

Woodchip

Wood chips do not flow, and cannot be easily pumped. This has a fundamental effect on the handling system. When discharging woodchips from a tipping trailer, unless the body is sub- divided, it is very difficult to discharge part of a load. The load will often leave the body as one mass. The implication of this is that either reception areas must cope with whole loads at one time, or some form of progressive discharge (e.g. trailers with walking floor) be fitted to the delivery vehicle.

The size and nature of a fuel store required for a wood chip boiler depends on several factors, in particular the size of the boiler itself and heat load placed on it, the re-fueling frequency that can be achieved and the means by which wood fuel is delivered into the store. Site constraints and costs are obviously other important factors to be considered.

Tipper Truck / Trailer

At present most wood chip is delivered by tipper truck or tractor with a tipping trailer. While this method is fine for some installations it is not suitable for all. Larger installations will often have a bunker at low level or a ramp that will allow the chip to be tipped directly into the bunker.

Installations obviously need to be specially designed to take tipped chip deliveries and on some sites there may be insufficient access for these types of vehicles.



It must be borne in mind that there are numerous types and sizes of tractor and trailer and therefore combinations of the two. Because the trailer or lorry is not dedicated to the delivery of wood chip this is often the least expensive form of delivery and due to the availability of the equipment a customer generally has a wide choice of suppliers.



A principal advantage is that the high speed of unloading means that disruption and noise on site is relatively minor. Travelling distances need to be kept to a minimum, ideally not much more than 20-30 miles, mainly because the low bulk density limits the carrying capacity and pushes up the cost per tonne.

Moving Floor & Conveyor Systems

These types of trailers have similar advantages to those listed above, i.e. they need not be dedicated to wood chip and are widely available. In addition they are capable of carrying far greater volumes and because they are often towed by lorry tractors it is more economical to transport greater distances.

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Wood Fuel

DELIVERY VEHICLES



As they do not tip there are fewer issues in terms of height restraints at the hopper. Installations obviously need to be specially designed to take bulk chip deliveries and on some sites there may be insufficient access for large delivery vehicles.

Wood Chip Auger Delivery System

An alternative fuel storage system that avoids the need for expensive civils works when constructing a below ground bunker but allows standard non-specialist delivery vehicles. Deliveries can be by either a tipper or walking floor vehicle. A delivery vehicle discharges chip into a trough that has a horizontal auger in its base which conveys chip directly into a shaftless vertical auger.



The maximum vertical lift can be up to 7 metres and the delivery speed can be between 30-50m³/hr, depending on both the chip and trough specification. The hopper is also suitable for pellets and so would allow pneumatic delivery.

Pneumatic Delivery

Chip can be delivered by a lorry or trailer fitted with a blower unit as detailed below for wood pellet. However this is generally more expensive. This is partly because it is a specialist item of equipment, but also because the lorry engine has to run at high revs to blow the chip and discharge can be particularly slow it is costly in terms of diesel fuel. It can also be a noisy operation which may not be acceptable in some sensitive environments.

Hook Bin Delivery Systems

The "Big Bin" roll-on/roll-off delivery system in use in the UK, and other countries on the Continent employs a large (about 35m³) customised version of the popular Ro-Ro hook lift bin to act as both delivery container and fuel feed hopper. The bins contain a scraper outfeeder system and thus perform the function of the delivery unit, the store and the outfeeder.

On delivery the empty bin is moved away and the full bin connected to the fuel handling system on site. Ideally one site will need at least two bins to give a continuous supply of wood chip.



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Chipping & Delivering in One Process



Due to the relatively low bulk density of wood chips it is often cheaper to transport the raw material. Provided there is sufficient room on the site where the biomass boiler is located for the storage of logs (or other form of woody biomass) and space for the handling and chipping operations to be carried out, this maybe the most satisfactory method of delivery. There will be no cost for the transport of chip and provided the chip store is large enough for a sizeable chip run, the cost per tonne of the hire and/or operation of the chipper can be reduced.

Be aware however that the chipping operation will obviously be noisy and therefore not acceptable in some environments.

Storage Volumes

For smaller boilers running on dry wood chip (MC 25%) a 1m³ hopper will provide up to 24 hrs of continuous running based on a density of 220kg/m³. In practice, daily filling may be awkward and a larger hopper, say 4m³, will provide up to 4 days of continuous operation and approximately 1 week of normal operation.

Whilst wood-chips do not occupy any more volume when wet than when dry, greater volumes of wet chip will be required due to their lower energy content (lower calorific value). This does not become really significant until considering quite wet chips. For example, to give the same operating time of the same boiler, chips at 50% MC will require 12% more storage volume than chips at 20% MC. Some indicative storage requirements for different boiler sizes are summarised in the table below:

Boiler Output	18 kW	80 kW	350kW
Fuel Input	6.25Kg/hr (25kW)	25Kg/hr (100kW)	200Kg/hr (400kW)
1 m ³ Storage	24 hrs	6 hrs	Insufficient
4m ³ Storage	4 days	24 hrs	6 hrs
16m ³ Storage	Over capacity	4 days	24 hrs
48 m ³ Storage	Over capacity	Over capacity	3 days

An important consideration when designing the hopper is that it must be sufficiently large to take an entire delivery load. It is not normally possible to deliver just a part load and the haulier will normally charge a flat rate in any case and may even charge extra if the balance of the load has to be returned to store.

Wood Pellet

Pellet Delivery Lorry (with blower unit)

Dimensions and turning circle of a typical 8 Wheeler Tipper Lorry.

Volvo FM 400 GVW 32 Tonne (with blower unit)

Fixed Wheel Base – 4 Axle, 8 Wheeler

Length: 9.05m

Width: 2.44m

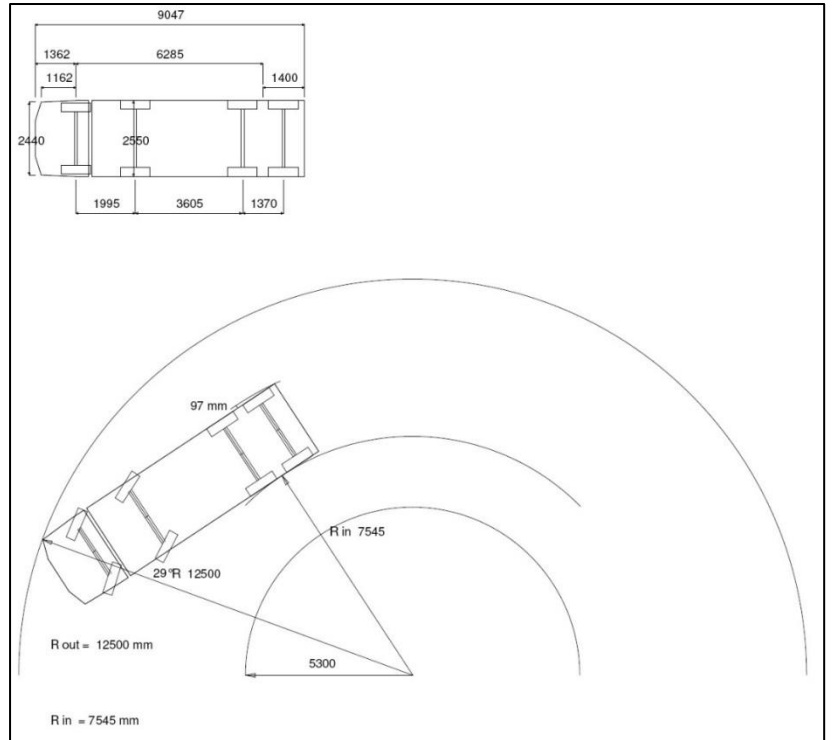
Height 3.50m

Turning circle: 12.5m

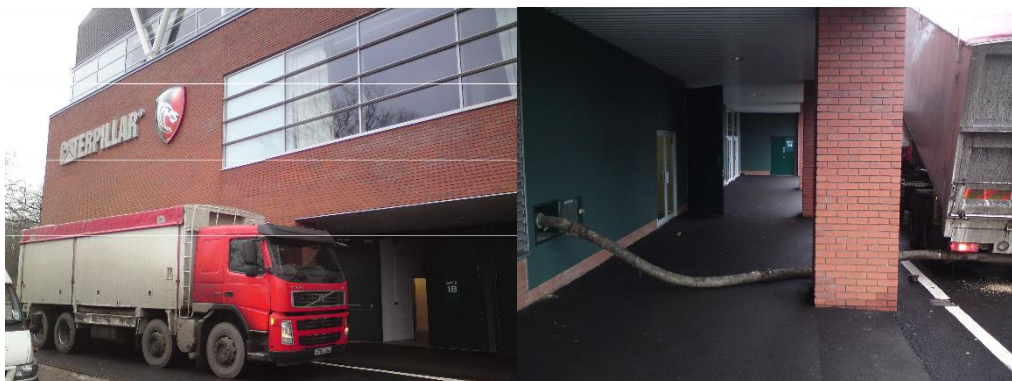
Distance from front end to (axle 1): 1362mm

Distance from centre axle 1 to centre axle 2:
1995mm

Distance from rear end to back axle (axle 4):
715mm Distance from centre axle 4 to centre
axle 3: 1370mm



There are numerous means of attaching the delivery hoses to fuel hoppers, though the industry is beginning to standardize and settle on the Storz 110A type coupling that have an identical locking head with no separate male or female halves and are available with BSP male and female threads. The length of hose should ideally be kept to less than 12 metres but can be as long as 30 metres. The longer the hose run the longer it will take to discharge and the greater the risk of the pellets disintegrating. Similarly the hose should ideally be laid straight from the lorry to the hopper or at least with a limited number of sharp changes of direction for the same reasons outlined.



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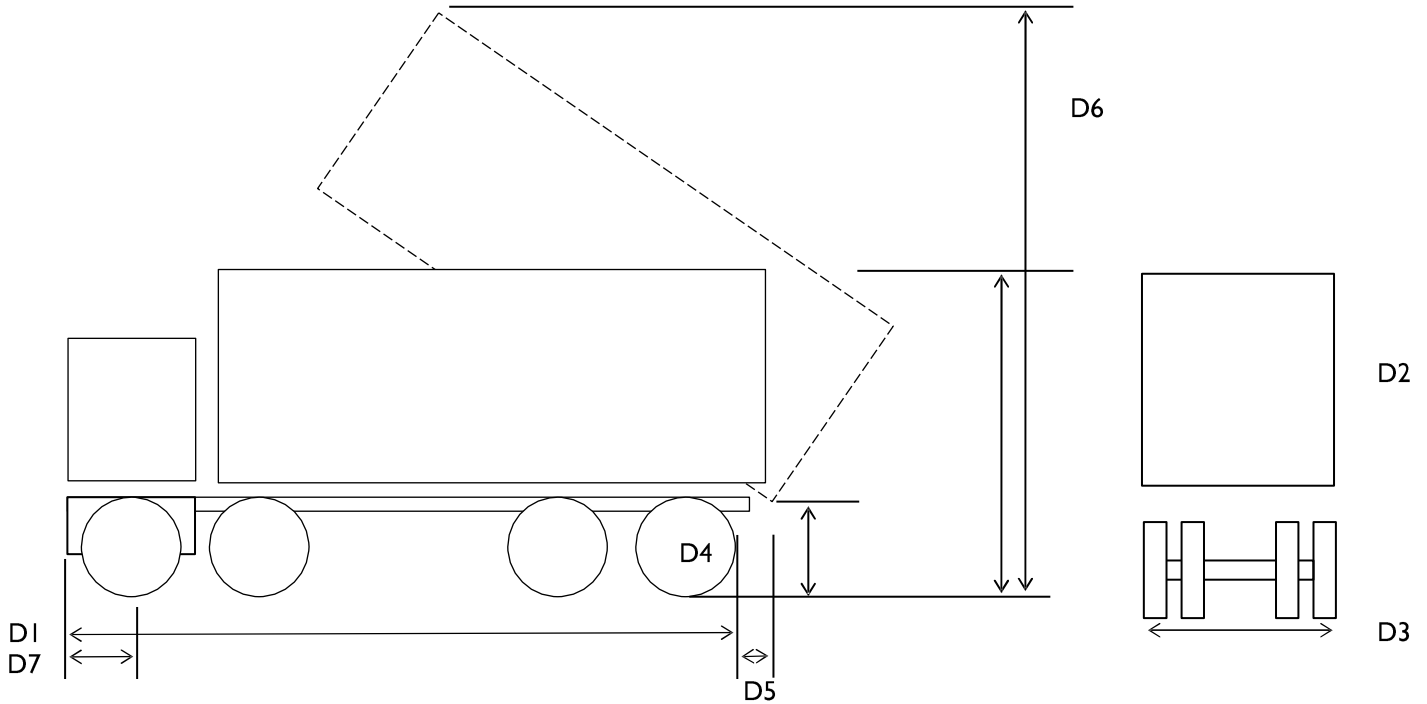
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Further Information regarding Delivery Vehicles

Numerous vehicles exist with the potential to deliver wood fuel. It is often necessary to understand those vehicles sizes and dimensions.

The following dimensions are indicative only and intended as guidance for a preliminary site survey.



Delivery Vehicle	Type	Capacity (m3)	D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)	D5 (mm)	D6 (mm)	D7 (mm)
4 Axel Tipper	Tipping	30-50	9000	3300	2500	700-1200	600-700	8000	700
4 Axel Hook Lift	Tipping	30-45	8600	4900	2500	1100	500	8200	700
Tractor/Trailer	Tipping	15-24	10000	3000	2800	700	600	7000	0-1000
Artic Lorry	Walking Floor	80-100	16500	4500	2500	700	1000	4100	150
Blower Lorry	Pneumatic	35	9800	3500	2500	N/A	N/A	8200	700