



Effectiveness of Dust Control Systems Tested for use During Masonry Restoration – The Sequel

**RT 232 - Implementing Engineering Controls in Construction - Needs, Challenges, and Effectiveness
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The local exhaust ventilation system evaluations being described are part of a four-year NIOSH-funded project to reduce exposures in construction



To reduce silica exposures during tuckpointing, LEV systems must be:

Commercially available

Capable of capturing airborne dust

Used correctly

Our partnership identified tuckpointing LEV systems to evaluate



The partnership rated the following as the **most important criteria when selecting systems for further evaluation:**

- 1. Impact on productivity**
- 2. Durability**
- 3. User acceptance/compatibility with existing work practices**
- 4. Blade visibility**

While considering these criteria, the partnership selected tuckpointing LEV systems for further evaluation

- 1. Impact on productivity**
- 2. Durability**
- 3. User acceptance/compatibility with existing work practices**
- 4. Blade visibility**

The partnership selected from the grinders identified as most prominent in construction

Hilti

Bosch

Metabo

Makita

Dewalt

The partnership selected from seven tuckpointing shrouds

ICS Dust Director



Hilti Tuck Point Dust Removal Hood



Joe Due Blades and Equipment Dust Mizer



Bosch Tuckpointing Shroud

Dustless Technologies CutBuddie II



Arbortech AS170 Brick and Mortar Saw



Danish Tool North America Tuckpointing Router Bit and Shroud

The partnership selected from 14 vacuums



**ICS Vacuums
(4 models)**



**Hilti VC 40U
Vacuum**



**Little Red Ruwac
WNS 2220**



**Bosch Airsweep™ 13
Gallon Wet/Dry Vacuum
Cleaner with Power Broker**



**Dustless Technologies
HEPA Vac**



**Dustcontrol
Vacuums (3 models)**



**Ermator Vacuums
(2 models)**



**Tiger-Vac AS-400
HEPA**

Four high ranking systems were tested, with and without LEV, in a controlled setting

- 1. Metabo grinder, ICS Dust Director shroud with Dustcontrol 2900 vacuum**
- 2. Bosch grinder, ICS Dust Director shroud with Dustcontrol 2900 vacuum**
- 3. Bosch grinders, ICS Dust Director shroud with Ermator S26 vacuum**
- 4. Hilti grinder, Hilti shroud with Hilti vacuum**

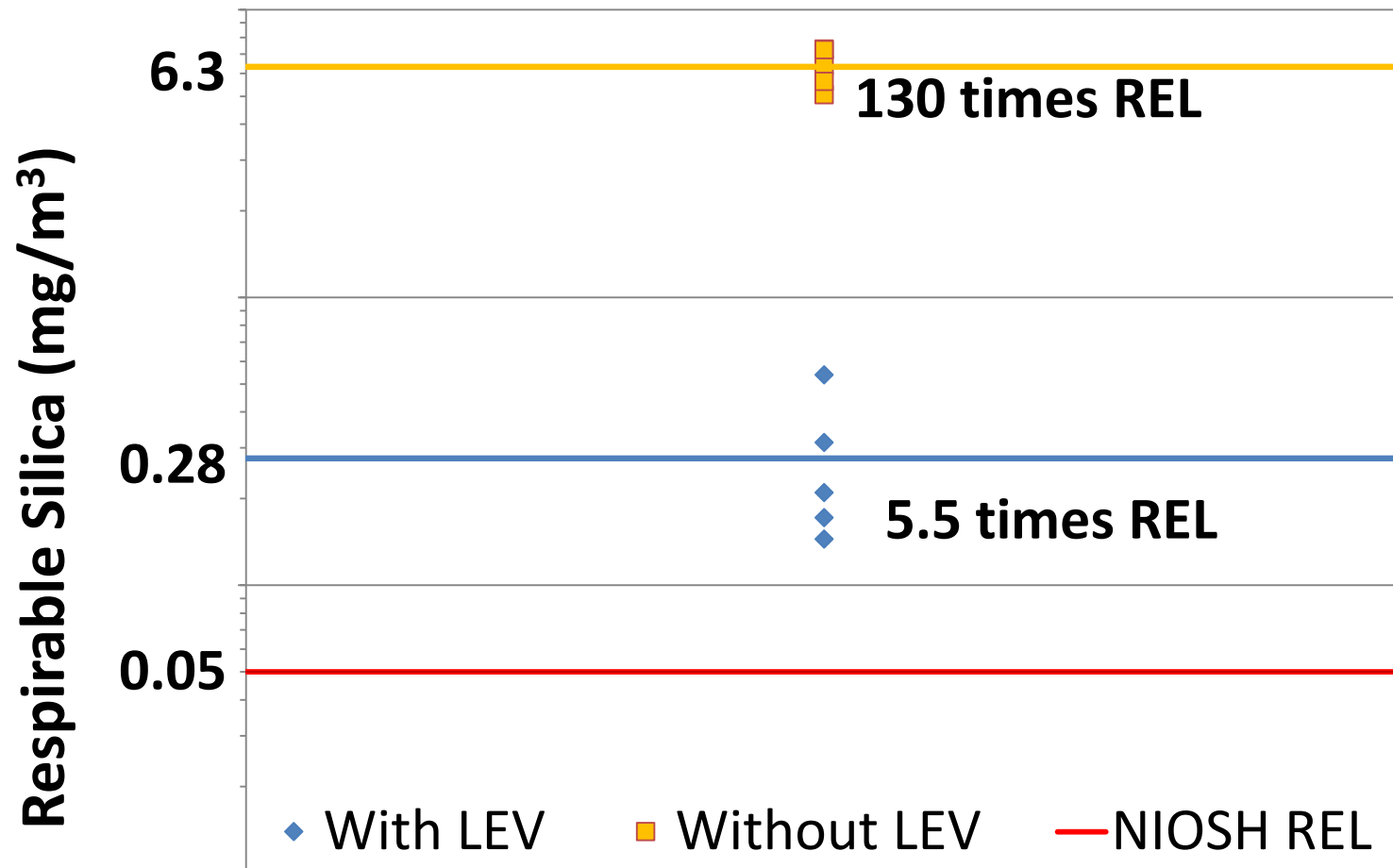
Test conditions and data collected were consistent between evaluations

- Used type S mortar after 28+ days curing
- Used filter (HEPA or 99.9%) recommended by manufacturer
- Conducted at least five trials per tool/control combination
- Randomized trial order to minimize bias
- **Sampled for 16 to 26-minute with LEV,** approximately half as long without LEV
- Sampled respirable silica sampling with BGI GK2.69 cyclone at 4.2 lpm
- Measured static pressure to monitor flow rate
- Documented mass of dust collected by LEV
- Documented linear feet of joints cut per minute

Using the Metabo grinder with the Dust Director shroud and DustControl vacuum reduced respirable silica exposures by 95.6%



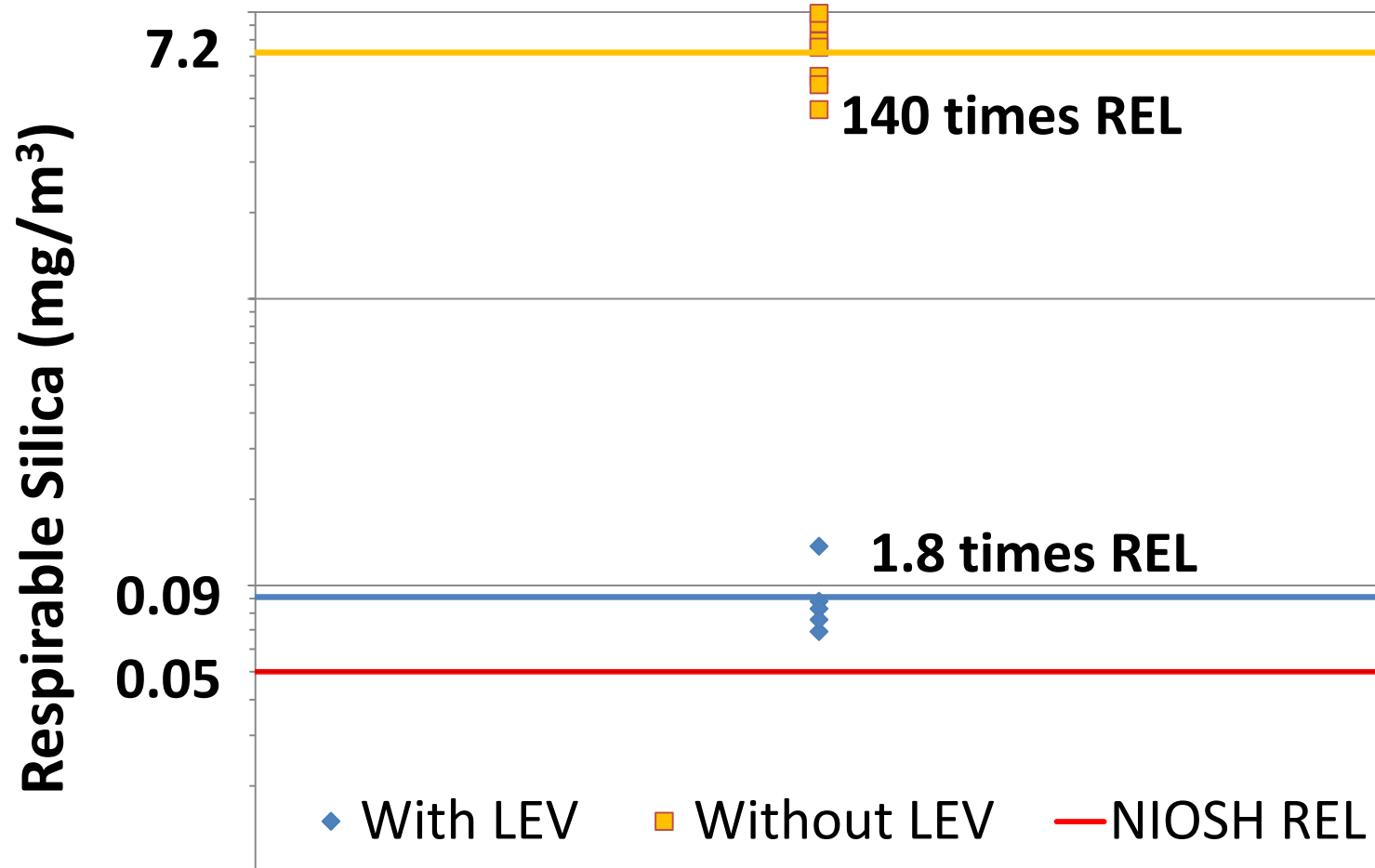
Using this LEV system reduced exposures by 95.6%



Using the Bosch grinder with the Dust Director shroud and DustControl vacuum reduced respirable silica exposures by 98.7%



Using this LEV system reduced respirable silica exposures by 98.7%



Using the Bosch grinder with the Dust Director shroud and Ermator vacuum reduced respirable silica exposures by 97.6%



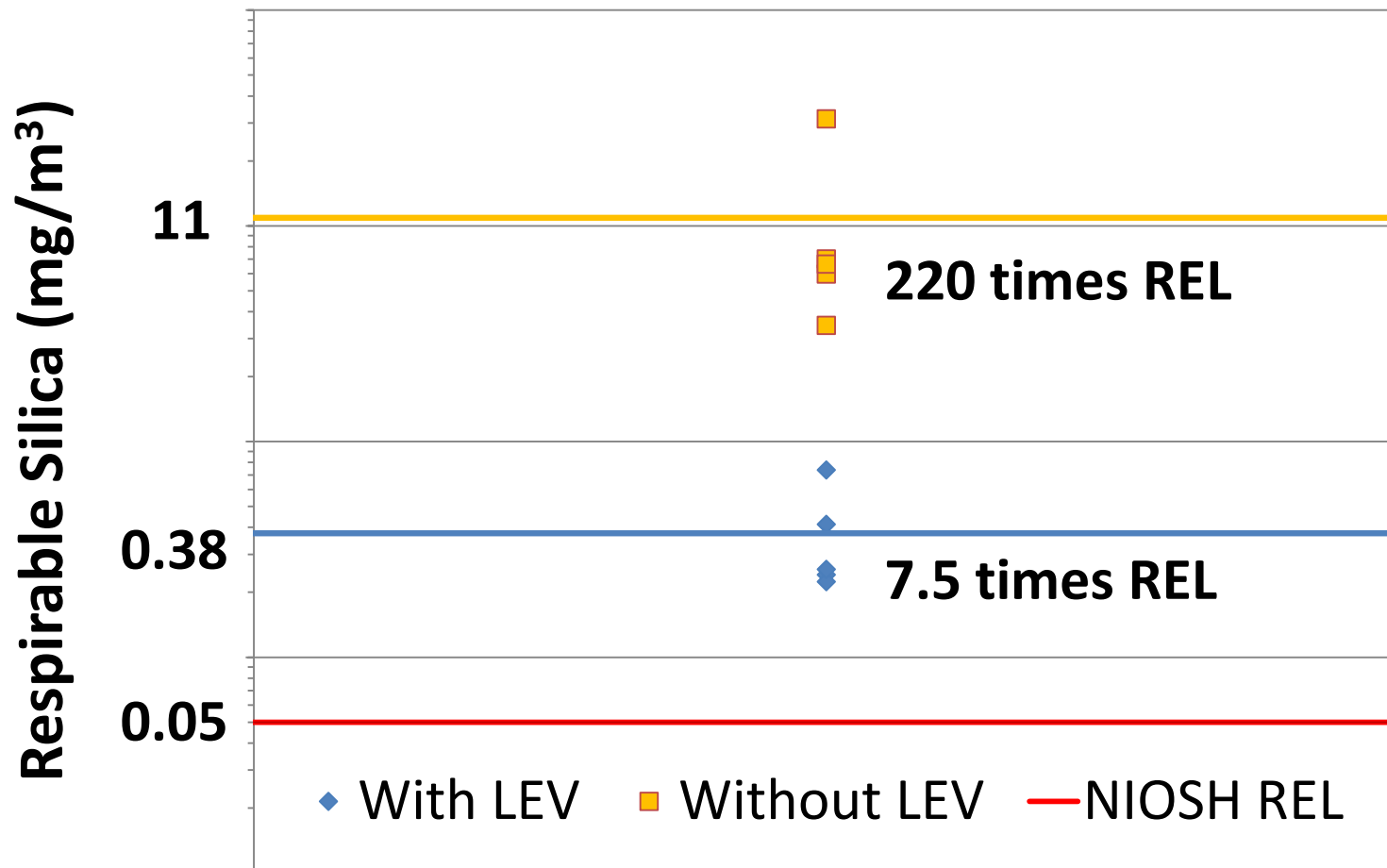
The Ermator S26 is rated to provide sufficient air flow to support two grinders



Using the complete Hilti tuckpointing LEV system reduced respirable silica exposures by 96.6%



Using this LEV system reduced exposures by 96.6%



In addition, we performed limited evaluations with a new grinder shroud from Ermator



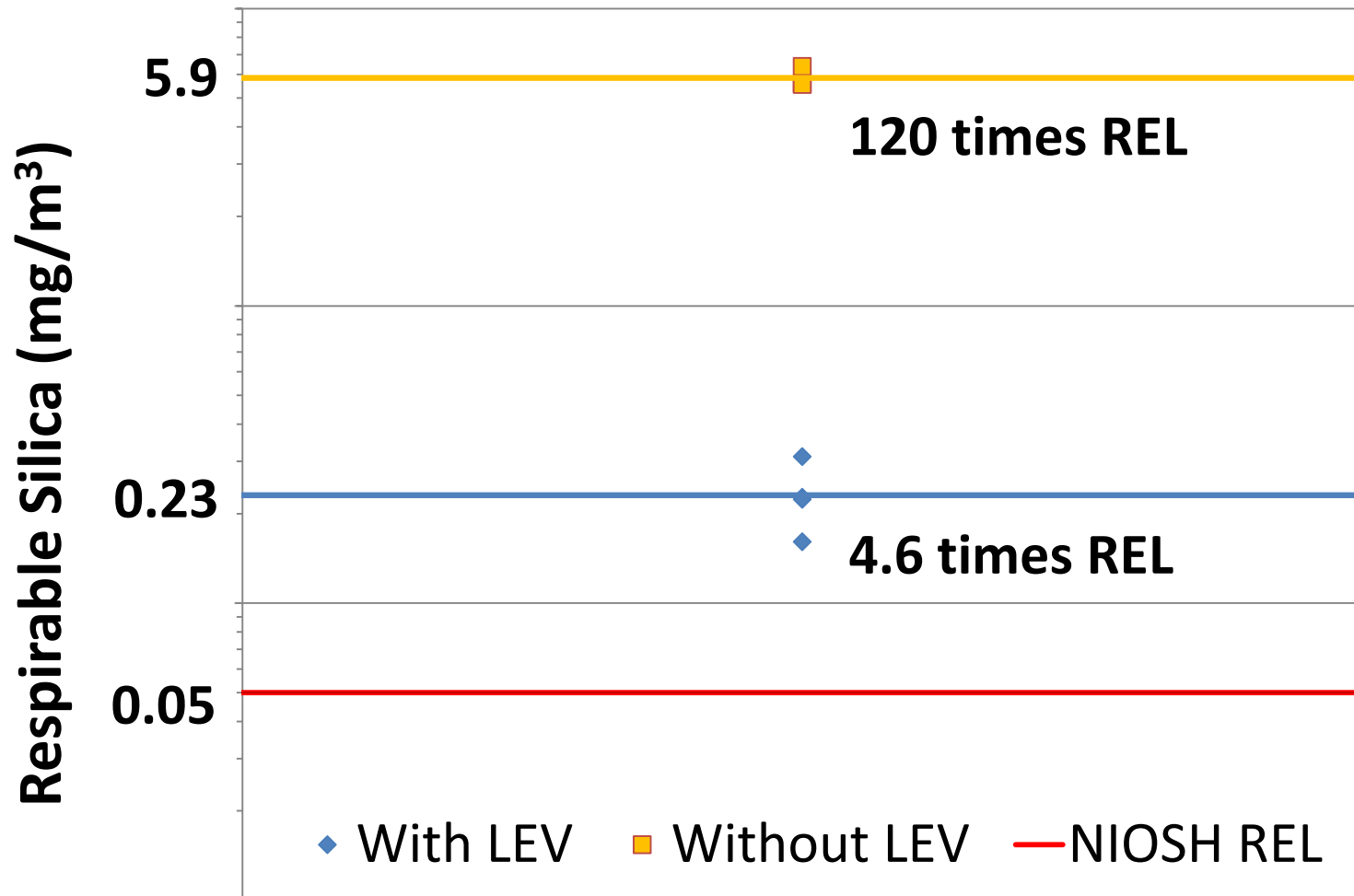
Test conditions and data collected were consistent between evaluations

- **Used type S mortar after 28+ days curing**
- **Used **HEPA** filter as recommended by manufacturer**
- **Conducted at least three trials per tool/control combination**
- **Randomized trial order to minimize bias**
- **Sampled for 24 minutes with LEV and 10 minutes without LEV**
- **Sampled respirable silica sampling with BGI GK2.69 cyclone at 4.2 lpm**
- **Measured static pressure to monitor flow rate**
- **Documented mass of dust collected by LEV**

Using the Bosch grinder with the Ermator shroud and Ermator S13 vacuum reduced respirable silica exposures by 96.1%



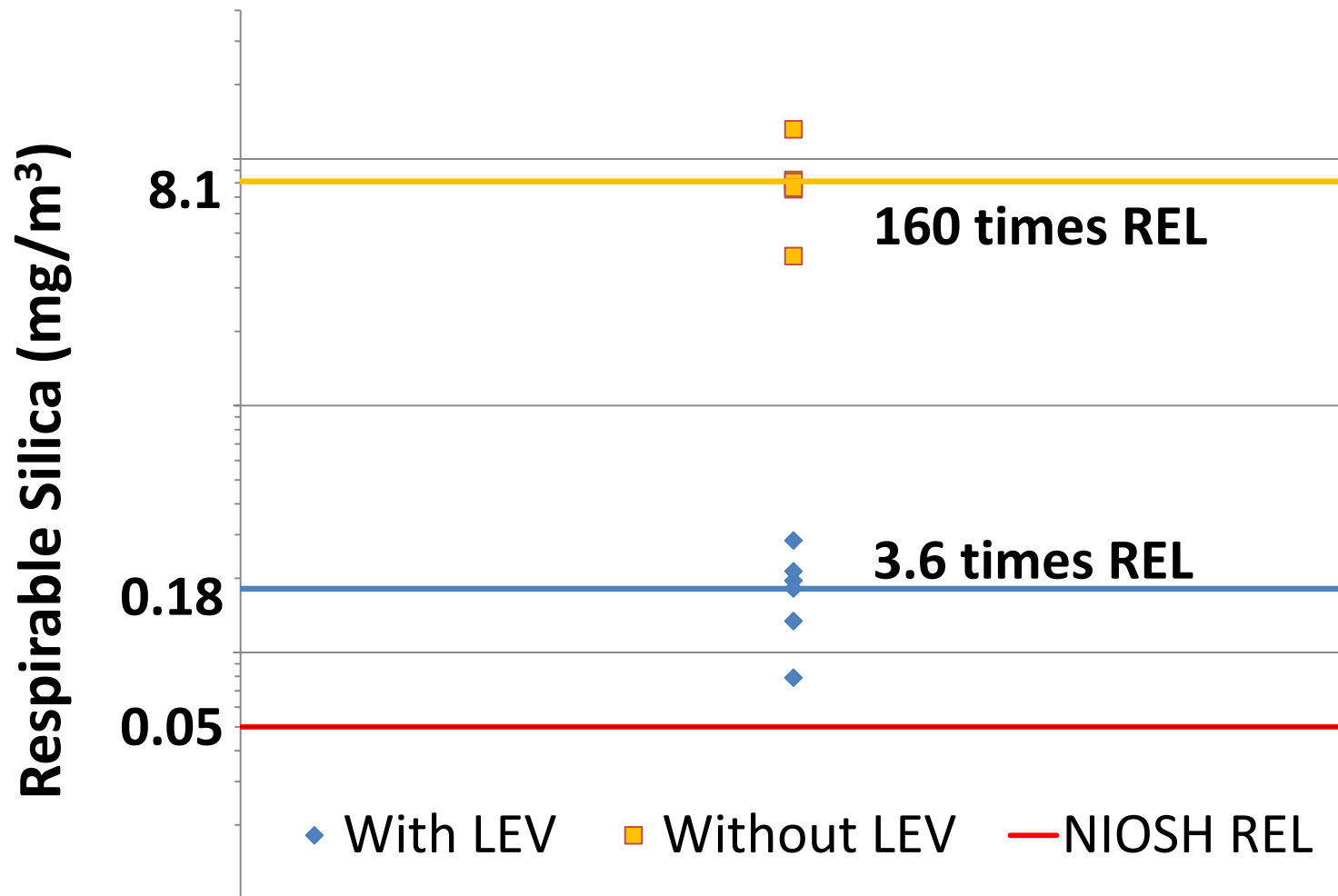
Using this LEV system reduced exposures by 96.1%



Using Bosch grinders with the Ermator shrouds and Ermator S26 vacuum reduced respirable silica exposures by 97.8%



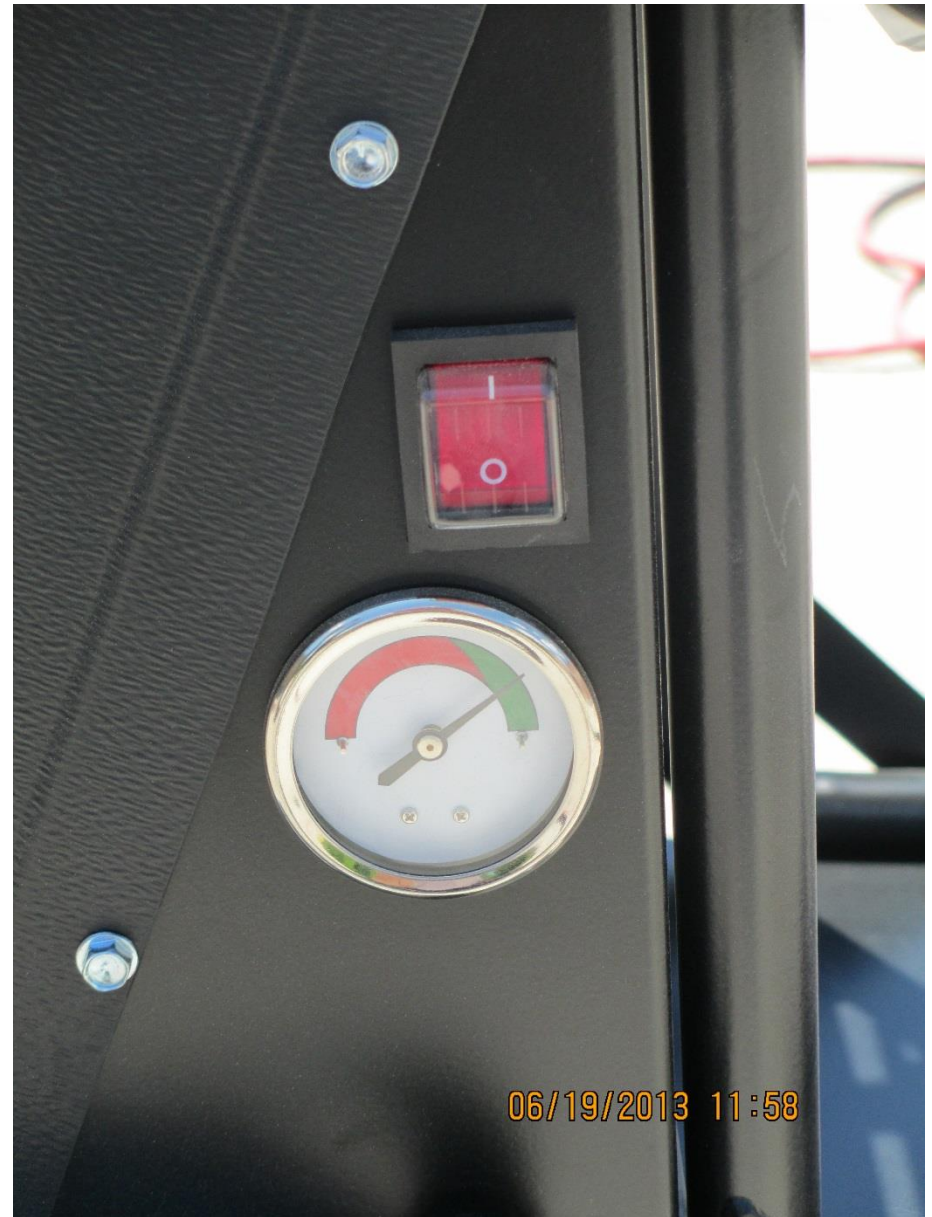
Using this LEV system reduced exposures by 97.8%



The highest flow rates at the tool were 79 percent of the manufacturers' specifications for the vacuums tested



The average flow rates after use were 68 to 75 percent of our desired flow rate



The average flow rates returned to 85 to 102 percent of our desired flow rate after filter cleaning

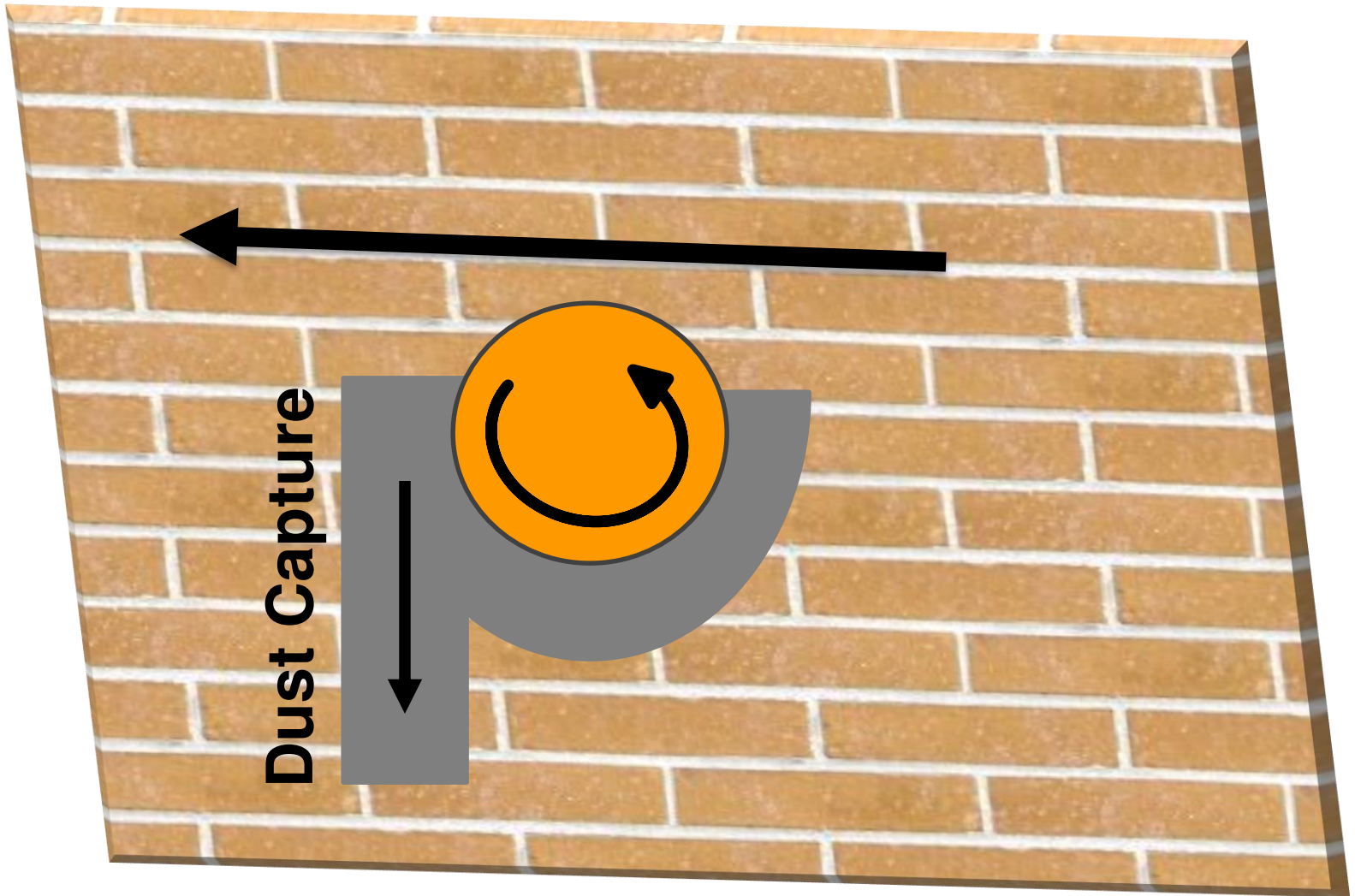


The available tuckpointing LEV systems can be effective but there are challenges

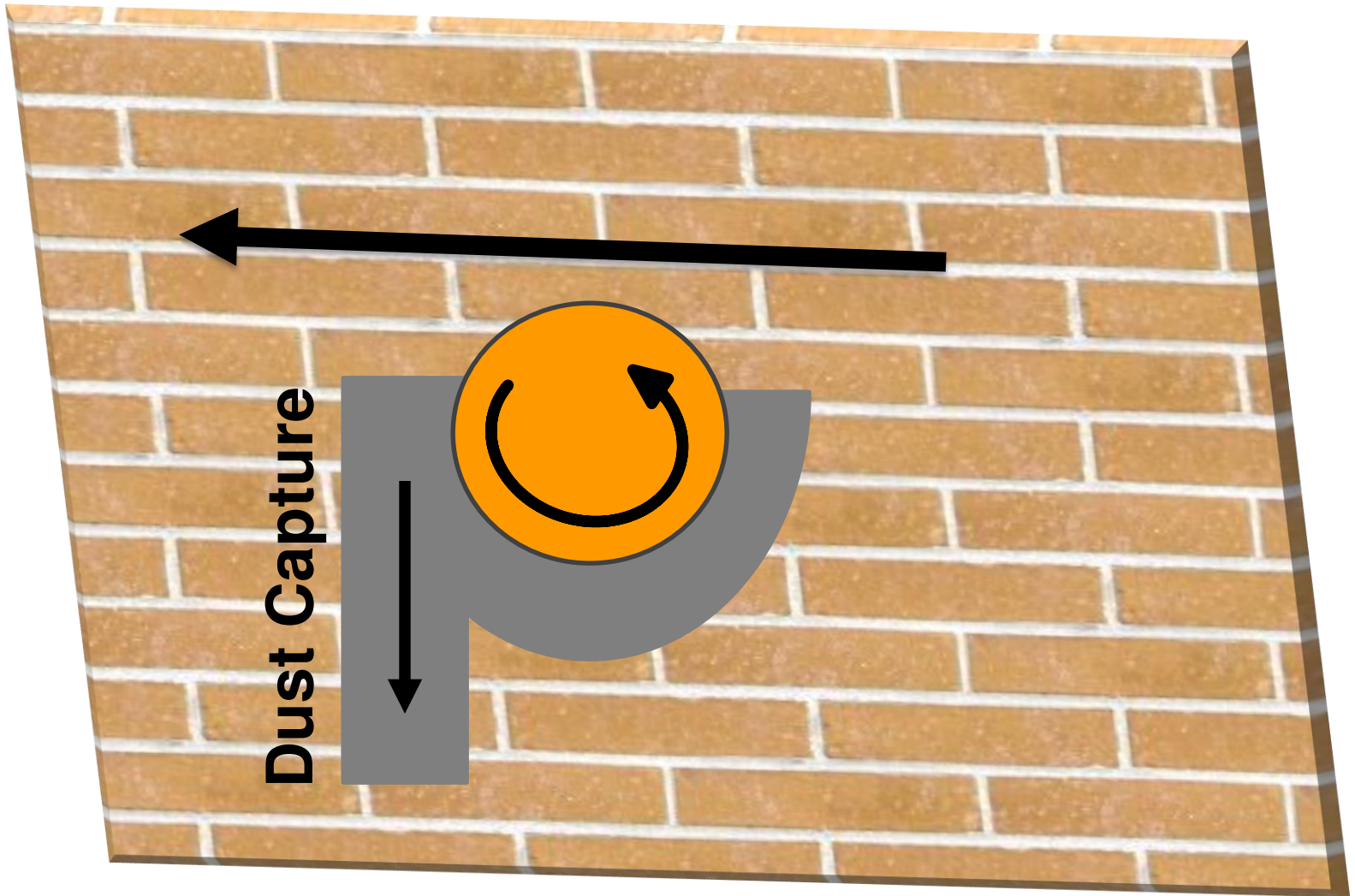
Acceptance and effectiveness varies with the user



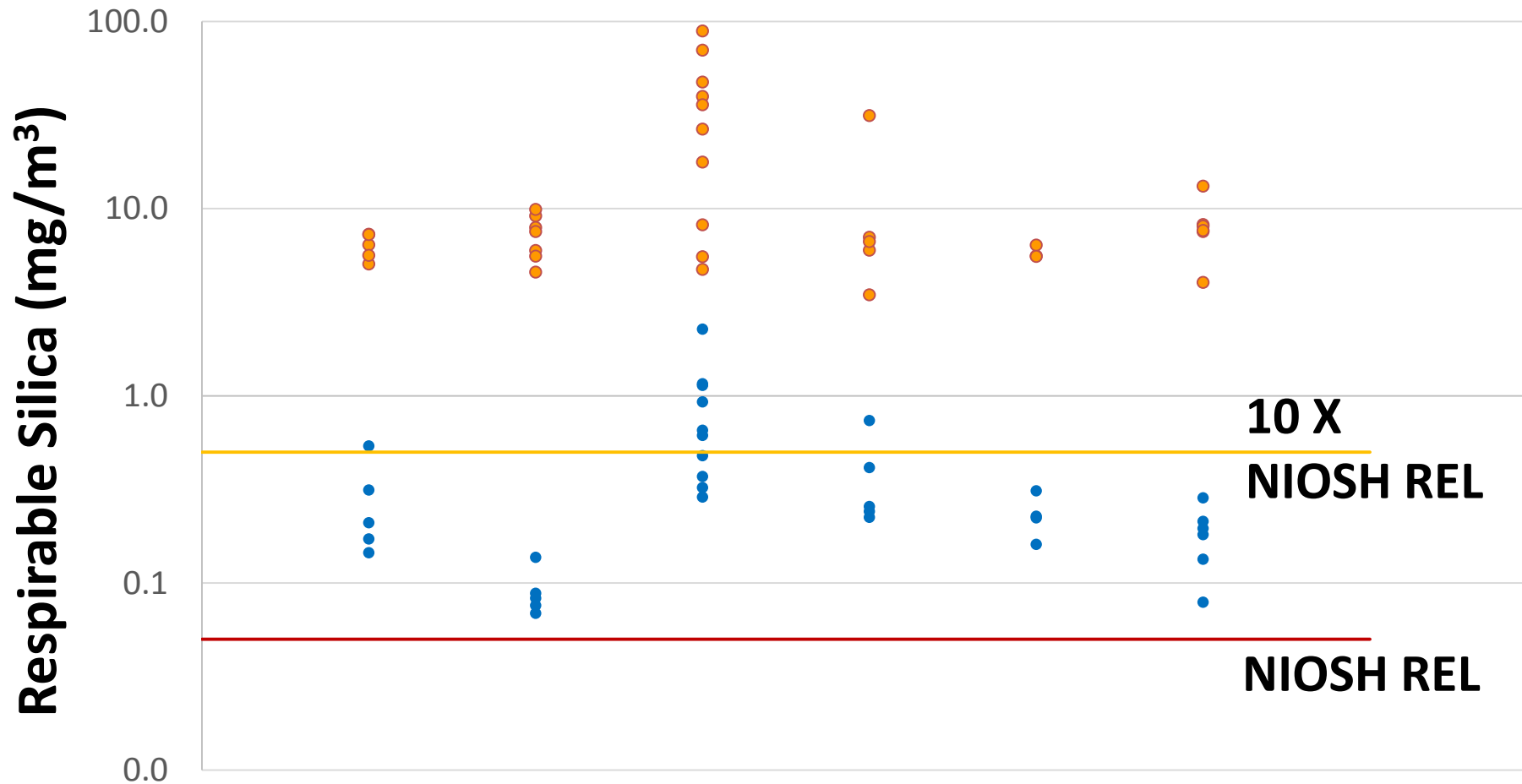
Moving the grinder toward the point of dust capture is required



Blade visibility and ability to cut both directions is important



Average exposure reduction was 97 percent but additional controls may be needed





Questions?

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