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Designers need to take a number of different factors into account to achieve the best possible results: a wheel that fully meets the real demands of the workplace drastically reduces overall material handling costs. In order to assess whether a product satisfies the requirements it is essential to examine the following factors in detail: maximum load, floor (condition and type), rolling resistance, speed, temperature and any other working conditions.

MAXIMUM LOAD

This is the load to be carried plus the weight of the truck or trolley. In the case of a four-wheeled truck or trolley, one can only be sure that three of the wheels will be in contact with the ground at any given moment, so the maximum load on each wheel is calculated by dividing the maximum total load by 3, using the following formula:

$$Q = (P_u + P_a) : n$$

where:
n = Minimum number of wheels always in contact with the ground
P_u = useful load
P_a = weight of truck/trolley
Q = Maximum load on each castor (theoretical)

One also needs to take into account the possibility of uneven load distribution by adopting a safety margin that ensures that the effective load never exceeds the theoretical load even in the event of overloads. Select a wheel or castor that has the same or a higher capacity than the maximum theoretical load calculated using the formula above. The actual load capacity of the wheels with Nylon hub will be reduced to 50 % of the nominal admissible load when used at temperatures above 60 °C (140 °F).

FLOOR

It is preferable to choose wheels with an elastic rubber or soft polyurethane tread for floors with a rough surface (grating, asphalt, etc.) or which are in poor condition; while wheels with a hard tread can be used on hard and compact floors (cement etc.). Relatively fragile floors (tiles, ceramic etc.) require the use of suitable rubber or polyurethane-tyre wheels chosen according to the load being transported and the amount of protection required.

ROLLING RESISTANCE

Rolling resistance decreases with the increase of the hardness of the tyre and/or the diameter of the wheel. The type and condition of the floor also influence rolling resistance, with the best results obtained on hard, compact, and smooth surfaces. Smooth running can be improved further by using wheels with ball bearings instead of roller or plain bearings. Manually operated trolleys should use large-diameter wheels with suitable bearings to avoid excessive operator effort (especially over long distances) even though it may result in a higher load capacity than the maximum calculated. Rolling resistance is always greater at the start; it can be 60–80 % higher after a long stop under load.

SPEED

The speed at which the truck or trolley moves strongly influences the wheel or castor load capacity. All the values shown in this catalogue are for a maximum speed of 4 km/h and manually propelled applications. Higher speeds will reduce the load capacity, thus making it necessary to choose wheels with a higher capacity. If the trucks are being moved by mechanical means, it is necessary to select a suitable fork assembly (with hardened precision bearings) and ensure that it is positioned for maximum stability and proper load distribution. Choosing an appropriate swivel assembly also helps avoid vibration ("shimmy") at higher speeds.

TEMPERATURE

For applications at temperatures outside the normal range (+15 °C to 28 °C) ensure the chosen wheel or castor can meet the required conditions. In cold-storage areas (down to -40 °C) use specially lubricated monolithic wheels. Low temperatures can stiffen normal elastomers and damage tyre bonding. For trolleys used in ovens or high-heat environments (+80 °C to +270 °C) select high-temperature wheels or castors.

ADVERSE CONDITIONS

Holes, tracks, steps, gate guides, unlevelled hoist doors and similar obstacles make it advisable to use elastic rubber or soft polyurethane-tyre wheels with the largest possible diameter. Swarf, glass fragments, foundry slag and other debris require steel or cast-iron wheels or wheels with a polyurethane coating. If oil, grease, humidity or corrosive chemicals are present, monolithic nylon or polyurethane-coated nylon wheels (for better floor protection and lower noise) should be chosen. The information concerning the resistance of materials to chemicals is indicative only, since performance depends on concentration, temperature, humidity, and contact duration. The combination of chemicals may cause different effects from those of individual substances. If in doubt, please contact our technical department.

Users are required to observe all recommendations provided by the manufacturers regarding the proper installation, use, and maintenance of the products to ensure safety and optimal performance.

STORAGE

Before installation, the wheels and castors must be stored in well-ventilated rooms without excessive humidity and within a temperature range of -10°C to +35°C. They must under no circumstances be exposed to sunlight for long periods of time.

USE

The wheels and castors are interchangeable parts which are normally used on manually-propelled equipment, trucks and trolleys for indoor material handling requirements. When the wheels or castors are to be put to a different use from that for which they were originally intended, prior agreement between the customer and supplier is essential (identifying which product is best suited for the application). On any single item of equipment always use wheels and castors of the same type and with the same specifications, bearings and tread.

All the locking or braking devices illustrated in this catalogue (improperly called "brakes") must only be used on horizontal floors. The braking force on floors which are not horizontal (which anyhow must not have a gradient greater than 3%) the braking force may not be sufficient to hold the total mass of the truck, trolley or equipment: suitable tests should be carried out before use. Never use these devices to reduce the speed of moving equipment or make it come to an immediate halt.

CAPACITY

The load capacities of wheels and castors for industrial applications shown in this catalogue apply to normal conditions of use, unless otherwise stated.

Namely:

- maximum speed of movement 4 km/h
- floor hard, compact and in good condition
- height of obstacles no greater than 5% of diameter
- ambient temperature between +15°C and +28°C
- non-continuous manual movement.

FITTING

The user must always check the strength of the mechanical parts (axles, bolts, bushes, etc.) used for assembling wheels, ensuring they are suitable for the type of fitting and the maximum load to which they will be subjected. When using swivel fork assemblies it is essential for them to be fitted perfectly perpendicular to the floor. Fixed castors must be vertical and perfectly aligned so that the wheel is under all circumstances orientated in the direction of travel. Castors with top plate mounting are designed to be fitted using four bolts with washers and nuts. The mounting interface of the equipment on which they are to be fitted must be rigid and the top plate must be in contact with it along its entire surface. Under no circumstances weld the top plate to the equipment. The solid stem castors require tubular structures with tight tolerances to ensure the solid stem is rigidly held inside the mounting hole.

MAINTENANCE

The user is responsible for maintenance of the product. Use of the product in more corrosive environments than normal, close to the sea, with loads exceeding the rated capacity, with overloads, at high speeds or on floors with surface damage can lead to early deterioration of the wheels and castors and even cause their failure. Draw up an effective maintenance schedule which includes the following:

Inspection of the trolley

Check:

- that the structure is stable and that the wheels and fork assemblies are fitted correctly;
- for any damage to the frame due to loads in excess of the rated capacity or to violent falls of the loads carried;
- that the surface on which the castors are mounted is perfectly flat.

If there are any faults restore the truck, trolley or equipment to its original condition, changing the wheels and castors if necessary. Make sure all the mounting means, such as bolts, nuts, washers etc. are tightened correctly, changing them if they are no longer effective.

Inspection of the wheels

Check the visible tread wear: flat areas indicate that foreign bodies (string, cord, threads, etc.) are preventing the wheel from turning freely on its axis. If necessary, fit thread guards to slow down the accumulation of this type of material around the hub. Change wheels and castors with excessive play or stiff rotation. Change wheels with cut or irregularly worn tread. Change wheels with cracked or dry elastomer coating and polyamide wheels with flat treads. Change wheels with rubber tyres that have stretched or show signs of swelling or softening. Check the electrical conductivity of the conductive wheels at regular intervals and clean the tread frequently to make sure it is free of any impurities which could insulate it from the floor. Remove larger foreign bodies which have penetrated the tread or made their way between the wheels of twin fork assemblies. Make sure the wheel axle is tight.

Inspection of the fork assemblies

Check that the fork swivels correctly, that the centre nut is tight, that the bearing races are in fair condition and that there are no foreign bodies and corrosion inside the swivel head. The plate bearings must be in fair condition, without excessive play. Replace the castor if wear or deformation detected is such to be of prejudice to the performance of the castor. Check that the arms on the fixed fork assemblies are not bent and are perpendicular to the floor. Check efficiency of breaking and blocking devices.

Lubrication

The swivel bearings and wheel bearings must be lubricated at regular intervals to ensure a long service life, reduce tractive force and improve the smooth operation of the assembly as a whole. Use appropriate lubricants for the application, paying particular attention to ensure they are suited to the work temperature. Our products are normally supplied pre-greased and it is generally sufficient to lubricate them every six months. When working in corrosive environments or in high temperatures, lubricate at least once a month. If the trucks/trolleys are washed frequently, it is advisable to lubricate them everytime after washing. Never use chemically corrosive detergents.