



General Building notes for Billy Cart builders and drivers v 16.07.2018

HAVE FUN!!!!

The following notes are offered as a guide only - so do not be discouraged if this sounds terribly technical. They are offered to help you better understand what works well as you start to build your cart and to help you to be the fastest cart in the West! but safely.

Read these notes in conjunction with Billy Cart Tech Requirements 1 to 13 and A,B,C & D.

1. As this event is for unpowered vehicles the greatest advantage will be weight hence the four maximum weight classes. Aim to be at the high end of your selected class to maximise your opportunities. Hand assistance to the wheels to gain speed is prohibited as we are concerned by such activity leading to a loss of control and possible collision. The starting ramp will provide the initial momentum required.
2. While the organisers are keen for an experimental approach and accept the use of both three and four wheeled designs, single front wheeled designs will be less stable on changes of direction and will NOT be accepted.
Cart builders will gain a significant advantage if they minimise wheel bearing drag and make use of light lubrication. Well inflated tyres offer a far better advantage over soft and flexing tyre sidewalls.
- 3 Requirement 3 above has been worded to discourage the use of string or rope as the steering method and the event organisers strongly recommend the use of sound engineering principles around the steering geometry. With consideration for Ackerman and caster principles. Ackerman being the principle in steering systems that causes the outer front wheel to turn less than its paired inner wheel. There are many excellent references and sketches just a Google away on the Ackerman principles. While the Caster action of each wheel can best be described as the principle that causes the steered wheels to both tilt as steered and offer a self-centering action for the steered wheels, think shopping trolley. Again, a greater understanding of this can be found with a Google search. Links below.
4. Requirement 4 has been worded to prevent the use of steered front axle design that become very unstable during steering and under some circumstances can induce roll over. Steered axle designs retain both wheels in alignment and pivot around the center of the axle.
5. These dimensional requirements are devised from the established practice of other similar events and can be tested during your build by simply placing two sheets of plywood the defined distances apart and ensuring the cart then fits between them. An alternate pre-event testing of these dimensions can also be done using a large cardboard box and a wall. The event organisers will allow slight increases on these dimensions by pre-event application where the oversize cart has previously competed in a similar event and can

demonstrate that entry occurred. However, the entry will be shown in the event program as by invitation.

6. Another dimensional rule based on both fairness and sound engineering principles. Wheel base is the measurement from the centre of each steered wheel to the centre of the rear wheels. Track is the measurement taken at the centre of paired wheels in the tyre surfaces that make contact with the ground. Below (In Green) is an excellent simple drawing of the two principles and a thanks to Wikipedia. The ratio 1.5:1 means that a reasonable state of forward movement stability can be enjoyed.

7. While a far greater braking experience can be found with road going automobiles on the front brakes the event organisers are concerned that front brakes not balanced to perfection and reliability can induce a self-steering effect. Some rear brake imperfection will also impact stability; however, the effect is always less dramatic.

8. Again, sound engineering principles are being applied here where carts with high centres of gravity and maximum widths of 1000mm will be more prone to a roll over in severe cornering moments. However, if a roll hoop is considered a desirable addition by a cart builder then it needs to extend higher than the helmet of the driver(s) as well as a little greater than the shoulder width of the driver.

9. This is really just about mass and design strength in the fairly small (2200mm x 1000mm) area available. However, the exception is for parents who are keen for the experience of this activity to extend to a younger child and Cart builders may well find the best arrangement would be to have the child seated between the legs of the parent with the ability to control both steering and brakes. Limiting steering activity to the child. Give consideration to facial protection and steering wheel contact under sudden braking.

10. This requirement has been introduced to ensure the toboggan approach to air streamlining is not used. (Lying prone on the Cart)

11. A sound floor of folded and ridged sheet metal or plywood fixed to a steel framed Cart chassis will offer a great base for the mounting of a seat, possibly the support for the steering column and side plates should there be a desire to feature signage. The self-testing of such a floor can be as simple as its ability to support the weight of the driver standing on it. A forward facing number plate for the race number is required to assist cart identity and race timing.

It is assumed that some Cart builders will look to mounting a plastic moulded seat from a discarded chair, consideration of strong mounting of the seat is important. However, others may look to a cushioned seating space formed by the floor and extended up as a seat back and supported with two sides that will also work as a method to prevent contact with the rear wheels. If builders are looking for an optimum rear seat back angle 21 to 23 degrees is very common in well sorted clubman style cars. The use of multiple thickness floor and seat back cushions then makes accommodating different sized drivers very easy. A 10 to 12 degree slope of the seat base also offers a far better feel, support and slightly bent knee seating position.

12. This requirement is designed to ensure fairness in terms of streamlining as well as sensible visual outlook for the drivers. Common sense is applied to those who are physically very short.

13. This requirement is a simple practical measure to minimise the possibility of grounding the Cart and spoiling the driving experience during the competition. Self-testing by Cart builders over a 75mm block of wood during the early build process is recommended. There will be no significant gain from making the Cart with a ground clearance of less than 75mm as the cart has to clear the starting ramp and small wheels may cause the cart to stick

at the ramp. No sharp protrusions the challenge here is to not get injured walking around the Cart. All fixtures and fittings securely mounted is just another common sense provision, as a rule of thumb any mounted item should be able to withstand a force three times its own mass.

Driver apparel items

In each case the intent of the event organisers is to minimise skin graze and suggest protection inspired by bicycle and skateboard users.

A. A helmet just offers that level of protection to the lump on top of your shoulders that sometimes makes contact with harder items. Bike type helmets are both less expensive and lighter. However, the event organisers accept the use of motorcycle helmets as well. Mention of correctly fastened cannot be overstated.

B. Knee, elbow, hand and eye protection from light grazing dust or debris is the intent here and might take the form of knee and elbow pads or heavy material overalls. Gloves as simple as light rubberised fabric garden gloves through to exotic leather materials will be accepted. Any form of eye covering from visors, spectacles or sunglasses will be accepted.

C. This is just to stop the bare foot brigade and calls for a complete foot covering. Stout shoes, sneakers or work boots will all be considered fine. Heavy boots may help fine tune the weight class but may reduce brake pedal control.

D. During scrutineering as well as the technical requirements, measurements and weights of the cart and driver, a confirmation the driver has this equipment is important.

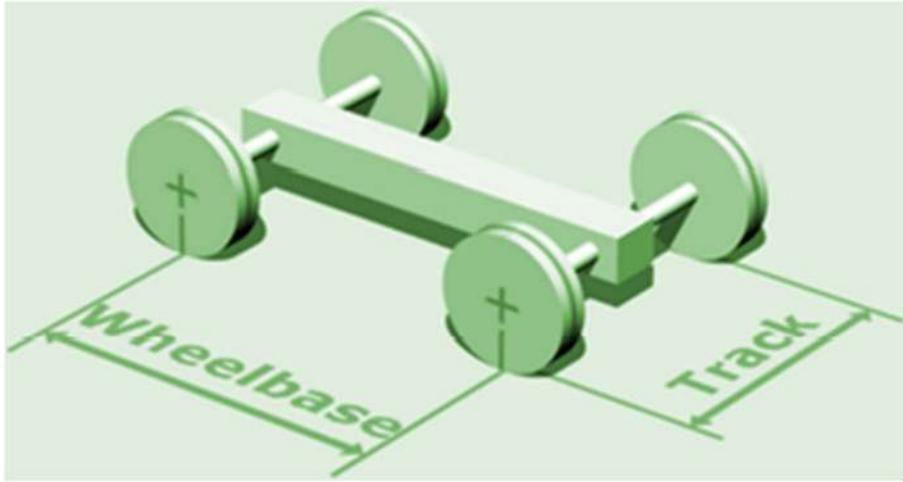
Ackerman link

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Caster Angle Link

<https://www.google.com.au/search?q=caster+angle&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwj3ITcruTaAhWDfrwKHf-gB14QsAQlcw&biw=1920&bih=963>

Thanks to Wikipedia.



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