

**Midwest Center Work - Related to  
Tractors and Machinery**

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## Within Minnesota - Related to Tractors and Machinery

- University of Minnesota sensor/shut-off system efforts.
- Regional Rural Injury Study II -- some focus on tractor injuries in the analysis.
- Proposed work --
  - further development and application of systems safety analysis tools to examine net risks of old vs. new technologies.
  - continuing education Institute on safety engineering for industry-based engineers

## The Project

- Continuation of 1997-2001 work
- Explore use of low cost security sensors to protect hazard areas
- Focus on stationary equipment
  - 50% of cases involve stationary equipment
  - Tested tractor and forage box

This research work was funded in part through the Midwest Center for Agricultural Research, Education, and Disease and Injury Prevention: A NIOSH/CDC Cooperative Agreement Program, #U07/CCU507126-09.

## Desired Outcomes

1. Test current sensor technologies
2. Analyze mounting height and approach angle
3. Create a functioning prototype system



## Method

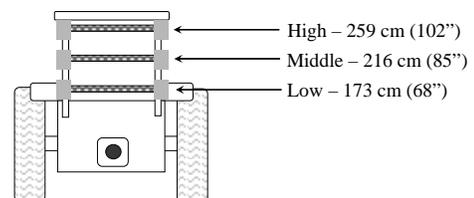
- Design the experiment
  - Sensors
  - Heights
  - Approach angles
- Update distance recording system
- Field testing of sensors
- Variable analysis
- Develop a working prototype

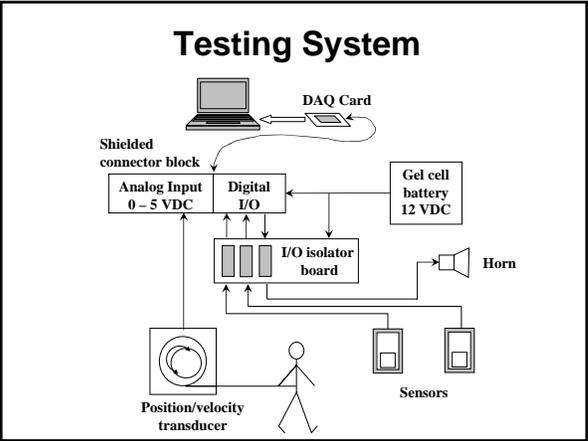
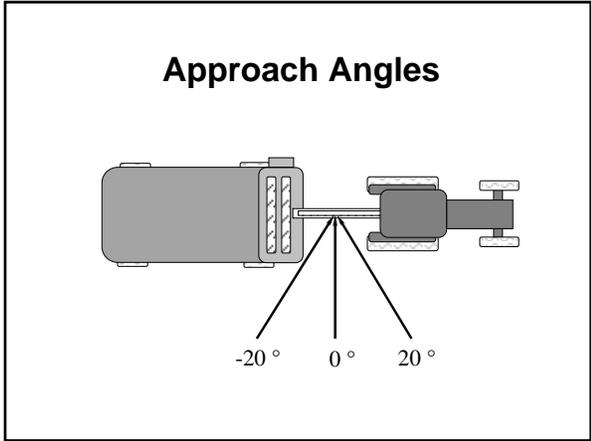
## Sensors used

- Commercially available security sensors from Sentrol
  - Radar
  - Radar & Passive Infrared
  - Microwave & Passive Infrared
  - Passive Infrared



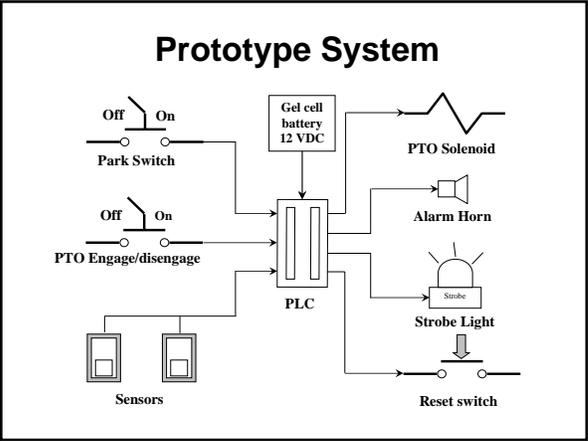
## Heights to Test





### Field Testing

- Completely randomized factorial design
- 4 sensors (blocked)
- 3 heights
- 3 approaches
- 8 replications
- Providing 288 walk tests



### Conclusions

- Radar was the optimum sensor technology
- Height affects detection distance more than approach
- Applied advanced testing procedure
- Safety system was created that disengaged the PTO

### Marshfield ROPS Directory Efforts

- Last printed in 1997
- On web -- 2,024 hits in 2001, 3,339 hits in 2002.

### **NAGCAT Guidelines**

- Several related to tractors and other machines.
- Tractor specific guideline

### **University of Illinois Efforts**

- Dr. Zhang, University of Illinois  
Agricultural Engineering Department