Appendix A: Instructions for time and motion data collection

Preparing for observations

Before collecting any data, print one observation form for each observation (customer transaction) you intend to make. You will also need a stopwatch with a lap feature and a pen or pencil to record data.

Performing observations

To establish unloading time for a customer transaction, start a stopwatch when employees begin the unloading process (either when they move a cart to a customer's vehicle or begin to talk to the customer—whichever happens first). Stop timing once the cart is fully loaded and has left the unloading area. Have the cart stop at a set location outside the unloading area and record the final time of the transaction on the observation sheet. Be certain to record how many people participate in unloading the vehicle. You will eventually need to multiply the total time spent unloading by the number of people involved (e.g., if 2 people helped unload the entire time and one person helped for approximately half the unload time, multiply your final stopwatch time by 2.5).

Any customer assistance with the unloading process should be included in this determination. *If you have recorded the unload time and number of employees involved in this–or any–step of the process, you can complete the multiplication step after all data have been collected.*

Once the unloading process is complete, and before any additional movement occurs, count the number of paint containers, mercury-containing bulbs or tubes, and other material items taken from that customer and record on the observation sheet.

To establish shared movement time of a customer transaction, you will measure the amount of time employees spend moving between stops as they unload their cart of materials. Start your stopwatch when the employee pushes the cart into the facility from the customer unloading area. Stop the stopwatch whenever they arrive at a material drop-off point and begin to unload the cart. Resume timing as soon as they finish moving materials from the cart to a container.

Continue this process until the cart has been emptied and returned to its resting place. It is important that you only measure the time spent on one observation at a time. Record the transaction shared time on the observation sheet.

To establish direct movement time of a customer transaction, start your stopwatch when an employee begins to unload a material into the gaylord or tub skid (when the employee first touches the item to be moved). Stop the stopwatch when the employee sets down the last container or bulb and begins moving to a different material type or activity. Time spent in direct contact with paint containers and mercury-containing bulbs should be noted separately, while time in contact with all other materials can be recorded as "other." Record the times on the observation sheet under the appropriate material column.

Note that depending on facility staffing and the level of activity, it can be difficult to manage simultaneous customer transactions. If a transaction is in progress when a new customer arrives, ask staff to wait until you have finished recording data for the active transaction before they begin the unloading process for the next customer. In order to minimize customer wait time when multiple customers arrive near the same time, you may instead record the unloading time for each customer immediately and then park the unloading cart at a "holding area" near the entrance to the facility (or another designated location before reaching the first material drop-off location). This allows you to unload several customers and queue the carts in the holding area until activity slows. You can then resume recording data for each of the individual transactions for the queued carts.

After observations (or during downtime)

To calculate time spent per item for each activity, you will need to complete multiple steps.
Unloading time. First, divide the total unloading time (the time spent unloading multiplied by the number of people unloading) by the number of material streams in that particular customer transaction. Then, divide this number by the number of paint containers (to determine the time spent per container). Repeat this step for mercury-containing bulbs. These numbers are the **unloading time** spent per unit of paint or bulb.

Direct Movement time. Divide the recorded direct movement time for paint by the units of paint containers in the transaction. Repeat this step for mercury-containing bulbs. These numbers are the **direct movement time** spent per unit of paint or bulb.

Shared Movement time. Divide the shared movement time by the number of material streams. Then, divide this number by the units of paint in the transaction. Repeat this step for mercury-containing bulbs. This will give you the **shared movement time** spent per unit paint or bulb.