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Potential Applications of Wearable Robotics to DOE-EM Missions

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DOE-EM Mission Challenges

- Many of the most challenging EM sites/tasks remain to be assessed and remediated
- EM environments present unique hazards to workers
  - PPE protects workers from external hazards
  - Musculoskeletal and ergonomic hazards remain
- Due to task/environment complexity and variability, automation and even teleoperation are difficult
- Wearable robotics can augment and protect workers

Examples of EM Environments

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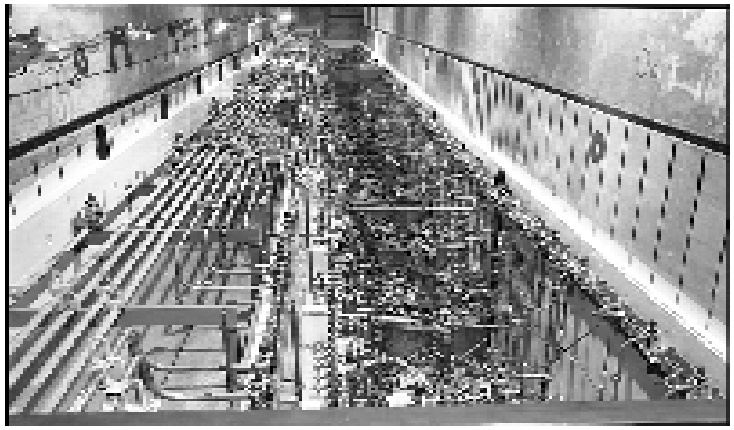

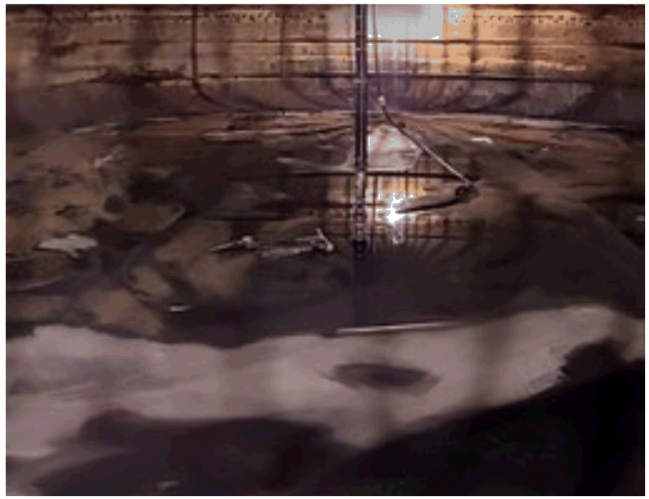

Examples of EM Worker Tasks

- Assessment, inspection, inventory
- Hot cell and glove box manipulation
- Maintenance and repair of equipment
- Demolition, disassembly, size-reduction
- Removal and/or loading of materials
- Emergency response operations
- Soil characterization and handling

Unique EM Wearable Robotics Drivers

- Musculoskeletal injuries are common across the complex
- EM Workforce is aging
- Level playing field for workers of different ages, genders, sizes
- Traditional teleoperation/automation approaches are difficult for many tasks/environments

Unique EM Wearable Robotics Challenges

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- Tasks are less repeatable than, e.g., factory assembly
  - Practical general-purpose exoskeletons are nascent at best
- Substantial mobility required for most workers
  - Weight, friction and inertia must be minimized
- Environments are challenging and variable
- PPE compatibility may be an issue
  - Can systems be decontaminated?