**CS AgHorizons**

Ergonomics Assessment —

Truck Prober Control Room

###### *Submitted to:*


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**Ergonomics Assessment: Truck Prober Control Room**

# Background

## Purpose and Deliverables

Mark Anderson, MA, PT, CPE, ErgoSystems Consulting Group, Inc., Minneapolis, MN conducted an ergonomics assessment of the Truck Prober Control Room located at CS AgHorizons, 12100 Dakota Avenue, Millard, MN 55378. Mark Kraft and John Morgan coordinated the assessment that took place on 11-28-XX

he objective of the assessment was to analyze job demands and tasks from an ergonomics perspective and offer recommendations designed to promote health, safety, quality and productivity. The assessment was conducted by means of onsite observation, interviews of personnel and physical measurements.

The deliverables are to provide specific design and use recommendations pertaining to the workstation (furniture, seating systems and equipment) that makes up the Truck Prober Control Room.

# Truck Prober Control Room

## Present Operation

The Truck Prober Control Room is used to monitor and control the Truck Prober operation. This is the process where samples are removed from trucks through the use of remotely controlled probes. The operator monitors and controls truck movement into and out of the prober truck lanes and controls the probes in terms of position and sampling.

Presently one workstation is located in the control room. One operator uses the control room at a time to control two probers. Two trucks can be probed at one time. **Visual lines of sight are critical to the success of the prober operation**. The control room is located at a second story level on the north side of the prober truck lanes. This vantage point allows the operator to look down to view the trucks and to properly place the probes.

Present interior control workstation physical dimensions are approximately 5’ by 20’. The control workstation itself is about 5’ by 5’. Windows are located on either side of the room (north and south sides) and doors (with windows) are located on each end (east and west ends.)

## Typical Prober Steps

Typical steps to perform the prober operation include:

1. The operator controls movement of the trucks in the truck lanes. This is done via CB radio and a radio base set with a speaker located in the truck lanes.
2. The truck driver presents the operator with the Bill of Lading. Presently the driver walks the Bill of Lading up the stairs to the control room. A tube system has been put in place to transport the bill from the truck lanes to the control room but it is not functional at present.
3. The operator enters information into the computer.
4. The operator controls the probes to position them in the truck box and acquires the samples. The samples are then transported via tubes to the sampling room.
5. The operator ensures the sample has been taken correctly and instructs the truck driver to the designated elevator.
6. New trucks arrive and the process repeats.

## Future Operation

John Morgan notes that the truck prober operation is presently a bottleneck for the number of trucks that can be handled at the elevator. The goal is to modify the Truck Prober Control Room to allow two operators to work simultaneously. To achieve this, the plan is to modify the present workstation by adding a second workstation on the west end of the present space. An ergonomically sound design of the workstations is desired to promote a safe, healthy and productive workspace.

## Design Assumptions

Design assumptions that define the ergonomics recommendations include:

1. Two complete workstations are required. Equipment required for each workstation includes:
* **Seating system (stool**) – the workstation will be set up as a **sit/stand workstation.** The sit/stand workstation - rather than a seated workstation - is preferred to enhance visual lines of sight from the control room to the trucks. **The higher you are the more straight down you can see**.
* **Worksurface** – suitable in dimension to **hold equipment** as outlined below with rounded edges to prevent sharp edge contact stress
* **Establish** **two sub-workstations** in each workstation: one for the **computer equipment** and one for the **prober control equipment**. There is no need to try to integrate them into the same space physically.
* **Computer equipment includes:**
1. One **computer CRT monitor** (CRT = cathode ray tube) – positioned in correct relationship to the user
2. One **computer** **keyboard and computer mouse** positioned in correct relationship to the user.
3. One **computer case**.
* **Prober equipment includes:**
1. Two **prober hydraulic control boxes** (one box for each probe) positioned in correct relationship to the user.
2. One **signal light control** box positioned in correct relationship to the user.
3. One **base set with speaker** in truck lanes.
4. One **CB radio** to talk with truck drivers.
5. One **base set** to communicate with the elevator.
6. One **intercom** to communicate with the grading room.
7. The operator needs to be able to easily **swivel the stool back and forth** from the computer workstation to the prober control workstation.
8. Adequate room under the worksurface needs to **allow for space for the operator’s knees and feet**. The south wall needs to be opened up under the worksurface to allow for knee/foot space.
9. The Bill of Lading **tube delivery system** (consists of two tubes) will be **shared by both workstations** and must be able to be accessed from either workstation with a reasonable reach distance (18 to 20”.)
* Tube system needs to be physically **accessible to the truck drivers** and they need to be made aware of it when it comes on-line.
1. **Worksurface available space should be enhanced** by removing equipment from the worksurface and placing it on shelves/platforms as possible. (For example, the radios can be relocated to an overhead shelf with microphones positioned within easy reach.)
2. Adequate **visual line of sight through the north window** down to the truck lanes is critical.
3. Potential **operator stature range is 63 to 74**”. Furniture and equipment selection must be able to accommodate this range.
4. Change over in the **workstation from one operator to another** must be able to be accomplished quickly and easily.
5. Furniture and equipment for each workstation must **fit within the present dimensions** of the control room (5’ by 5’.)
6. Need to **control amount of light entering the control room.** Intense sunlight coming through the east door window makes it very difficult to see the computer monitor.
7. HVAC system needs to provide a **moderate temperature** **controlled** environment.

# Design Recommendations

## Seating system (stool)

1. The recommended seating system is a stool as noted above. A stool with the following criteria is recommended:
* Five point support system for the stool legs
* Adjustable height foot ring to provide for foot support (foot ring adjustment range from 8 to 16” above the floor.
* Glides on the stool legs. Wheels are not needed; the stool does not have to be rolled from one place to another.
* Adjustable seatpan height (range of about 27 to 32” from the floor)
* Adjustable seatpan tilt (100 negative and positive tilt)
* Adjustable seatpan slide - front to back depth adjustment (optional but desirable)
* Adjustable back support height
* Adjustable back support angle
* Adjustable lumbar support (optional but desirable)
* Suitable seatpan and back support cushion - in terms of foam density, wearability and breathability and type of material (fabric).
* Adjustable armrests in terms of height, side-to-side position and rotation (fixed position armrests are not acceptable)
* Adequate instruction for the user in the proper setup and use of the chair, they should be able to demonstrate competency.
1. In terms of size, a **standard size adult** stool should meet the needs of the present workforce. For smaller or larger individuals other stool sizes may need to be available.
2. ***A number of stools meet these criteria; please contact the consultant if a list of vendors is needed.***

## Foot support platform

1. To accomplish foot support when seated at the stool, **foot support platforms** need to be fabricated.
* One foot platform needs to placed be at a **height of 10” from the floor in an L-shape** that fits under each side of the worksurface. Dimensions need to allow the stool legs to fit under the worksurface – a platform depth of 12” is recommended under the computer workstation and 6” under the south wall worksurface.
* A **second foot platform (4 “ in height)** that is positioned on top of the 10” platform will be used by shorter individuals to provide foot support. It may be possible to hinge the 4” platform so it attaches to the 10” platform and can easily lifted and down as needed.
* Cover the foot platform with an **anti-fatigue rubber mat**.

## South Wall Window

1. **Extend the south wall window** over to the west end of the control room. This is necessary for both workstations to gain visual access to the truck lanes.
2. Place the **bottom of the window at 40” from the floor** – this will allow the operator to look closer down through the window.
3. Place the top of the window at about 78” from the floor. The top position is not critical. We just need enough room to place a shelf for radios, etc. within the window well in an overhead position.

## Workstation

1. The recommendation is to **setup two workstations** – one the mirror image of the other. (refer to the drawing)
2. **Create knee and foot space** in the south wall by going into the wall a minimum of 6”. The wall looks to be about 10” thick. This will leave about 4” for an insulated wall.
3. Fabricate the **workstation worksurfaces** with following dimensions:
* **Workstation height** (top surface) at 42” from the floor
* **Computer equipment worksurface**: depth of 26”, width of 32” (rounded edge) **NOTE**: It is possible to **build in a height and angle adjustable keyboard/mouse tray into the** **worksurface** – it will not work to just add one to the underneath surface. This will allow for the greatest amount of adjustability in the setup of the computer equipment. This is a point for additional discussion.
* **Prober equipment worksurface**: depth of 12”, width of about 60” (rounded edge). The edge of the worksurface can have a low lip but should extend higher than about 1” – higher than this limits visual access down to the truck lanes.
* **NOTE: exact measurements need to be made by the contractor to ensure fit.**

## Computer equipment

1. Place the **keyboard and mouse** on the computer worksurface in a position that puts the user in a neutral hand and arm position (elbows comfortable at the side, bent to about 900 and the wrists in a straight line.)
2. Place the **computer case** on a recessed shelf built below the worksurface. Ensure placement does not impede knee/foot space.
3. Place the **monitor on an adjustable monitor arm** so the monitor height and distance can be positioned per each operator. The monitor arm should allow the keyboard to be somewhat pushed underneath the monitor for additional workspace on the worksurface for writing, etc. ***NOTE: contact the consultant if a vendor reference is needed for the monitor arm.***
4. Each user should receive **training in use and setup of the workstation**. Each user should be able to demonstrate competence in setup and use.

## Prober control equipment

1. **Prober control boxes:**
* Recess the prober control boxes into the worksurface. The boxes should protrude about 1” to allow access to the cover hinges and latch for the boxes.
* The boxes can be placed about 2” apart.
* Place a gel wrist rest at the front edge of each box.
* **In terms of exact placement of the boxes, the recommendation is put together a simple cardboard template that duplicates the position of the worksurface and with the operator’s assistance determine exactly where to place the recessed boxes.**
1. **Bill of Lading Tubes:**
* Position the tubes midway between the two workstations to make them accessible by both operators. The tubes are to be modified to make them much easier to use.
* **In terms of exact placement of the tubes, the recommendation is put together a simple cardboard template that duplicates the position of the worksurface and with the operator’s assistance determines exactly where to place the tubes.**
1. **Signal control box:**
* Option One - If possible incorporate the signal controls into the prober control box.
* Option Two – Position the signal control box in the same general location as the Bill of Lading tubes. With the present tubes it looked like there was some room under the door of the tubes.
* **In terms of exact placement of the box, the recommendation is put together a simple cardboard template that duplicates the position of the worksurface and with the operator’s assistance determines exactly where to place the box.**
1. **Radios/Intercoms**
* Free up worksurface space by moving the radios/intercoms to an overhead shelf.
* Provide hooks to hang the microphones per operator discretion.
* Two radios have desktop microphones that either can continue to be used on the worksurface or changed out to have hanging microphones.

## Parabolic mirror

1. Place a parabolic mirror outside on the south wall on the west end to act like a rearview mirror for the operator using the east workstation. This will decrease the amount of head twisting to see trucks lined up to enter the truck lanes. **NOTE**: the west workstation does not need one on the east end.

## Drawings

**(For illustrative purposes only – not intended for use as construction documents.)**

**Refer to the report for specific details.**

1. The two workstations will be constructed in a space about 5’ by 10’. Space as outlined in the drawing on the left below.
2. Foot support for the operators will be provided by foot platforms as outlined in the drawing on the right below. (see report for details)

1. Worksurfaces will be fabricated to hold the equipment – sub workstations include the Computer and Prober as noted in the drawing on the left below.
2. Overhead shelves will be constructed to hold the radio/intercom equipment – drawing on the right below.

Thank you for the opportunity to conduct the assessment. Please contact me with any questions/ comments and for any additional assistance I can provide for the project.



Mark Anderson, MA, CPE

ErgoSystems Consulting Group, Inc.