

## **General Information Bulletin No. 5**

# **Overloaded or Unbalanced Hopper Cars Are Unsafe**



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ASSOCIATION OF AMERICAN RAILROADS  
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# **Acknowledgement**

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## **OUR PURPOSE**

Every year, railroads deal with thousands of overweight and unevenly loaded hopper cars creating problems for both railroads and shippers. We all need to ensure that more attention is paid to proper loading guidelines.

Derailments and accidents are something everyone wants to avoid. This booklet outlines some guidelines, as well as safety, cost and efficiency considerations.

Railroads want to ensure safe operations, and reduce the unnecessary expenses, inconveniences and delays that result from overloaded and unbalanced hopper cars. Your support in this effort is needed.

## **WEIGHING AND SWITCHING COSTS**

Railroads use both static and weigh-in-motion scales to detect overloaded and unbalanced cars. When one is discovered, the railroad must switch it out, and spot it in an area where the shipper can adjust the load or remove the extra weight.

The shipper is responsible for the cost of any weighing and switching, and for possible demurrage costs. A typical scenario could cost the shipper over \$600, plus the cost of removing and disposing of the grain.

Switching cars out and moving them into sidings is a time consuming operation. It means extra man hours, engine hours and expense and detracts from overall efforts to provide more efficient rail transportation.

Obviously, both railroads and shippers will benefit if cars are loaded following weight and balance guidelines.

# OVERLOADED HOPPERS

It is vital to ensure the load does not exceed maximum weight limits. A hopper car carrying more weight than it is designed for can cause a breakdown in the wheel assembly. A loaded car weighing more than the rail line's capacity can also cause the track to break down.

In either case, the breakdown can lead to a derailment with all the danger, inconvenience and expense that such an accident involves.

All rail cars currently have stencil markings on the side. A brief definition of terms are listed on the following page. For further information, contact your local railroad representative.



# UNBALANCED LOADS

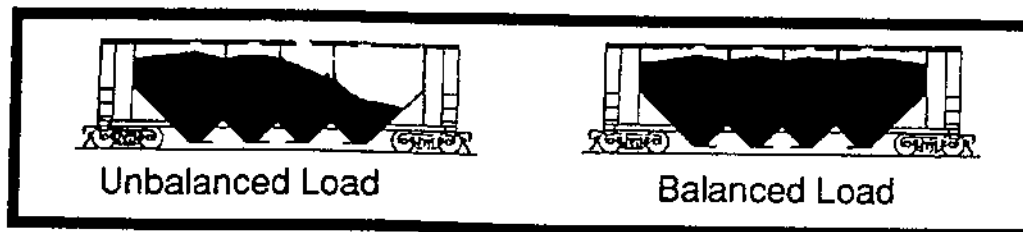
Just as important as not overloading, balanced loading is a must. Distributing the load evenly throughout a car is of major concern. Mistakes can lead to serious accidents.

If a car is loaded heavier at one end, instabilities may develop when the car is in motion.

The car may start lifting and the motion can affect the dynamic forces of the train, leading to a derailment, loss of the car and its contents.

In addition, an uneven load can cause structural stress on the interior compartment welds. If the welds break, the result is undetected spillage between compartments.

Please ensure that hopper cars are loaded correctly to protect their product, to avoid delivery delays and additional charges as well as jeopardizing safety.



# **RAIL CAR STENCILS**

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All rail cars currently have stencils on the side which describe the car's characteristics and load limits. This information is also contained in the Universal Machine Language Equipment Register (UMLER).

**LOAD LIMIT (LD. LMT.):** Indicates the maximum allowable weight of grain the car can carry. The Load Limit is the difference between the AAR gross weight limit on rails (car and contents) and the Light Weight of the car. The total weight allowed on rails is found in AAR Interchange Rules.

**LIGHT WEIGHT (LT. WT.) or tare weight:** Indicates total weight (in multiples of 100 lbs. nearest the scale weight) of the empty car, including trucks and all appurtenances considered part of the car.

## **WEIGHT LIMITS**

Rails and rolling stock are closely designed to some well-researched stress limits, beyond which the possibility of structural failure increases.

To understand how these engineering limits are applied to rail transportation, a short glossary of key terms is helpful.

1. **Gross Rail Load.** The weight of a car and its contents.
2. **Tare (Light) Weight.** The weight of the empty car only.
3. **Load Limit.** The weight of the contents (lading) only.

The gross rail load limit of any car is determined by its construction and in particular the size of its wheels and axles.

The load limit or maximum capacity for the grain being carried equals the gross rail load less the tare (light) weight of the individual car. For example, a standard 4,750 cube covered hopper which may have a tare weight of 63,000 pounds has a load limit of 200,000 pounds. It is important that cars not be overloaded since most carriers will not handle even modestly overloaded cars for any appreciable distance.

**NOTE:** If a car is found overloaded after it is weighed, it is the **SHIPPER'S RESPONSIBILITY** to immediately reduce the lading.

# GENERAL GUIDELINE FOR LOADING GRAIN IN 100-TON COVERED HOPPER CARS

At some country points and at other locations when weight measuring devices are not functioning, it is not possible to accurately determine a grain car's final weight.

In these instances, the chart and table below are offered for your assistance in loading grain in covered hopper cars. As you know, there are many factors which may substantially affect the total loaded weight of the commodity: density of the product; evenness of the load distribution; existence of pockets or voids; and accuracy of measurement from top of load to bottom of hatch-frame, to name a few. Do not regard the chart as the absolute standard for determining compliance with tariff minimum weight requirements or avoidance of overloading. Instead it is offered as guideline to be used in addition to other aids such as scales.

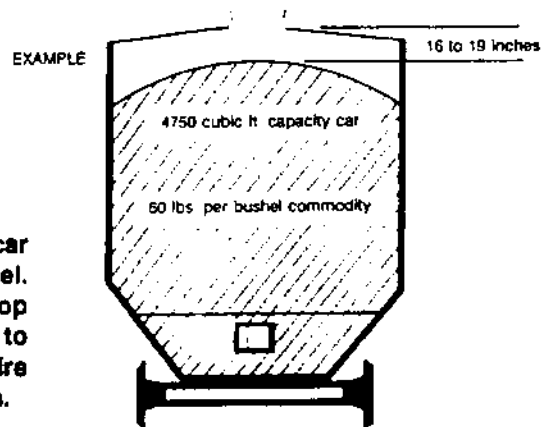
In all instances, it is imperative that the commodity be evenly distributed throughout the covered hopper car. Failure to load one end of the car or placing the load unevenly longitudinally tends to cause imbalance problems and can result in derailments. Overloading penalties or minimum weight charges may also be assessed. Liability to the shipper can result if the car is not properly loaded and causes damage to other lading or railroad property.

Remember, it is the shipper's responsibility to properly load the car.

Cubical Capacity of Car	Commodity Weight (Lbs. Per Bushel)									
	55	56	57	58	59	60	61	62	63	64
4427	0 to 2	1 to 3	2 to 5	4 to 7	6 to 8	7 to 10	9 to 12	10 to 13	12 to 15	13 to 16
4460	0 to 5	2 to 8	6 to 11	9 to 13	11 to 15	13 to 17	15 to 19	17 to 20	19 to 22	20 to 23
4500	0 to 4	3 to 5	4 to 7	8 to 9	8 to 10	9 to 12	11 to 14	12 to 15	14 to 17	18 to 18
4600	5 to 9	7 to 11	10 to 13	12 to 15	14 to 17	16 to 19	17 to 20	19 to 22	20 to 23	22 to 24
4650	6 to 11	9 to 13	11 to 15	14 to 17	16 to 19	18 to 21	19 to 23	21 to 24	23 to 26	24 to 27
4750	8 to 11	10 to 13	12 to 15	13 to 16	15 to 18	16 to 19	18 to 21	19 to 22	21 to 23	22 to 24
5250	22 to 25	24 to 27	26 to 29	27 to 30	29 to 32	31 to 34	32 to 35	34 to 37	35 to 38	37 to 39

**Note:** Distance from top of load to bottom of hatch frame shown in inches

The example at right illustrates a 4750 cubic ft. capacity car loaded with a commodity that weighs 60 pounds per bushel. In order to avoid overloading car, the dimension from the top of the load to the bottom of the hatch frame should be 16" to 19". This is a general guideline and as such may require adjustment for different loading equipment and procedures.



# GRAIN WEIGHTS AND MEASURES

<b>BUSHEL</b>	= 2,150.42 cubic inches
	= 1.24446 cubic feet
<b>METRIC TON</b>	= 2,204.622622 pounds

## APPROXIMATE AVERAGE TEST WEIGHT

<b>WHEAT:</b>	60 pounds per bushel (36.743710 bushels per metric ton)
<b>BARLEY:</b>	48 pounds per bushel (45.929638 bushels per metric ton)
<b>CORN:</b>	56 pounds per bushel (39.368261 bushels per metric ton)
<b>FLAXSEED:</b>	56 pounds per bushel (39.368261 bushels per metric ton)
<b>OATS:</b>	32 pounds per bushel (68.894457 bushels per metric ton)
<b>RYE:</b>	56 pounds per bushel (39.368261 bushels per metric ton)
<b>SORGHUM:</b>	56 pounds per bushel (39.368261 bushels per metric ton)
<b>SOYBEANS:</b>	60 pounds per bushel (36.743710 bushels per metric ton)
<b>SUNFLOWER SEEDS:</b>	28 pounds per bushel (78.736522 bushels per metric ton)

**AVERAGE GRAIN LOAD** carried in covered hopper cars = 3,400 bushels\*

\* Varies between various grain types.



**ACF INDUSTRIES, INC.**

# **BENEFITS TO YOU**

There are several good reasons to make sure that hopper cars are properly loaded:

- **Protect your load**
- **Help get your product to destination on time**
- **Ensure that you do not cause any safety problems**
- **Save money spent on weighing, switching and other corrective costs and penalties**
- **Help you make the grain transportation system more efficient, keeping the grain industry more competitive in world markets**

# **BENEFITS TO RAILROADS**

Properly loaded cars:

- **Help railroads operate in a safe manner**
- **Prevent delays that keep cars from reaching their destination on schedule**
- **Improve cost efficiencies for the mutual benefit of the railway and its customers**
- **Help ensure the reliability of grain deliveries to domestic and export markets**
- **Result in increased hopper utilization through the reduction of delays in the car's loaded cycle**

# **GRAIN CAR LOADING CHECK LIST**

- **Inspect the covered hopper to insure it is mechanically suitable for loading and clean of any former commodities. Receivers are responsible for complete discharge of the loaded car as well as closing all hatches and gates prior to release.**
- **Check all bottom gates and close and lock as necessary.**
- **Note car number and initial for future reference.**
- **Note tare (light) weight and load limit to determine how much lading - grain can be loaded into the car.**
- **If a volumetric device is used to measure the amount of grain loaded into the car, determine weight per bushel of grain to be loaded and calculate number of bushels or dumps for each compartment in the car.**
- **If a track scale is used to determine the final gross weight of the loaded car, note the car's tare weight before loading. Compare this light weight from your track scale with the car's stencil. If you note a difference greater than 500 pounds, either the stencil is incorrect or your scale may not be operating correctly. Contact your carrier or private car owner representative and advise the car may need light weighing and restenciling.**
- **No matter how you measure the volume of grain loaded into the car, be sure and balance the load by distributing it equally throughout all interior compartments.**
- **Be sure your loading spout extends far enough into the car to keep the grain and dust from spilling out on the top of the car. Residual grain left on the tops of cars is a major reason for reject by the next shipper.**
- **When you have completed loading the car, close and lock the top hatches and clean off any residual grain left on the top of the car.**
- **Once the car has been loaded and all hatches and gates closed and secured, apply seals as necessary.**



# **SHIPPER INCURRED COSTS WHEN AN OVERLOADED OR IMBALANCED CAR IS DETECTED**

When a rail carrier detects an overloaded or imbalanced car the shipper may be liable for charges and penalties published by that carrier as well as absorbing penalties that may be imposed in the "market". Each carrier publishes its own unique tariff provisions covering the handling of overloads on its lines. The following is a list of possible charges and penalties the shipper may incur. The shipper should contact the appropriate carrier in each case to determine specific policies and charges.

- **Switching Charges** - The overloaded car requires switching from the train to a side track suitable for shipper access and reduction.
- **Demurrage** - Generally most carriers allow some free time for reduction of an overload. If the car is not reduced and released back to the carrier for further movement, the shipper may be charged demurrage.
- **Reweigh Charge** - If required or if the shipper requests the car to be reweighed there will generally be a charge.
- **A subsequent switch charge** may be assessed when the car is switched from the reduction track back into train service.
- **A separate and specific penalty charge** may be published and assessed by the carrier detecting the overload.

These charges may be applied separately or as a package depending on the carrier.

Also the shipper may have to arrange and pay for reducing the load and absorb any penalties associated with late delivery.

The shipper may also suffer a discount on the grain reduced from the overloaded car.

# **RULES & REGULATIONS IMPACTING THE OVERLOADING OF RAIL CARS**

## **RESPONSIBILITY FOR OVERLOADS AND WEIGHT DISTRIBUTION**

- **Grain Trade Rules of the National Grain and Feed Association Governing Transaction in Grain**

**RULE 23. RAIL LOADING REQUIREMENTS:** It shall be the duty of the Seller to load cars in accordance with applicable tariff rules in effect on the date of shipment, and to assume any loss resulting from noncompliance with such rules. In the event the weight prescribed by applicable tariff is changed between the date of sale and date of shipment, the Seller shall deliver the weight requirements in effect on date of shipment, and any variance from the original contract to be settled at market price on that date.

- **Association of American Railroads Circular No. 42-H**

### **RULE 3. MAXIMUM LOAD WEIGHT**

- (A) The weight of load in car must not exceed the load limit stenciled on car.
- (B) The weight of load on one truck must not exceed one-half of the load limit stenciled on car.

### **RULE 4. DISTRIBUTION OF WEIGHT LENGTHWISE IN CARS**

- (H) When loading covered hopper cars all compartments are to be uniformly loaded to an equal height unless the car is listed in The Official Railway Equipment Register as being designed for unequal compartment loading. When loaded with high density material to gross rail load and less than 60 percent of available volume, car owner must be contacted for approval.
- (I) Covered hopper, if subjected to stopover unloading, may have the compartments listed below partially or completely unloaded:
  - (1) 2 compartment car - not permitted.
  - (2) 3 compartment car - both end compartments or the center compartment.
  - (3) 4 compartment car - both center or both end compartments.

Consignee must inspect car before releasing to ensure that remaining load is equally distributed and meets the provisions of Rule 5.

### **RULE 5. DISTRIBUTION OF WEIGHT - CROSSWISE OF CAR**

- (A) The load must be located so that the weight along both sides of car is about equal for the entire length of the load.
- (E) Partial unloading of covered hopper cars crosswise of car or complete unloading of any compartment along one side, in cars with longitudinal partition sheets, is prohibited.

# **RESPONSIBILITY FOR PROPER LIGHT WEIGHTS AND STENCILING**

- **AAR Field Manual of Interchange Rules**

**RULE 70. A.2.a. Cars will be relightweighed and restenciled for light weight and load limit only by car owner or their designated representative when car is:**

**(1) Rebuilt and receives rebuilt status per Rule 88.**

**(2) Has major structural changes or repairs which alter lightweight of car by 300 pounds for cars weighing 50,000 pounds or under, by 400 pounds for cars weighing over 50,000 pounds but under 60,000 pounds or 500 pounds for cars weighing over 60,000 pounds. All weights of cars are those following the structural changes or repairs to car.**

**(3) Has missing or illegible lightweight or load limit stencil.**

- **Weight Limitations**

**RULE 91 - WEIGHT LIMITATIONS (in part)**

- 1. Cars must not be loaded in excess of total weight on rail limits, for applicable axle size...**
- 2. The total allowable weight on rail, is the weight of car and lading, including temporary fixtures, dunnage, brine, ice, fuel, etc.**
- 3. Weight of lading on or in car must not exceed stenciled load limit, or a reduced load limit indicated by a star (\*) symbol stenciled on car.**
- 4. Special loads in excess of load limit will be permitted under controlled conditions, agreed to between participating roads.**

# **SAFETY**

Safety is the end result of doing things the way they should be done. That's as true on railroads as it is on the highway, home, elevator or farm.

When accidents happen, it is often the result of someone failing to perform a task properly. Overloading a hopper car, or loading it unevenly can result in derailments, damage to property and personal injury.

While extra weight or lack of balance may not seem all that important, it is vital. If there is an unbalanced or overweight car in the line of cars, it may lead to a derailment.

That means your grain may be dumped on the ground. But a more important consideration is that the event can put lives at risk.

All railroads consider safety as a top priority. Railway workers must do everything they can to ensure that rail operations are conducted safely. They rely on those who load cars to do it in a safe manner.

Quality and safety cannot be separated.

Safety is everyone's business.

# **CONCLUSIONS**

- Both the shippers and railroads benefit when care is taken to ensure that hopper cars are loaded correctly.
- Improper loading can lead to serious safety problems in rail shipments.
- Shippers can avoid delays and extra costs by following recommended loading guidelines.
- The grain industry can improve its efficiency by eliminating unbalanced and/or overloaded hopper cars.
- All railroads are anxious to co-operate with you to help ensure hopper cars are properly loaded.

# **ADDITIONAL INFORMATION**

A video concerning the "Proper Loading of Grain Cars" is available. For information please call (202) 639-2350 or write: Damage Prevention and Freight Claim Section, Association of American Railroads, 50 F Street, N.W., Washington, DC 20001-1564.

# IMPROPER LOADING OF COVERED HOPPERS

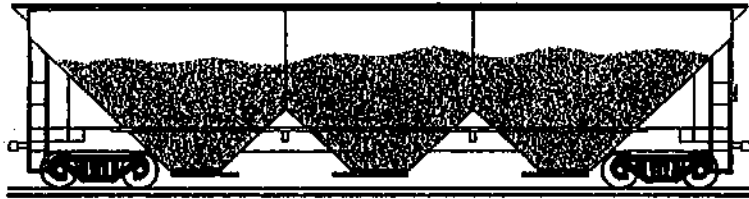
CAN RESULT IN  
A DERAILMENT OR STRUCTURAL DAMAGE  
OR COMMODITY LOSS FOR THE SHIPPER

## CORRECT HOPPER LOADING METHOD

ALWAYS fill each compartment equally.

The stress on each compartment divider is then equal, which helps to prevent structural damage.

The car is designed to carry equal amounts of product in each compartment. It will ride smoothly down the track.

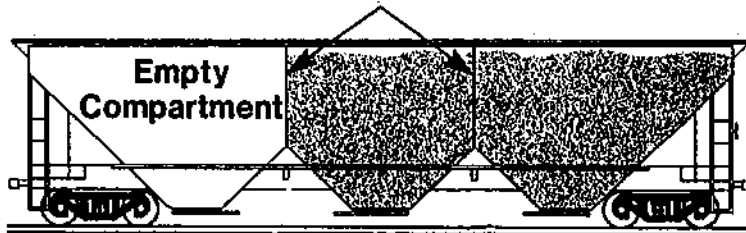


## INCORRECT METHODS

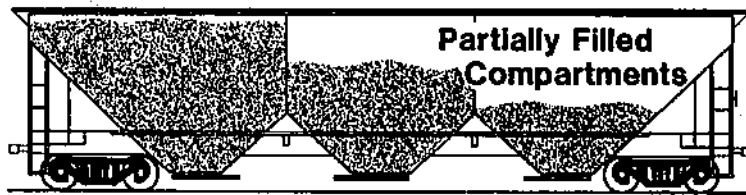
The weight capacity of the car is fully utilized in this example, BUT, because one compartment is empty, two problems could result:

1. A great deal of stress is placed on the compartment divider between the full and empty compartments. Welds can break. If they do, product can spill over into the empty compartment and might go undetected.
2. Weight is unevenly distributed in the car. The empty compartment end is lighter than the full compartment end. The car will tend to lift from the tracks on the empty compartment end. A DERAILMENT COULD OCCUR.

Compartment Dividers  
(welded at seams)



The weight capacity of the car is also fully utilized in this example, BUT, because compartments are each loaded differently, the same stresses are placed on the compartment dividers as noted above. Welds could break and product could spill into a bin already unloaded without knowledge of the unloading company. As a result, the shipper could lose commodity.



The Railroad Industry Appreciates Your Help  
To Properly Load Cars.

