



## Understanding Dimensional Weight & DIM FACTOR


### The Importance of Volume and Weight of Cargo for Transportation

All cargo space involved in transporting goods has physical limits based on the volume of the cargo and the weight. Once the cargo has reached a limit in either volume or weight – the container (trailer, train, plane or shipping container) is transported. Weight has traditionally been the measurement that the transportation costs of individual packaged freight have been calculated.

The difference in weight and volume costs can be appreciated if one considered the expense of transporting a large volume with little weight (e.g. large boxes of Styrofoam drinking cups). Transportation companies have recognized these variables and most have allocated a volume per weight standard in their billing to capture cargo of light density.

### Dimensional (Volume) Weight

The dimensional weight (also known as volume weight) is the minimum weight that a package of a given size may have that is handled by a carrier. A carrier may state that any package of one cubic foot (12"x12"x12") will have a minimum weight allowance of 10 pounds. If the cubic foot package actually weighs 8 pounds – it will be invoiced for 10 pounds. This is a ***minimum*** weight allowance – if the cubic foot package weighs 12 pounds – the charges will be based on 12 pounds.

 ***There are no international or domestic standards concerning values of dimensional weight covering all modes of transport. A significant number of courier companies use the dimensional weight standard set by the International Air Transport Association (IATA) but many regional couriers define their own dimensional weights for ground delivery.***

In the US as in other countries, the IATA standards have come under increased scrutiny as 'clearly a price-fixing agreement among horizontal competitors'<sup>1</sup>. If the US Department of Justice recommendation was followed, the Department of Transport would withdraw the approval and antitrust immunity for all IATA agreements and members would set their own low-density formulas (DIM Factors) in a free market environment. In this competitive environment, it will be much more critical for shippers to know the DIM FACTOR used by their carrier.

<sup>1</sup>Docket OST-2003-14480 submission by Antitrust Division, U.S. Department of Justice concerning a request from IATA to lower the DIM Factor (Resolution 502)

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### **DIM Factor (Dimensional Weight Factor)**

The DIM Factor is a mathematical factor used to calculate the dimensional weight of an object. The DIM Factor represents the volume of a package allowed per unit of weight. Although mathematically related, the DIM Factor is different for measurements in units of inches/pounds and for measurements in centimeters/ kilograms.

All major courier companies now apply the DIM Factor to virtually every cuboidal (rectangular/ square) parcel that they handle to determine the dimensional weight. They then adjust customer invoicing to reflect charges based on the greater weight between actual weight and dimensional weight.

#### **Finding a DIM Factor using in/lb**

Find the DIM factor if each cubic foot (12"x12"x12") has a minimum weight allowance of 10 pounds:

$$\frac{1 \text{ cu ft}}{10 \text{ lbs}} \quad \frac{12" \times 12" \times 12"}{10 \text{ lbs}} \quad \frac{1728 \text{ in}^3}{10 \text{ lbs}} \quad \boxed{172.8 \text{ in}^3/\text{lb}}$$

#### **Finding a DIM Factor using cm/kg**

Find DIM factor if each cubic meter (100cm x 100cm x 100cm) has a minimum weight allowance of 200 kg:

$$\frac{1 \text{ m}^3}{200 \text{ kg}} \quad \frac{100\text{cm} \times 100\text{cm} \times 100\text{cm}}{200 \text{ kg}} \quad \frac{1000000 \text{ cm}^3}{200 \text{ kg}} \quad \boxed{5000 \text{ cm}^3/\text{kg}}$$

### **IATA Dim Factors**

Currently used by most large North American couriers:

$$\text{Domestic} = \text{Dim Factor [in}^3/\text{lb]} = 194$$

$$\text{International} = \text{Dim Factor [in}^3/\text{lb]} = 166 ; [\text{cm}^3/\text{kg}] = 6000$$

$$\text{International (Proposed)}^2 = \text{Dim Factor [in}^3/\text{lb]} = 138 ; [\text{cm}^3/\text{kg}] = 5000$$

<sup>2</sup>Note: Due to substantial resistance and thus delays in obtaining national government approvals; the implementation of this proposal was 'delayed indefinitely'

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**Using DIM Factor (Dimensional Weight Factor)**

The DIM Factor provides a quick determination of the dimensional weight of any cuboidal package. The best way to describe this application is by an example of the application and use of the DIM Factor by a courier company:

What is the billing rate of a 10"x 12"x 14" package that weighs 8 lbs by a courier that has a minimum dimensional weight of 10 lbs per cubic foot (i.e.: DIM Factor = 172.8 in<sup>3</sup>/lb) ?

$$\frac{\text{Volume}}{\text{DIM Factor}} = \frac{\text{Volume}}{\text{Volume / lb}} = \frac{10 \times 12 \times 14 \text{ in}^3}{172.8 \text{ in}^3/\text{lb}} = \frac{1680 \text{ in}^3 \text{ lb}}{172.8 \text{ in}^3} = \mathbf{9.7 \text{ lb}}$$

The courier company will invoice based on 9.7 lbs – the dimensional weight.

*☞ This is an example. Some courier companies always round dimensional weight up to the next pound, which would make the billing weight 10lbs.*

**Dim Factor Conversion Between in<sup>3</sup>/lb and cm<sup>3</sup>/kg**

The ExpressCube Countertop will automatically adjust the selected DIM Factor to correspond to the units selected by the user. The mathematical relationship between DIM Factors can be expressed as follows:

$$\text{Dim Factor [cm}^3/\text{kg]} = \text{Dim Factor [in}^3/\text{lb]} \times 36.12728079$$

$$\text{Dim Factor [in}^3/\text{lb]} = \text{Dim Factor [cm}^3/\text{kg]} \times 0.027679913$$

**Examples of Dim Factor Effect on Dimensional Weight Charges**

The following chart illustrates the possible different weight charges based on different Dim Factors. All dim factors are in use except proposed IATA (138). [Box :20x10x12.5 = 10lbs]

Dim Factor	Actual Weight	Dimensional Weight	% Increase from Actual
250	10 lbs	10.0 lbs	0%
194	10 lbs	12.9 lbs	+ 29%
172.8	10 lbs	14.5 lbs	+ 45%
166	10 lbs	15.1 lbs	+ 51%
138	10 lbs	18.1 lbs	+ 81%

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Your cubing and dimensional weighing solution

## How Comparative Shipping Knowledge and ExpressCube Can Save You Money

As technology has advanced, international and national courier companies have invested millions of dollars on machines that perform dimensional weight measurements on virtually every package<sup>3</sup> that they handle. This has resulted in dramatically increased revenue based on dimensional weight charges. For most shippers, this increased revenue manifests itself in the form of adjusted shipping invoices. This can be extremely frustrating, particularly because these costs can be very difficult to manually calculate prior to shipment.

You can accurately predetermine shipping costs by using ExpressCube to dimension and weigh your package<sup>3</sup> before shipment. The DIM Factor used by different courier companies will help you determine how each courier will treat the size of your package<sup>3</sup> when it is shipped. National couriers are currently following IATA standards but look to regional couriers for local deliveries to minimize penalty charges. Regional couriers can be better or worse than the national courier but substantial differences are there. The author of this report found ranges of Dim Factor 250 to 172.8 [national = 194] with just a cursory Internet search of courier rates.

Use the DIM Factor published by your courier company to establish the dimensional weight. The ExpressCube countertop unit will indicate which weight (actual weight or dimensional weight) you should use to determine shipping cost. You can preprogram different Dim Factors and then step through them at the press of a button to predetermine the dimensional weight for a given DIM Factor.

If your shipping department handles different priorities of shipments such as emergency repair parts, small orders, inventory spares, etc.; all parcels should have a form filled out that clearly identifies when delivery is expected. This allows the shipper to find significantly reduced cost alternatives for packages with longer delivery allowances.

There are rapidly emerging software solutions now that will quickly find the least cost routing of a package given the destination, weight, dimensional weight and delivery requirements. If you are researching to purchase this type of software, inquire if they can interface directly to an ExpressCube countertop unit. A shipper only has to place the package on the ExpressCube countertop unit and fill in the delivery information directly into the computer program to determine the most economical shipping route.

<sup>3</sup>Note: Packages are measured as cuboidal objects. A cuboidal object is either square or rectangular in shape. In the event that an object is in countered that is not cuboidal, many couriers calculate the minimum dimensions of a cuboidal box that could contain the object and use this figure for dimensional weight. The ExpressCube countertop unit exclusively measures cuboidal packages.

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