Policy Document

# HAULTRUCK TYRE MATCHING POLICY

February 2009

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## 1 INTRODUCTION

This haultruck tyre matching policy applies to:

1. Rigid frame haultrucks, and
2. Prime-mover / trailer haulers.

Tyre matching criteria and tolerances under this policy are the same irrespective of whether radial ply or bias ply tyres are fitted to the truck.

The reason that we need to follow tyre matching rules for haultrucks is to ensure that tyre and truck component life are not compromised. Poor tyre matching by circumference / diameter can result in significantly reduced tyre life through tyre over-loading and excessive or abnormal wear; and in significantly reduced life of truck wheel bearings and mechanical drive train components.

## 2 DEFINITIONS

The following definitions are used in relation to this tyre matching policy.

- **Fixed axle**: a rigid axle, lacking independent suspension of the wheels on either side of the axle (eg. the rear axle of a Cat 793, Komatsu 830 & Terex MT4400, or the front beam axle of a Terex MT4400). Note: the front axles of Cat 793 and Komatsu 830 haultrucks are not fixed axles because they have front wheel independent suspension. The rear axle of a Liebherr T272 is not a fixed axle because the two rear tyre dual assemblies have independent suspension.
- **Inflated circumference** of a tyre: is the circumference measured along the tread centre line of a fully inflated[1] tyre. – typically measured with a tape measure.
- **Average tread depth** of a tyre: is the average of the two tread depths taken at the quarter-points of both shoulders of a tyre[2] – typically measured with a tread depth gauge; this measurement may be taken on an inflated or deflated tyre[3].

[1] The measured circumference of tyre will vary significantly depending on whether the tyre is inflated or deflated.

[2] Example: a tyre whose quarter-point tread depths are 43mm on one shoulder and 47mm on the other shoulder has an average tread depth of 45mm [(43 + 47) / 2]

[3] A tyre's tread depth measurement does not vary whether the tyre is measured while inflated or deflated.

## 3 POLICY

Haultruck tyres should be matched in terms of inflated circumference / tread depth within the dimensional tolerances set out in Tables 1 to 3 below. While matching tyres by inflated circumference is the most accurate method it is often impracticable (because one tyre is often in a deflated state, and also because of increased potential risks with the task); hence matching by tread depth is, in practice, usually the preferred method and is quite reliable provided that the tyres being measured and compared are of the same brand, size and tread pattern[4].

Retreaded tyres should always be matched by inflated circumference rather than tread depth because of variations in retread thickness. The same rule applies to repaired bias ply tyres that have been autoclave cured because of the probability of tyre shrinkage during curing.

There is a requirement to match tyres as follows[5]:

1. Within a dual tyre pair
2. Across a (front or rear) fixed axle

Note that there is no requirement to match tyres across a non-fixed axle (ie. an axle where the wheels have independent suspension), nor between the front and rear axles (providing that there is no mechanical drive train connecting the front and rear axles).

Table 1 shows Otraco's matching tolerances (by inflated circumference and by tread depth) for earthmover (EM) tyre sizes.

Tables 2 and 3 show Otraco's matching tolerances (by tread depth only) for common haultruck and hauler models, respectively.

An Appendix shows diagrams, with examples, of the most common variations of fixed frame haultruck and prime-mover / trailer hauler tyre and axle configurations.

[4] "Same tread pattern" also implies the same Original Tread Depth (OTD).

[5] Otraco applies the same matching tolerances irrespective of whether the haultruck is electric or mechanical drive; Otraco's prescribed tolerances across a fixed axle take into account the effect of "differential windup" (damage to drive train components that can result if tyres are not correctly matched across the drive axle of a mechanical drive truck) as well as the effect of abnormal tyre loading on either side of the fixed axle (whether the fixed axle is a front or rear axle).

| Tyre size | Tyres in a Dual pair[6] | | Tyres across a Fixed axle[7] | |
|---|---|---|---|---|
| (rim diameter) | Inflated Circum. | Av. Tread Depth | Inflated Circum. | Av. Tread Depth |
| 63" | 8 cm | 12 mm | 31 cm | 50 mm |
| 51 & 57" | 6 cm | 10 mm | 25 cm | 40 mm |
| 35-49" | 5 cm | 8 mm | 19 cm | 30 mm |
| 33" | 4 cm | 6 mm | 16 cm | 25 mm |
| 24-25" | 3 cm | 5 mm | 13 cm | 20 mm |

**Table 1** – Maximum allowable variation in inflated circum. / av. tread depth by tyre size

*(Note: average tread depth, highlighted in the above table, is more commonly used than inflated circumference; however tread depth comparisons may only be used for tyres of the same brand, size, tread pattern & OTD)*

| Haultruck model | Dual tyre pair | Across Rear axle | Across Front axle |
|---|---|---|---|
| Cat 797, Kom 960, 930, Liebherr T282, Hitachi EH5000 – on 63" tyres | 12 mm | 50 mm | n/a |
| Terex MT6300 – on 63" tyres *(beam axle on front)* | 12 mm | 50 mm | 50 mm |
| Liebherr T272 – on 57" tyres *(independent duals on rear)* | 10 mm | n/a | n/a |
| Cat 793, 789, Kom 860, 830, 730, Hitachi EH4500, Liebherr T262, T252 – on 57" tyres | 10 mm | 40 mm | n/a |
| Terex MT4400, 3700 – on 57" tyres *(beam axle on front)* | 10 mm | 40 mm | 40 mm |
| Cat 785, Kom 630 – on 51" tyres | 10 mm | 40 mm | n/a |
| Terex MT3600, 3300 – on 51" tyres *(beam axle on front)* | 10 mm | 40 mm | 40 mm |
| Kress 2000 – on 51" tyres *(dual tyres on front as well as rear; front duals have independent suspension)* | 10 mm | 40 mm | n/a |
| Cat 777, Kom HD785, Hitachi EH1700 – on 49" tyres | 8 mm | 30 mm | n/a |
| Cat 775, 773, 772 – on 35" tyres | 8 mm | 30 mm | n/a |
| Cat 771, 770, 769 – on 33" tyres | 6 mm | 25 mm | n/a |

**Table 2** – Maximum allowable variation in av. tread depth by rigid-frame haultruck model

[6] This is the maximum tolerance between the two tyres of a dual tyre pair; eg. for 57" tyres, if the position 3 tyre has a tread depth of 50mm, the position 4 tyre should have a tread depth of between 40mm & 60mm (ie. 50mm +/-10mm). Where possible the larger tyre should be fitted to the outside position (typically position 3 or 6) of the dual assembly to compensate for haulroad crown profile.

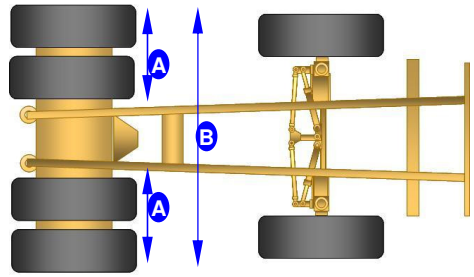
[7] This is the maximum tolerance between the average tread depth for the tyre(s) on one side of the axle and the tyre(s) on the opposite side of the axle; eg. for 57" tyres, if the position 3 tyre has a tread depth of 45mm and the position 4 tyre has a tread depth of 55mm (giving an average of 50mm for the two tyres) then the average of the tread depths for the position 5 and 6 tyres may range from 10mm to 90mm (ie. 50mm +/- 40mm).

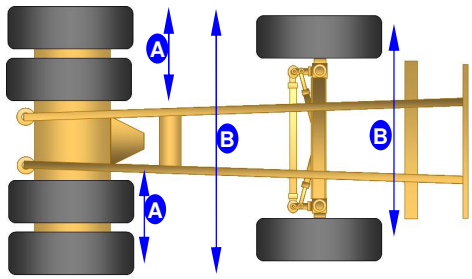
| Hauler model[8] | Dual tyre pair | Across Rear axle | Across Front axle | Across Trailer axle |
|---|---|---|---|---|
| Terex BD270 / trailer – on 51" tyres *(beam axle on front)* | 10 mm | 40 mm | 40 mm | 40 mm |
| Cat 784 / trailer – on 51" tyres | 10 mm | 40 mm | n/a | 40 mm |
| Cat 776 / trailer – on 49" tyres | 8 mm | 30 mm | n/a | 30 mm |
| Cat 772 / trailer – on 35" tyres | 8 mm | 30 mm | n/a | 30 mm |

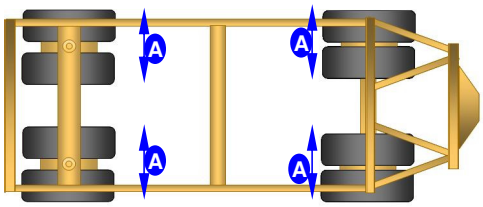
**Table 3** – Maximum allowable variation in av. tread depth by prime-mover / trailer hauler model

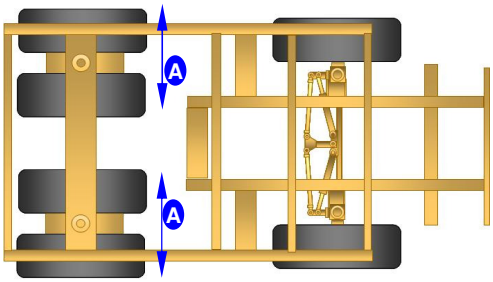
[8] These haulers have dual tyres on fixed axles on the rear of the prime-mover and on the trailer.

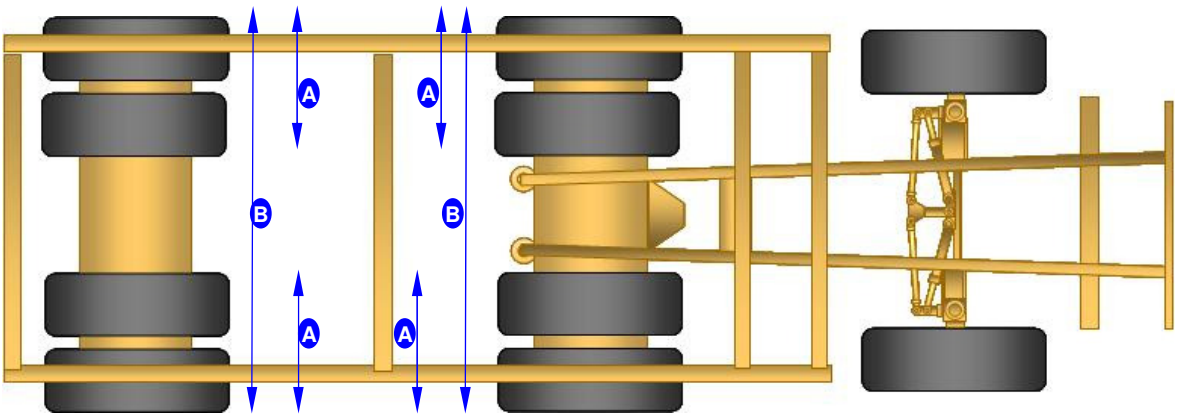
The maximum allowable tread depth variations for particular truck models can be noted in the table that accompanies each diagram.

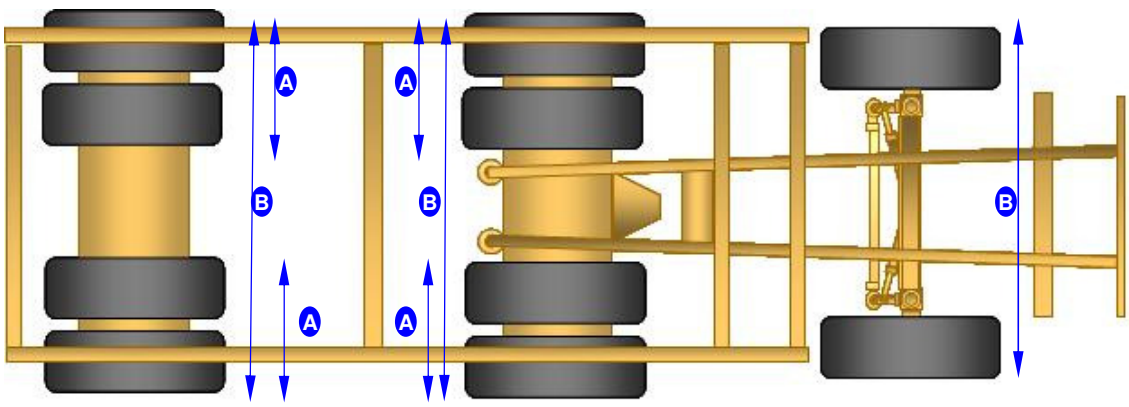
| Cat, Kom, Hitachi, Liebherr (except T272) | | mm |
|---|---|---|
|  | A | |
| | B | |
| | C | |
| | D | |

| Terex | | mm |
|---|---|---|
|  | A | |
| | B | |
| | C | |
| | D | |

| Kress | | mm |
|---|---|---|
|  | A | |
| | B | |
| | C | |
| | D | |

| Liebherr T272 | | mm |
|---|---|---|
|  | A | |
| | B | |
| | C | |
| | D | |

| Cat 784-772 prime-mover / trailer | | mm |
|---|---|---|
|  | A | |
| | B | |
| | C | |
| | D | |

| Terex BD270 prime-mover / trailer | | mm |
|---|---|---|
|  | A | |
| | B | |
| | C | |
| | D | |