

Guidelines for Proper Handling, Loading, Safety & Bale Specifications

We have put together these guidelines on bale characteristics, storage and handling considerations, shipping considerations, loading Instructions, and a chart containing loading diagrams to help increase operating efficiencies, improve safety and ensure the highest value for your scrap plastics.

Bale Characteristics

It is vital to the reclaimers and end users of post-consumer plastic that bales meet specifications. Specifications include bale size, bale density, bale integrity, bale wire and the level and type of contamination. The following will address the first four characteristics.

1. **Bale Size:** Although there are a variety of bale sizes and weights, an ideal bale weight is 1,000 lbs., with the standard dimensions of 48" x 30" x 60". This is often the case. If you have the ability to modify your bale size you should do so. Properly sized bales are easier to handle, store and load. While it may take time to adjust your baler, you will easily make up for this time with loading efficiencies. Ideally you want bale sizes and weights that will avoid special loading configurations, such as standing bales on end to achieve required minimum shipping weights. In the **Loading Instructions for Plastic Bales** section of this report there are further details on this process.

Throughout the industry we have seen the following size bales:

- | | | | |
|-------------|-------------|---------------|----------------|
| 1. 45x36x45 | 4. 45x30x70 | 7. 48x30x72 | 10. 54x36x60** |
| 2. 45x45x45 | 5. 52x32x76 | 8. 42x30x48* | |
| 3. 45x30x45 | 6. 48x30x60 | 9. 48x36x72** | |

**This is the size bale that is recommended by the "Best Practices and Industry Standards in PET Plastic Recycling". This useful document is available from the Association of Post-Consumer Recyclers (APR) at 202/974-5419. There is also a best practices document for HDPE.*

***These bale sizes require a very high bale density/weight needed to make weight. It is unlikely that such high bale weights/densities can be achieved and, if they were, they would not be acceptable to the buyers. Therefore we strongly recommend against generating these bale sizes.*

2. **Density:** Most buyers require bales compressed to a minimum of 10 lbs./cu./ft. Any less than that and the bales will fall apart. However, if your bales are only 10 lbs./cu./ft., you will not meet most buyers' minimum weight requirements. An ideal density for plastic bales is 20 lbs./cu./ft. This is generally heavy enough for making weight in both domestic and export containers, but not so dense that it creates problems for the buyer. Most buyers can work with densities up to 23 to 25 lbs./cu./ft. depending on resin type. Bales with a density of greater than 25 lbs./cu./ft create a variety of problems including yield loss and contamination from bottle necks and pieces that crack and fall off. Also, high-density bales can "explode" when de-baled, causing possible injury to personnel in receiving or reducing the efficiency of de-baling equipment. High-density bales are difficult to break apart for cleaning and sorting, often hiding contamination between bottles that are inseparable.

To figure out the density of your bales use the following formula:

(length in inches X height in inches X width in inches) divided by (1,728) = X1
(bale weight in pounds) divided by (X1) = lbs./cu./ft.

3. **Bale Integrity:** There are three major reasons to maintain bale integrity. First, bales must remain intact through loading, shipping, and off loading. Second, integrity must be maintained for in-plant storage and stacking the bales. Distorted or broken bales are difficult to handle and are very unsafe when stacking for storage. Third, the integrity of a bale can also affect the efficiency of production and handling. Integrity affects everyone from the seller to the processor to the end-user.
4. **Bale Wires:** Due to the elastic nature of plastic, the bales should be held together with 10 to 12 gauge, non-corrosive galvanized metal wires. Plastic is one of the only commodities that will expand after baling, and for that reason the proper wire should be used when baling plastic. Ideally, producers of plastic bales should use 10/18 wire. 10 represents the size or gauge and 18 represents the hardness of the wire; the smaller the second number is, the softer it will be and ultimately easier for the bales to burst. When baling, all bale wires should be wrapped in one direction. Two directional wire bales are not suitable for some buyers due to their automated processing systems. As a general rule, use the fewest wires possible while still maintaining bale integrity.

Storage and Handling Considerations

Plastic should be stored so that it is kept clean and dry with minimum exposure to the sun. Sunlight can cause ultra-violet degradation of the plastic. Bales should be stored indoors on a clean surface. If they must be outdoors, limit exposure to rain and sun and store on pallets or a clean dry surface. Avoid dusty or dirty areas.

When moving bales keep them off the floor. Never push bales across the floor, as they will pick up dirt and contamination. Limit the number of times a bale is handled. This will maintain the integrity of the bale, reduce contamination and increase operational efficiency.

For safe and efficient operations, stack bales properly. Safe stacking height should be determined at each facility based on integrity of the bales, ceiling height, bale dimensions, and fire codes or building regulations. When stacking against a wall, do not push the bottom bale flush against the wall. It should be about 6 inches out; otherwise subsequent bales will lean away from the wall instead of into it.

Consider tagging bales or keeping them in lots by supplier or shift. That way, if there is a contamination problem or weight discrepancy, you can determine the source of the material.

Shipping Considerations

1. **Different Size Containers and Trailers:** You are likely to encounter the following shipping container sizes:
 1. 40' HC steel or aluminum containers for export use (more rigid) 92"W x 110"H x 480"L
 2. 45' HC steel containers for export use 92"W x 110"H x 540"L
 3. 48' trailer 92"W x 110"H x 576"L
 4. 48' trailer 101.5"W x 110"H x 576"L
 5. 53' trailer 92"W x 110"H x 636"L

Flat beds may be used at the discretion of buyers, when loads are shipped locally. Usually, for export shipments, 40' or 45' high cube containers are used.

For domestic shipments the 48' trailers are the most commonly used, however, you will see a 53' trailer once in a while. The shipping industry is moving toward the wide trailers (101.5") but to-date only about 30% of containers are the wider ones. Long distance domestic loads are usually transported to the rail station and then on to their final destination.

- 2. Proper Axle Weights:** The total gross weight of any truck and trailer combined should not exceed 80,000 lbs. As a standard rule of thumb, the net weight of any load should not exceed 44,000 lbs. To prevent any hefty fines, the truck and trailer combined should have the proper axle weights. There are 3 stages in determining the axle weight. They are steer axle weight, second axle weight, and rear axle weight. Steer axle weight should not exceed 12,000 lbs. and the second and third axle should not exceed 34,000 lbs. per axle. The rear axle is the only axle that can be adjusted if it's overweight. The rear axle can be adjusted mechanically by moving the actual axle forward or backward. This shifts some of the weight to the second axle. However, if the steer axle is overweight, the only way to fix it is by off loading most of the material and rearranging it. Please see the "loading diagrams" for proper loading.

Loading Instructions for Plastic Bales

When the container comes in to your facility, examine the container for damage. If there is damage to the container, be sure the driver is aware of it prior to loading your bales. Also, to avoid contamination, sweep the container before loading.

When loading, never put broken bales or partial bales into the container. Do not force bales into the container as this may cause damage to the container, break bales or make it difficult to unload the bales. Don't push bales along the truck bed and be sure to watch for clearances as the container is loaded. Also, take time to orient the fork blades to avoid bale wires, this will save you time in dealing with broken bales later.

If the truck is not being filled to capacity try to distribute the bales evenly throughout the truck (see loading diagrams). This will avoid bales shifting in route and will evenly distribute weight on the axles. Also, use "load locks" when appropriate to keep bales from falling or shifting in route. This is especially important at the back of the container to avoid injury to the operator who opens the container at its destination.

It is important to consider bale size when loading a container or a trailer. The table on the next page shows bale sizes and what the corresponding bale weights should be to make 40,000 lbs. in a 40' high cube export container and 48' (92" wide) domestic container. As a general rule the minimum weight should be 40,000 lbs., and the maximum weight should not exceed 44,000 lbs. Some exceptions apply for export loads. Check with your buyer.

The table also provides a general guideline on how many bales should be in those containers to meet the axle weight guidelines. In some cases there is room for more bales but this will cause the load to be overweight.

Bale Size	Container Size	Bale Weight (lbs)	Number of Bales	Loading Diagram
45" x 30" x 45"	40'	714	56	1
45" x 30" x 45"	48'	620	65	1
45" x 30" x 70"	40'	1175	34	2
45" x 30" x 70"	48'	950	42	2
45" x 36" x 45"	40'	1080	37	3
45" x 36" x 45"	48'	1000	40	3
45" x 45" x 45"	40'	1080	37	4
45" x 45" x 45"	48'	1080	40	4
48" x 30" x 60"	40'	1180	34	5
48" x 30" x 60"	48'	1000	40	5
48" x 30" x 72"	40'	1380	29	6
48" x 30" x 72"	48'	1176	34	6
52" x 30" x 76"	40'	1435	28	7
52" x 30" x 76"	48'	1215	33	7
54" x 36" x 60"	40'	1900	21	8
54" x 36" x 60"	48'	1600	25	8
72" x 36" x 48"	40'	1670	24	9
72" x 36" x 48"	48'	1428	28	9

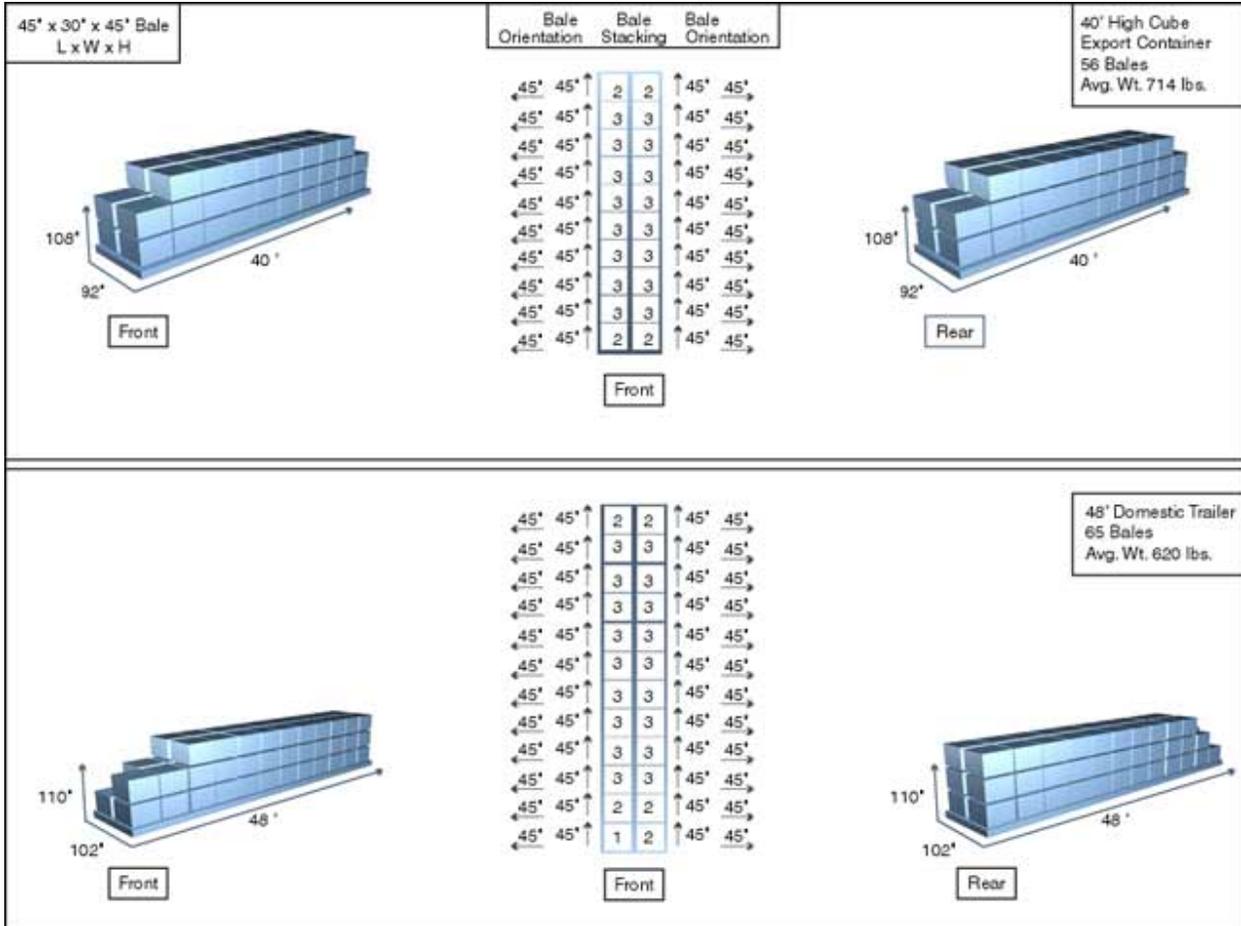
If your bales match one of the size and weights above, then utilize the correct loading diagram for your bale size.

If your size bales don't weigh enough, then you will need to re-bale your material because you will not be able to make the minimum weight requirements. If your bales weigh more than what is indicated on the chart above, then you may put fewer bales in the trailer.

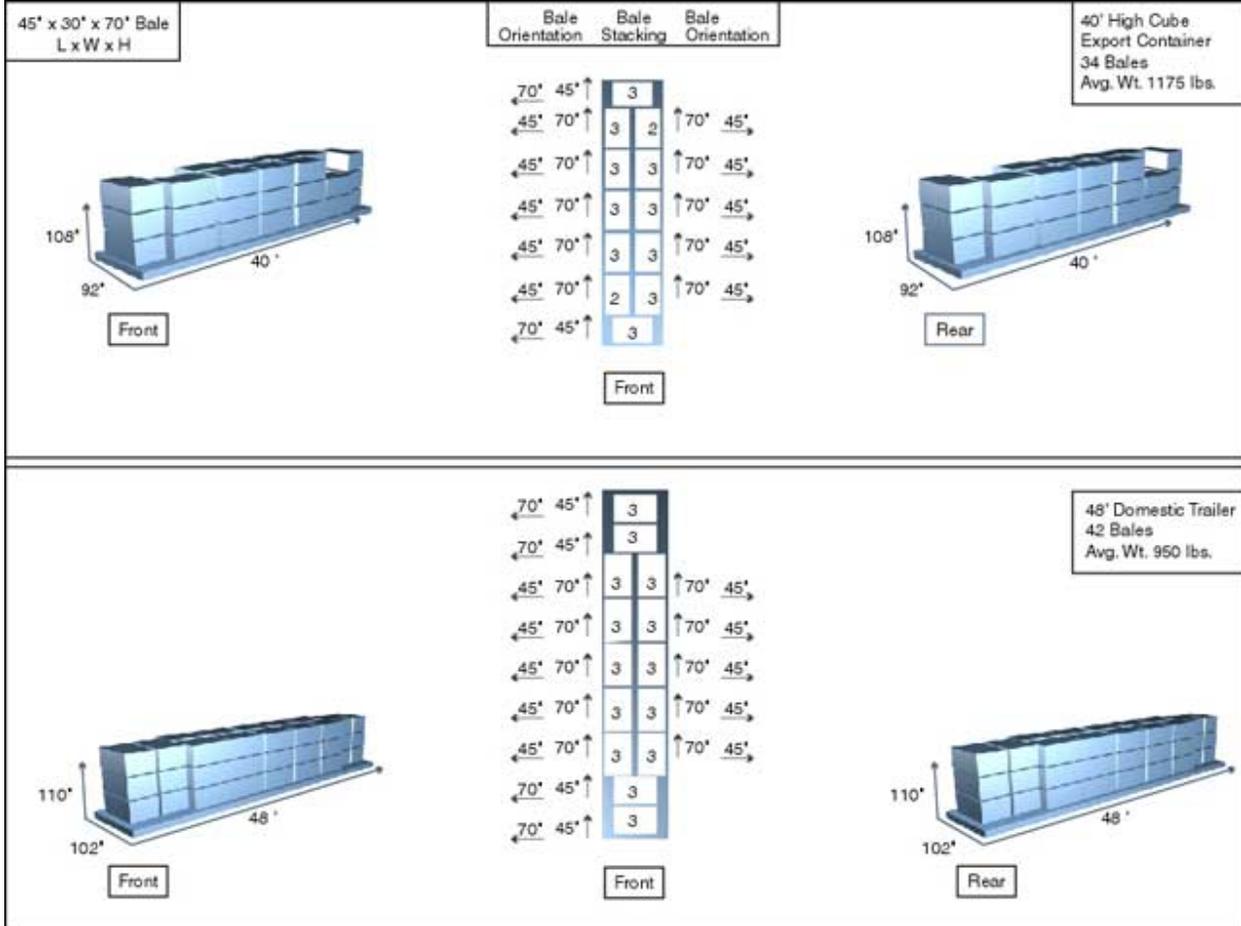
Keep in mind that there should be fewer bales stacked in the very front and very back of the container (as indicated in the diagrams) in order to avoid overloading the axles. If you get a 48' trailer that is 101.5" wide, then you can load a row of six bales two bales wide and two or three bales high. This loading pattern is the simplest, most efficient loading pattern and should be used whenever possible.

Otherwise, please follow the above chart and the diagrams on the following pages and contact PRCC for assistance.

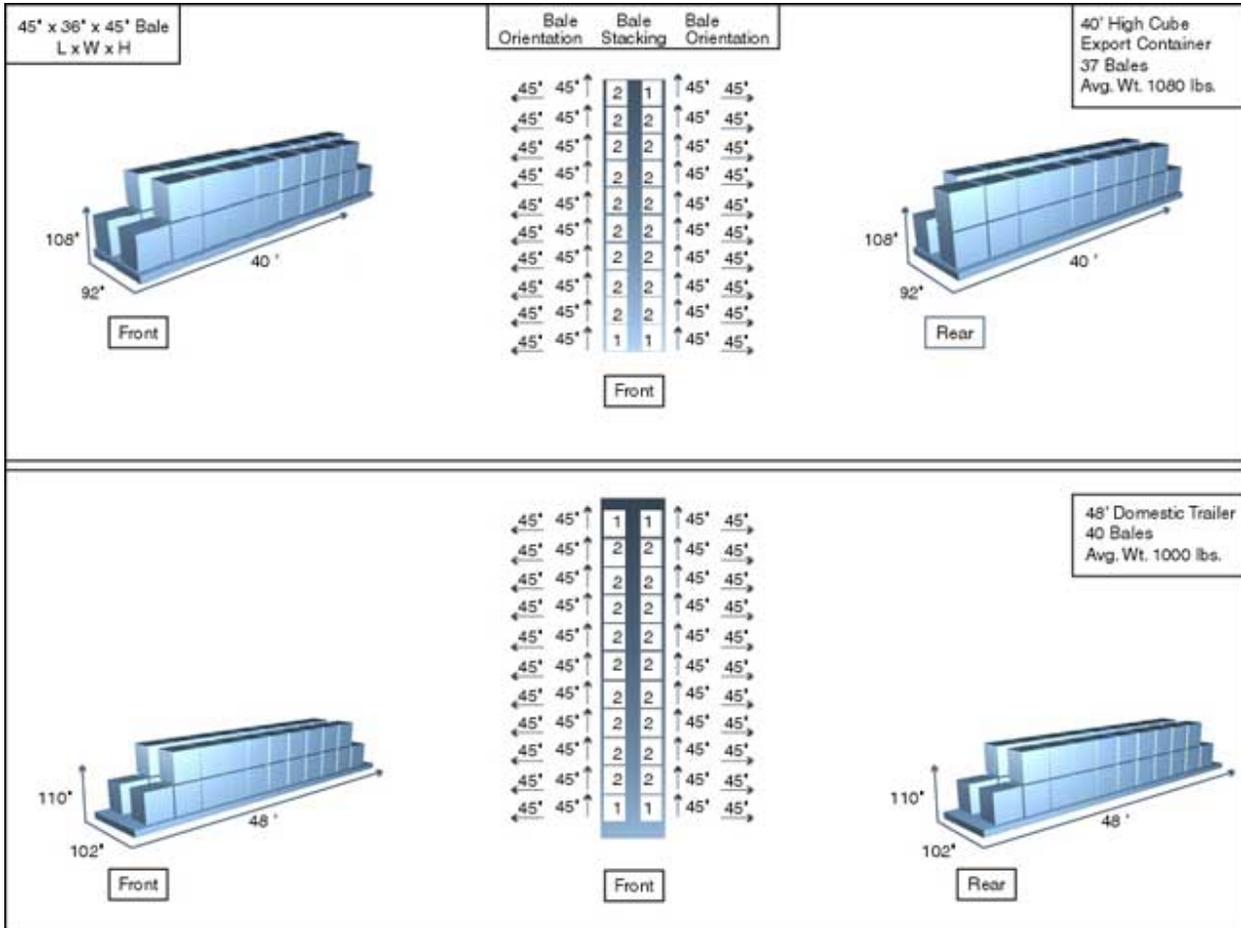
Loading Diagram 1 (45x30x45 bale; 40 HC or 48 DT)



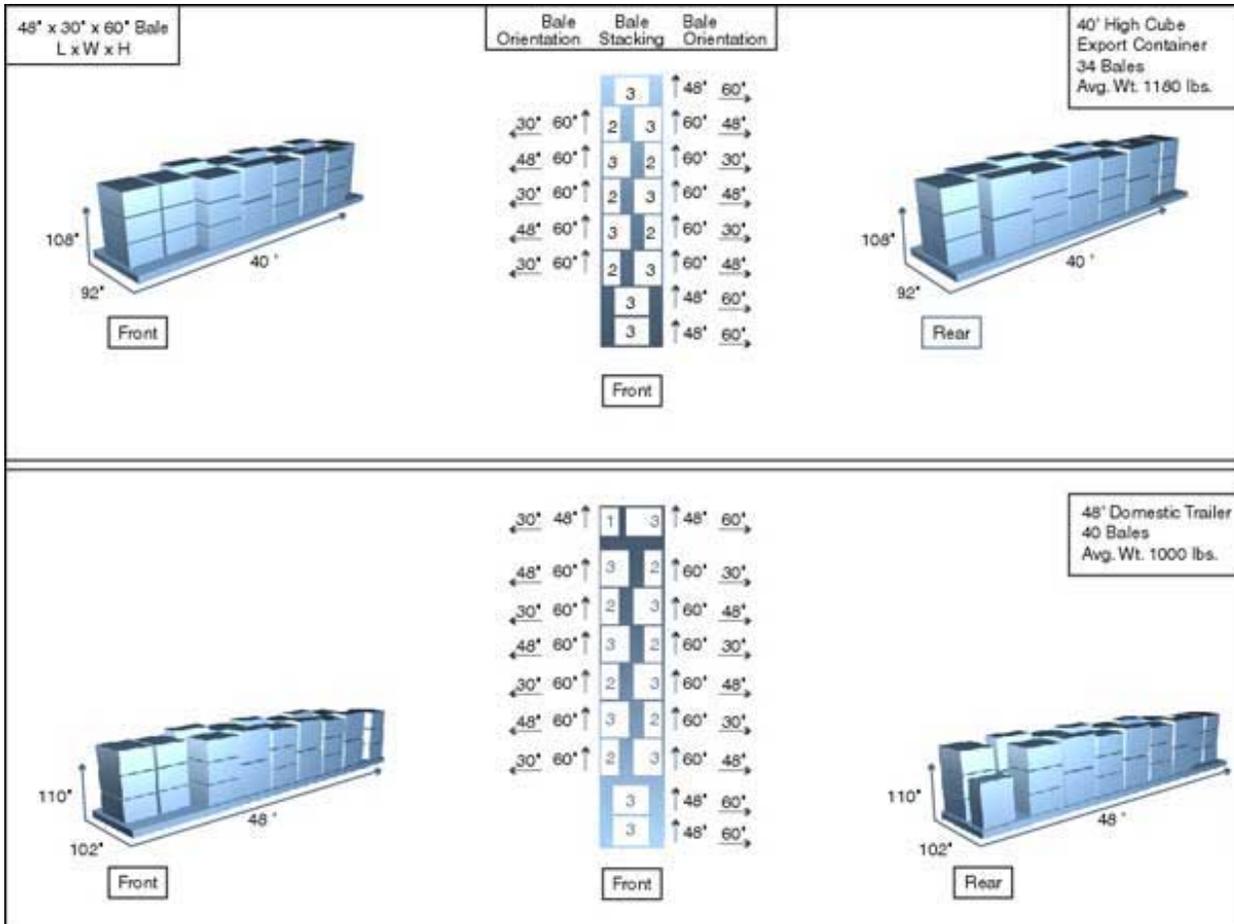
Loading Diagram 2 (45x30x70 bale; 40 HC or 48 DT)



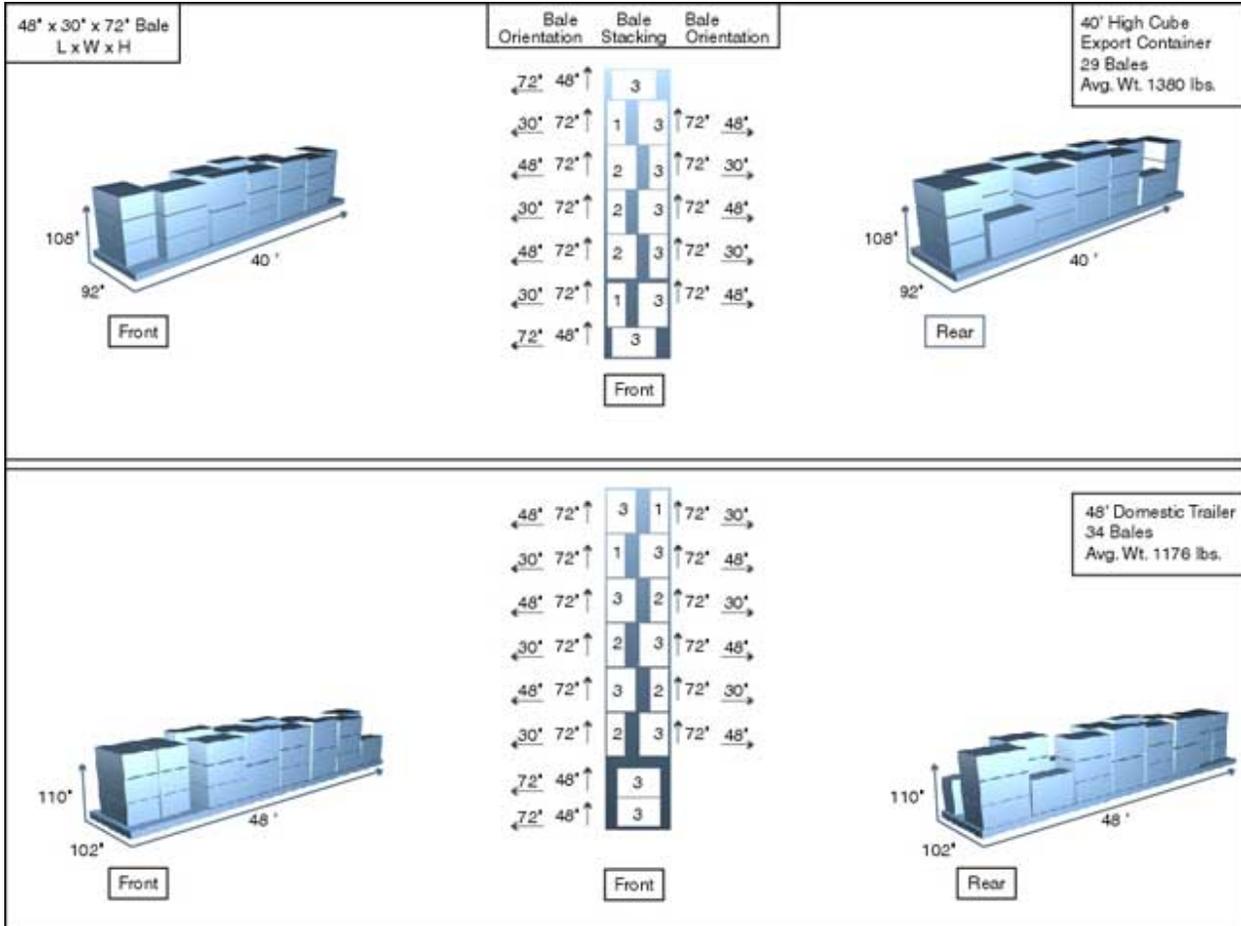
Loading Diagram 3 (45x36x45 bale; 40 HC or 48 DT)



Loading Diagram 5 (48x30x60 bale; 40 HC or 48 DT)



Loading Diagram 6 (48x30x72 bale; 40 HC or 48 DT)



Loading Diagram 9 (72x36x48 bale; 40 HC or 48 DT)

