BEST MANAGEMENT PRACTICES FOR BULK MATERIAL LOADER TRAINING

1. Purpose and Scope

The purpose of this document is to provide the bulk mulch and soil industry with a Best Management Practice (BMP) for bulk, non-packaged, volume sales. Bulk loads need their own practices because NIST Handbook 133 covers packaged goods but gives no protocol for bulk transactions. This BMP fills that gap.

Loading bulk materials relies on the combination of the equipment operator skills and equipment capacity. This BMP is for use in training loader operators and seasonally verifying their loading skills. This training procedure verifies the volume of a whole bucket an operator delivers at once with the object being consistency and repeatability. ***IT IS NOT A DAILY BULK LOADING PROCEDURE*** but helps to minimize measurement variability and error.

The BMP aims to:

- Ensure market equity through consistent, verifiable methods for selling non-packaged product;
- Standardize loader operator training across the industry;
- Build customer confidence through standardized practices;
- Reduce the risk of inaccurate measurements.

1.1 Bulk Volume Variabilities

Bulk mulch and soil can vary from load to load, so loading methods must be controlled to keep stated volumes accurate. Unlike bagged goods, a trailer of mulch cannot be emptied into a calibrated test container, so credibility must come from repeatable loading methods.

- **Product Variables**
  - **Moisture Content:** raises weight sharply and can reduce volume through consolidation.
  - **Particle Size and Density:** particle size and shape set the pore space in a load; finer materials settle more densely.
  - **Texture:** mulch and soil textures differ, and each behaves differently in the bucket.
- **Other Sources of Error**
  - **Manufacturer Ratings:** manufacturers rate buckets in aggregate terms which are not a legal basis for selling products.
  - **Bucket Wear:** a bucket's real capacity changes over time, so it must be recalibrated.
  - **Operator Actions/Loader Compression:** material compresses as the bucket scoops it and again as it drops into a trailer.
  - **Trailer Shape:** irregular shapes, internal bracing, and bulging walls make visual or manual volume checks difficult.
  - **Weather:** weather affects volume by increasing the water content or by drying the material which lead to inconsistencies in loading.
  - **Compaction in Transit:** vibration settles the load after it leaves the yard.

2. Required Equipment

- **Known Volume Container (KVC):**

- Rigid, floorless box that is non-deformable and of known internal dimensions in a size sufficient to hold an entire bucket.
- The container should be larger than the nominal bucket capacity to allow for overfill measures.
- Made of materials that do not absorb or react with the product.
- Interior dimensions should be labeled with lines for leveling and volume determination on all four sides.

Nominal Capacity of Heaped Roll-out Bucket	KVC Interior Length x Width	KVC Interior Height	KVC Capacity	KVC Measure Increments*
0.5 cubic yards (cu yd)	4' x 3'	2'	0.89 cu yd	27" = 1 cu yd
1 cu yd	5' x 4'	2'	1.48 cu yd	16.2" = 1 cu yd
2 cu yd	6' x 5'	2.5'	2.78 cu yd	10.8" = 1 cu yd
3 cu yd	9' x 5'	3'	5 cu yd	7.2" = 1 cu yd
5 cu yd	10' x 6'	3'	6.67 cu yd	5.4" = 1 cu yd
7 cu yd	10' x 6'	4'	8.89 cu yd	5.4" = 1 cu yd
10 cu yd	12' x 6'	4'	10.67 cu yd	4.5" = 1 cu yd

**Mark measure increments up from the bottom of the KVC*

- **Loader Buckets:** the struck and/or heaped volume must be determined and regularly verified.
- **Rake:** for leveling material in KVC
- **Measuring Device:** Flexible tape measurer
- **Electronic and Laser Systems (optional):** maybe used for internal evaluations but must be certified and approved (National Type Evaluation Program in the U.S.) before use in legal-for-trade transactions, with regular calibration and maintenance.

3. Operator Training Procedure

1. Establish operator loading parameters

    a. Product pile size: Keep the stockpile a consistent size and condition

    b. Drive speed: Enter the pile at the same speed each time, with smooth, controlled bucket entry and lift to limit voids and spillage

    c. Load striking techniques: Follow the standard strike procedure and fill to the same level on every scoop (struck or heaped)

    d. Load carry/transport technique

    e. Load counting method

2. Pre-loading preparation

    a. Check fluids, tires, and controls.

    b. Inspect the bucket and linkage for wear or damage.

    c. Choose a bucket sized to fill the truck in the fewest scoops, that the loader can fill easily, and that carries safely.

3. Set the KVC on a level, stable ground. Make sure the interior is clean.

4. Fill the loader bucket with the target “ideal scoop”, strike and carry the bucket exactly as in normal loading, over the usual travel distance.

5. Dump the bucket continuously into the vessel.

6. Rake the pile level without pressing it down.

7. Read the volume on the interior markings on the KVC

8. If the volume falls between interior markings, measure down from the top:

    a. More measurements = increased accuracy

    b. Take measurements every 1 to 2 feet around the KVC

    c. Read all measurements in 1-inch increments

    d. For measurements that fall between 1-inch increments, round DOWN to the nearest inch.

9. Lift the vessel off the pile and repeat a minimum of three times.

10. Determine the average fill for each load measurement.

11. Cross-check (optional). Compare the load with electronic measurements, where available, for internal quality control.

    a. Drone survey (for example DroneDeploy, Propeller Aero, or Stockpile Reports): measures several piles in one flight.

    b. SR Measure app: uses the lidar on an iPhone 13 or newer for about ± 2% – 5% accuracy. For iPhone 15 or newer phones, use of a digital cone will improve accuracy to about ± 1% – 2%. Take an average from at least 3 dumped buckets.

12. Logs should be kept of the date of the test, the driver, the equipment used, the product, and the average fill.

13. Determine if additional training is needed.

14. Reverification should be done per driver, equipment, and product seasonally.

4. Other Things to Consider

- Bulk mulch loses measurable volume between the stockpile and the customer. Sellers should build overfill into their loading targets and disclose likely compaction.
- Documented training, calibration records and clear customer communication are what allow a seller to defend a stated volume when a customer or Weights & Measures inspector challenges it.
- Retrain and assess operations periodically to ensure continued adherence to your established loading parameters.