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Client: Willy Chipeta



Problem & Background:

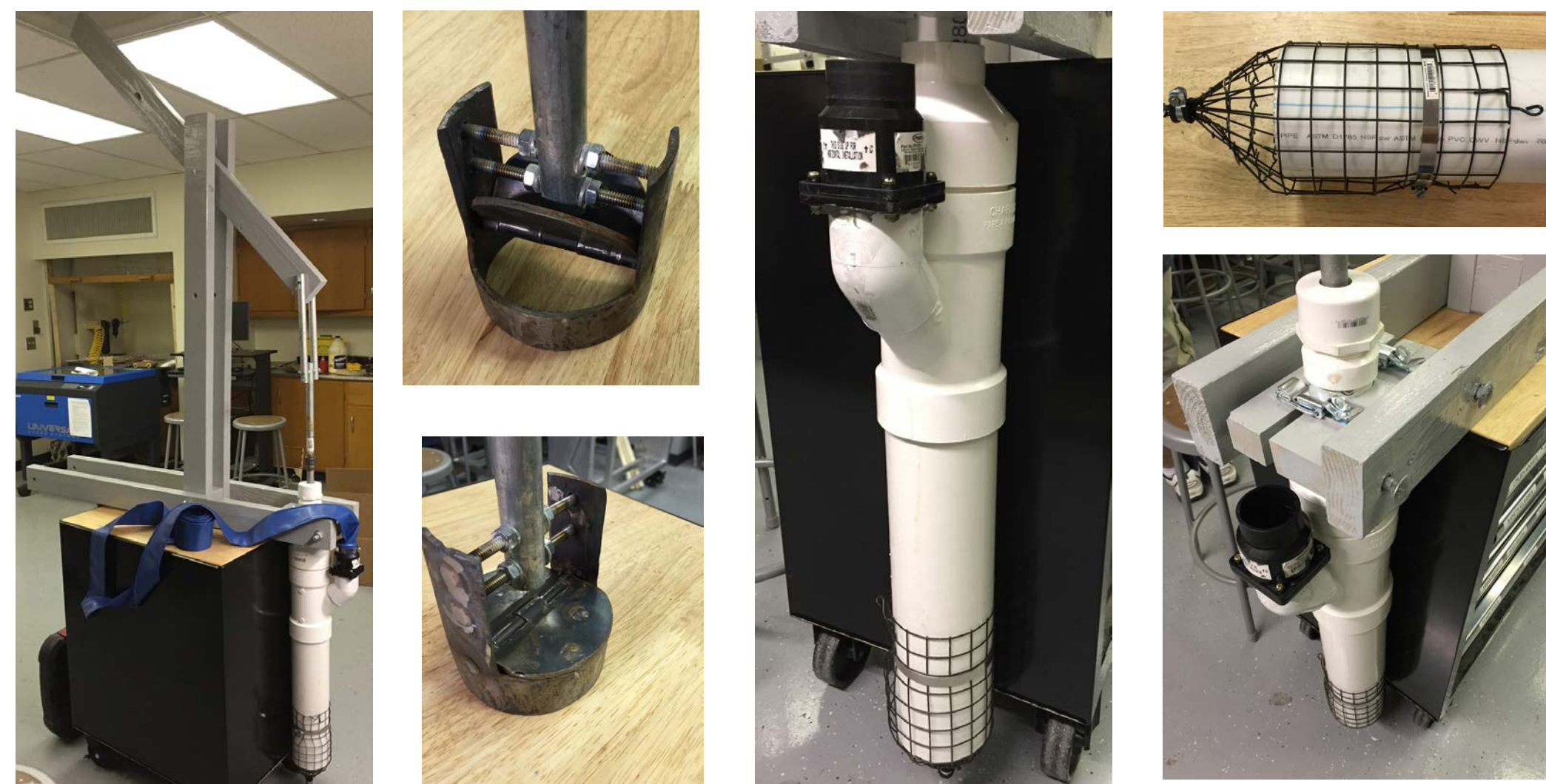
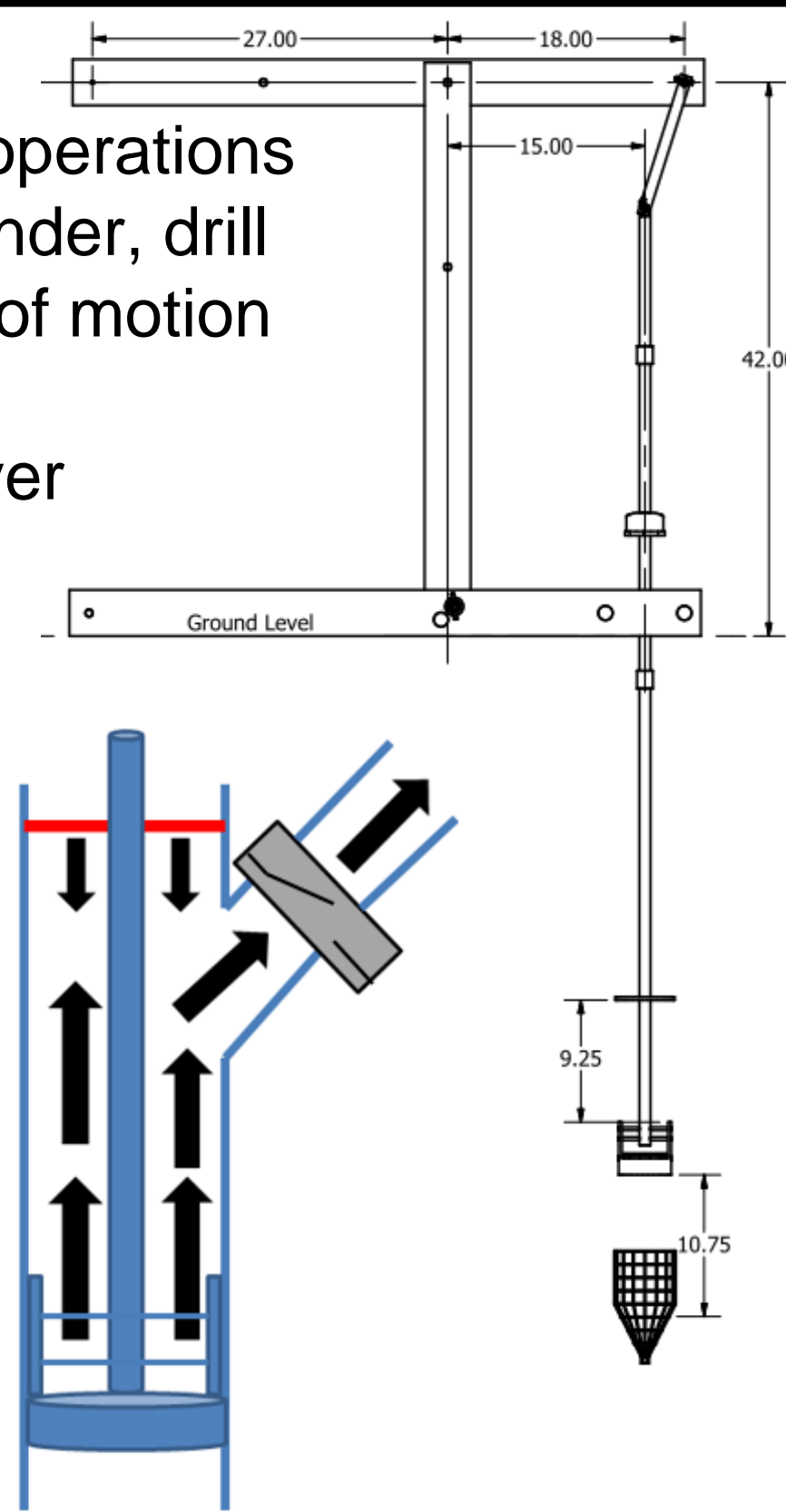
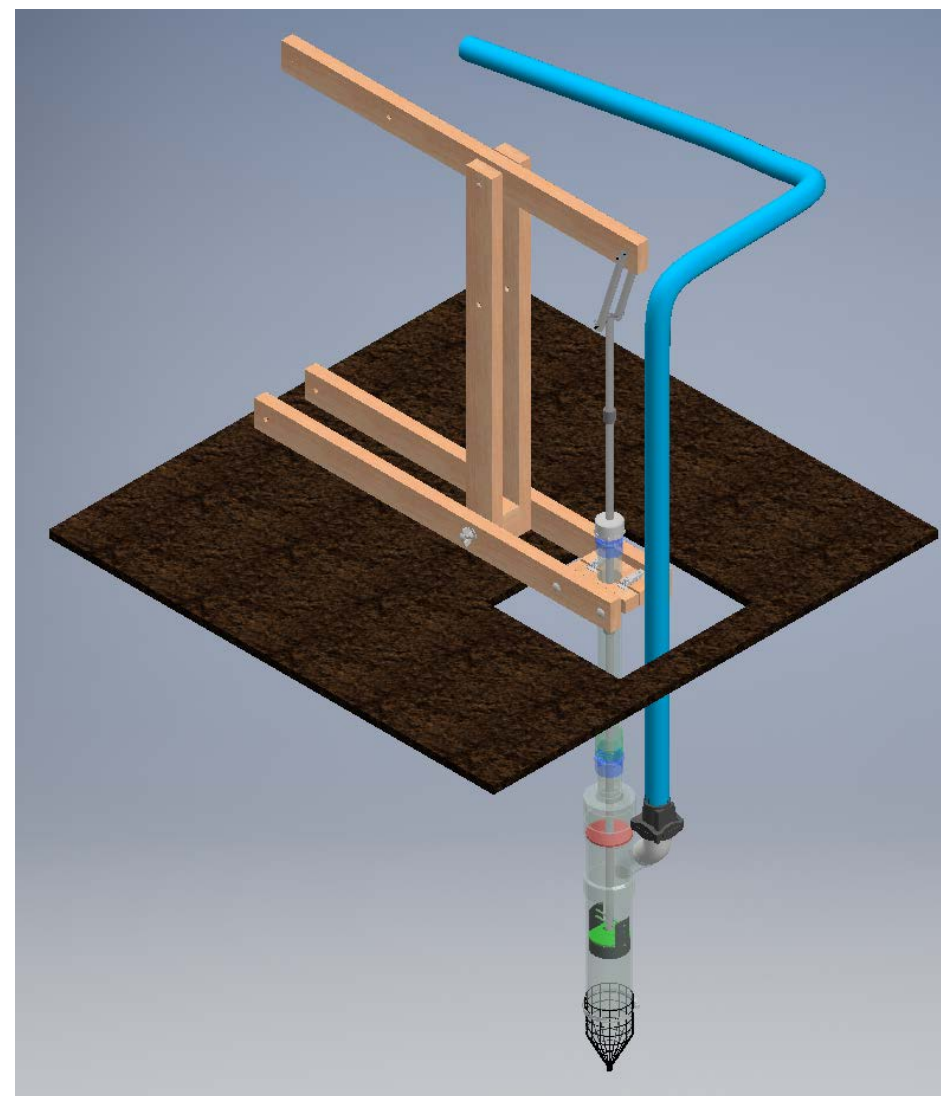
- Diarrheal diseases cause 8,800 deaths annually in Malawi, including 4,500 children under the age of five
- Pit latrines can improve sanitation but only if they are emptied regularly
- Latrines are confined spaces with limited pit access
- Emptying devices should be manually operated and able to be transported manually or by motorbike
- Sludge settles into a stratified mixture with solids consolidated at the bottom of the pit



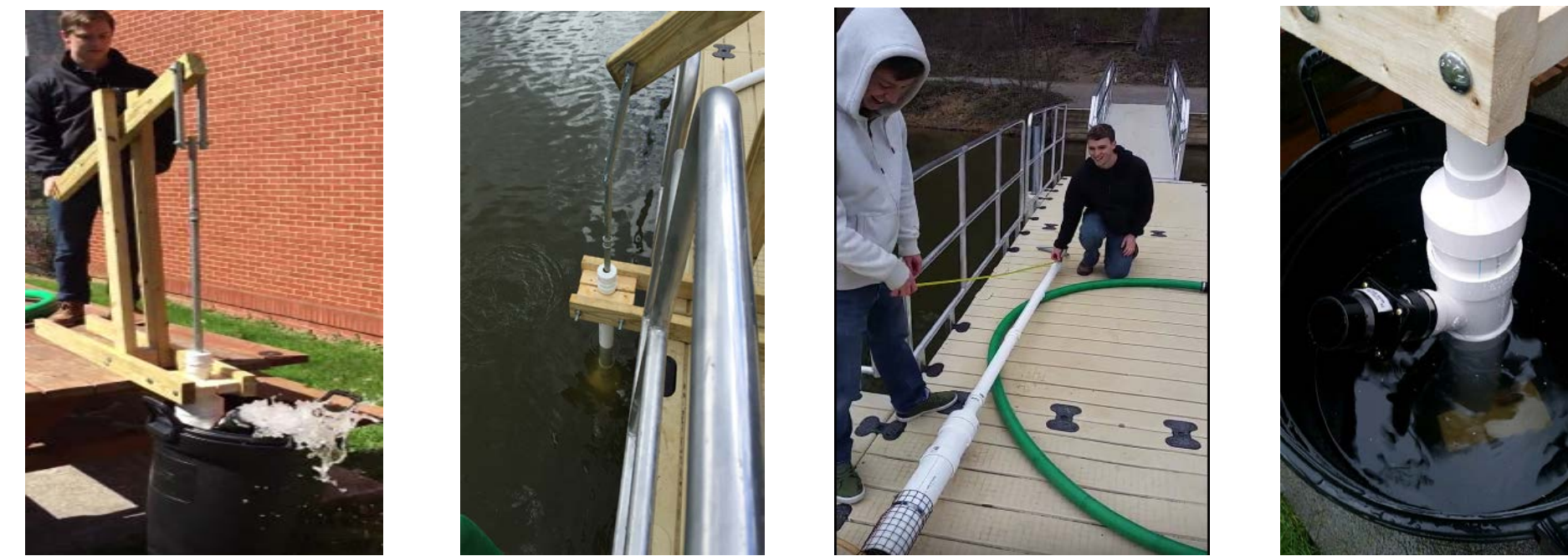
Objective: Create a device that can safely, sanitarilly, and effectively remove human waste from pit latrines in Malawi using locally available materials, tools, and processes.

Design

- Standard parts minimize machining operations
- Only required tools include saws, grinder, drill
- Pumping stroke matches arm range of motion
- Extensible to pump stratified sludge
- Kinematics minimize linkage crossover



Testing on Water



Testing on Clay Mixture



Testing on Pig Waste



Key Design Improvements

Extensibility:

- Able to pump depths of 2' to 8' with threaded couplings
- Draw latches clamp lever to pump



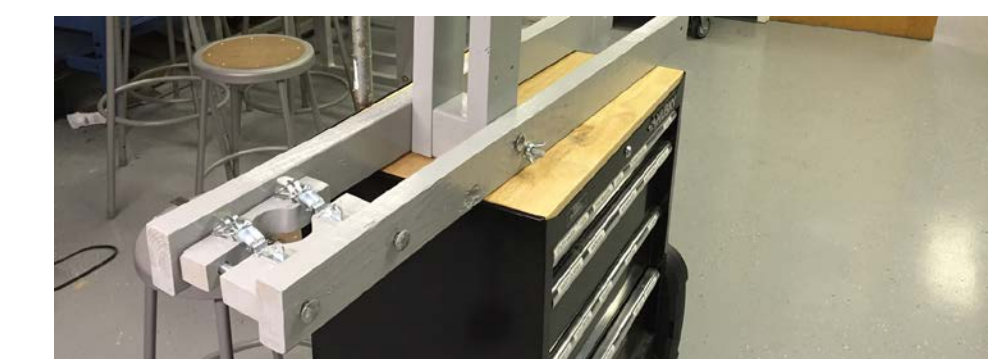
Transportability:

- Lever folds and locks into 8' bundle
- Longest single component is 4' long



Assembly:

- Clevis pins for linkages
- Wing nuts for lever
- Latches for pump clamp



Further Improvement

1. Sludge liquidizing techniques
2. Simplify piston fabrication
3. Better cleaning method
4. Unpredictable in-country improvements

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