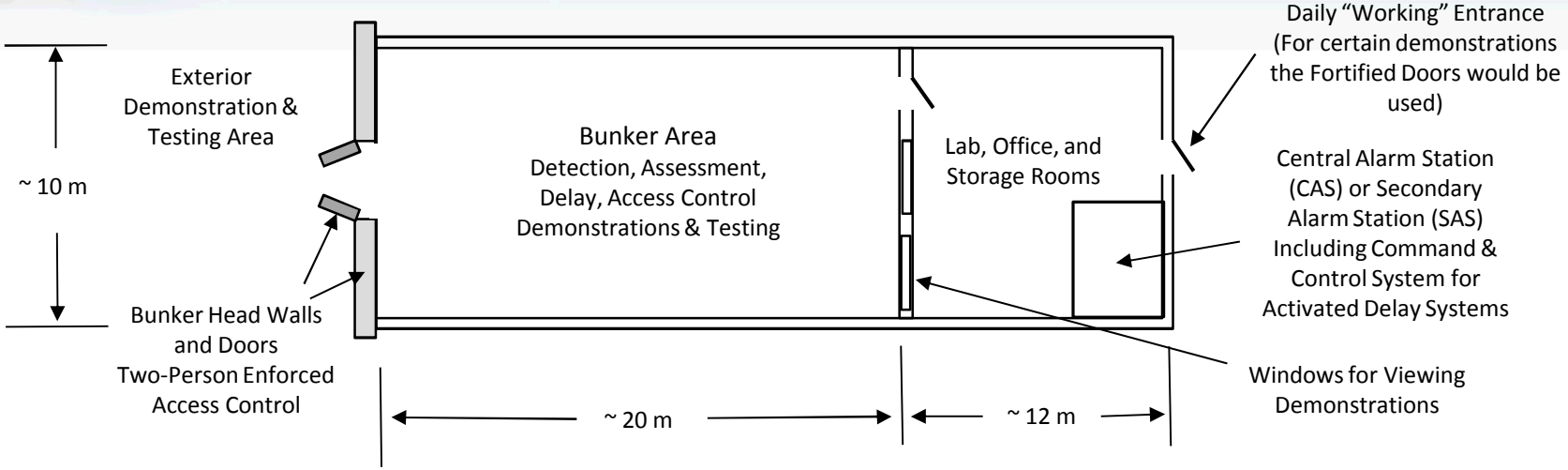
Delay Equipment
- Same as for Option 1

Detection Equipment (examples)
- Penetration Sensors
  - BMS (doors)
  - Vibration – fiber optic, mechanical (walls, door, ceiling , vents)
- Volumetric sensors (within bunker, mounted to walls, ceiling)
  - PIR
  - Microwave
  - Dual Technology
  - VMD
- Proximity sensors (mounted to specific items - ventilation grates, protected items)
  - Fiber optic
  - Capacitance

Assessment Equipment and Lighting (examples)
- CCTV Cameras (visible and near IR)
- Lighting
  - Visible – sodium, LED
  - Near IR – incandescent, LED)
- Thermal Cameras
- Pre- and post-alarm recording and display

Access Control System
- Mechanical key locks (2 person rule)
- Access control system (enforces 2 person rule with process involving system operator)
  - Magnetic locks
  - Badge readers, PIN pads, biometric (hand geometry , iris)

Option 3 Concept
Bunker with Detection, Assessment, Delay and Access Control Demonstration and Testing, and Lab, Office, CAS



Delay Equipment
- Same as Option 1 but adds:
- Storage for Hand/Power/Thermal Attack Tools
- Safety/Emergency equipment to support Delay Testing, Human Studies Review Board
- Fire Resistant Design of Interior/Exterior where testing is to be conducted
- Frames, hoists, forklift, pallet jacks, etc to support testing
- Testing does not include high energy, explosives or breaching tests of the Bunker Head Walls, Doors, vehicle barriers, etc.
- Phone/Radio/Intercom System to support testing
- Ability to handle/mix/dispose of chemicals – aqueous foam surfactant, glycol fogger liquid, etc.
- Forensics capability to determine why barriers failed
- Command & Control system/space for development and testing of activated delays

Detection and Assessment Equipment
- Equipment Similar to Option 2
- Capability to locate/relocate detection sensors and cameras to different areas outside & within bunker for demonstration and testing
- Capability to easily install new sensor and camera models for demonstration and testing
- Ability to test sensors in Bunker overburden
- Ability to test with humans & by automated means

Access Control System
- Equipment Similar to Option 2 (enforces 2 person rule with process involving CAS operator)
- Can be used for other areas needing access control

Central Alarm Station (CAS) or SAS
- Alarm communication and display (AC&D) system
  - Display of bunker alarms with bunker map
  - Reconfigurable
- Assessment system
  - Integrated with AC&D system
  - Pre- and post-alarm recording
  - Automatic display of live and recorded video upon sensor alarms
  - Reconfigurable
- Unmanned alarm data collection mode
  - Collect nuisance and false alarm data
- Could be tied into exterior sensor test bed and other areas with intrusion sensors and assessment CCTV