

AgTEM float trailer

by David Allen – August 2021



Notes

- The AgTEM float trailer is designed to make deployment of AgTEM quick and easy. Without it small budget jobs are not feasible.
- It has a second benefit of allowing legal transport across road corridors within a job site where unregistered vehicles cannot travel.
- The design concept involves a unistrut track and trolley with a tow ball on it. This is winched up an incline so that the cart is dragged up onto skids that locate it on the trailer. No loading ramps are needed.
- Weight with load is 620kg. An alternative double axle trailer version could be designed that also accommodates a quad bike however a better solution is to tow this trailer to site with a large capacity van and to house the quad bike, locked away securely, in the van with all electronics permanently setup on it. At nights this is then driven to the motel so all batteries can be charged via an extension cord without removing them.
- Trailer width is 2.2m. A narrower trailer would exacerbate the sideways jolting action that occurs when hitting pot holes at high speed and would lead to a less stable trailer.
- There need be only 2 or 3 leaves in the leaf springs. With 620kg weight (with much forward of the wheels) more leaves would make the trailer shake the AgTEM-cart violently. The wheels need to be a long way back on the trailer so that the AgTEM wheels come right up to them when loaded – otherwise they would bottom out frequently. The centre of gravity of the cart is then well forward of the wheels but weight on the tow ball remains within acceptable limits. This weight distribution is great for preventing resonant swerving action that some trailers often achieve.
- The trolley track is a double back-to-back-welded 40mm Unistrut member. This allows the top to stay free for the trolley while fixture is to the lower member. For a 5m AgTEM drawbar it needs to extend 7.5m while for a 4.5m drawbar (recommended) it need extend only 7m.

Notes continued

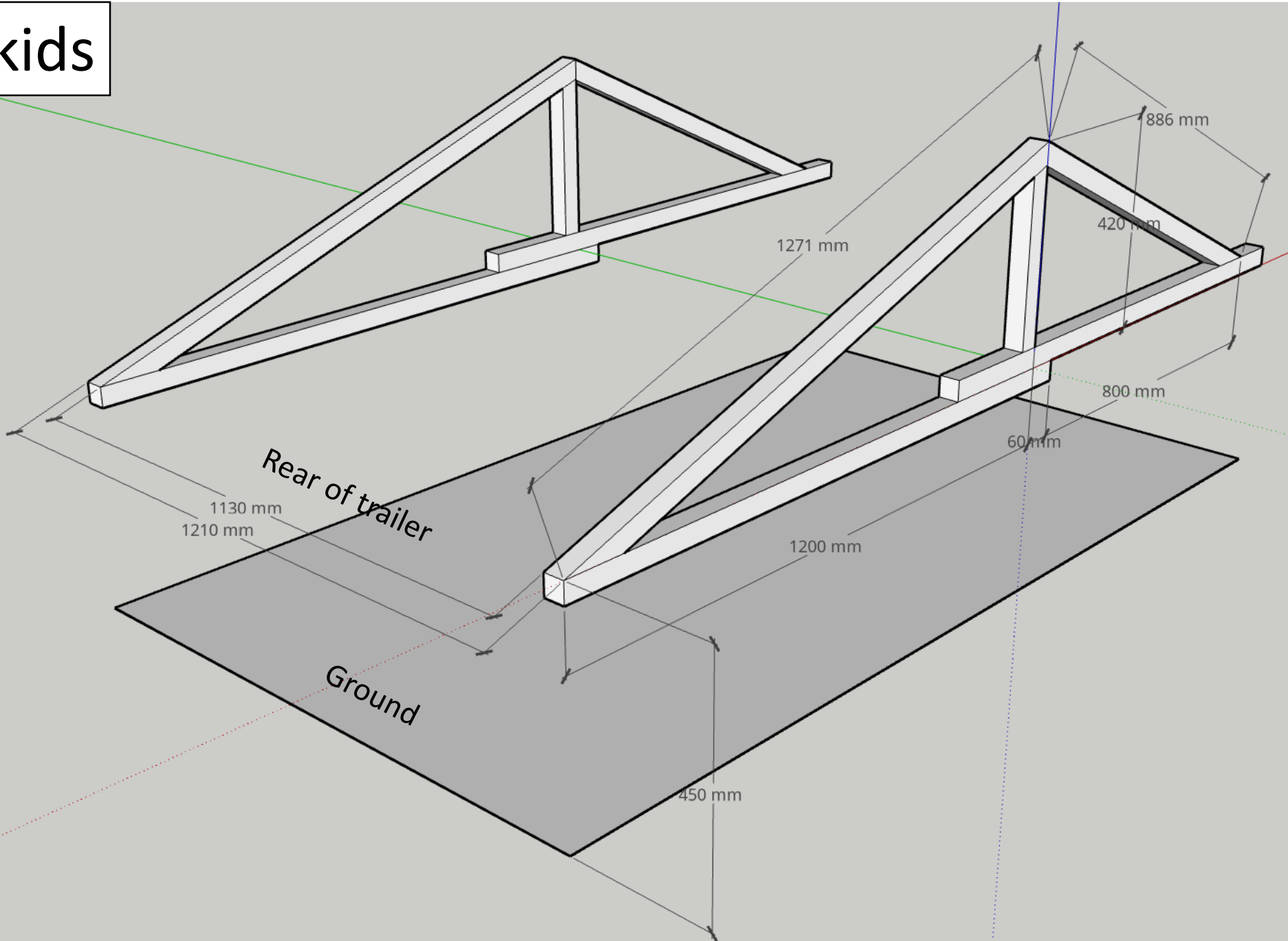
- The rest of the trailer is also largely made of Unistrut and a parts list is provided however this was largely for efficiency while prototyping. With these photos a welder will find it easier, cheaper and lighter to make most of the trailer simply by cutting and welding 40mm square tube together. Similarly, bracing is done with steel rope but a welder may find it easier to weld rod or tube in its place.
- A 230mm PVC pipe is added for rear booms to slide into and tarpaulin and elastic straps are added at the back to accommodate rigging without detaching it from the cart.
- The bar of lights and number plate at the rear are detachable for loading and unloading.
- An aluminium box (stock) is added to house spare wheels and tie-downs.
- If the front loop is to be efficiently used – while maintaining ease of AgTEM removal while the front loop remains on the trailer then brackets can be fixed off the front vertical post to accommodate the front loop boom assembly without retracting it.
- The trailer is designed to place part of the load over the rear of the towing vehicle to make parking easier. This limits the height of the rear of possible towing vehicles. The photos are for a 5m drawbar AgTEM-cart. For a 4.5m drawbar cart it is more feasible not to have such an overlap of the towing vehicle but the incline should remain at this angle should AgTEM be lifted into position by sliding up skids in one action without using ramps. The angles also are important for the strength of the float trailer.
- An Excel spreadsheet of parts and costs including all Unistrut part numbers is available for this trailer – it is not perfect but will help greatly.



Critical dimensions

- The tops of the rear tips of the skids need to be <450mm off the ground in order for AgTEM to roll straight onto them.
- Inside distance between the skids needs to be >1120 and <1140 so 1130 is the logical choice.
- The gantry trolley track incline is 18.43 degrees but maybe altered to suit heights of rear of vehicles.
- Gantry trolley track length for 4.5m drawbar cart needs to be 6.8m (recommended) and for 5m drawbar needs to be 7.3m (as in the photos).
- The next drawing shows the dimensions on the skids and their elevation off the ground.

Skids














The rear light bar is quickly removed using R-clips



The rear light bar wiring is connected here so it can easily be fully removed

A sloped skid is added here to prevent the float trailer load coming down on AgTEM wheels when the float trailer rear bottoms out







AgTEM-cart is secured at the tow hitch and each side of the undercarriage cross-member. On the cross-member there are polyethylene guide blocks designed to precisely guide AgTEM up the float trailer skids. The distance between the skids is thus critical. The angle and height of the skids also is critical to the guide blocks sitting level. Straps tie down each side of the cross-member.

A spare tyre is mounted in the trailer





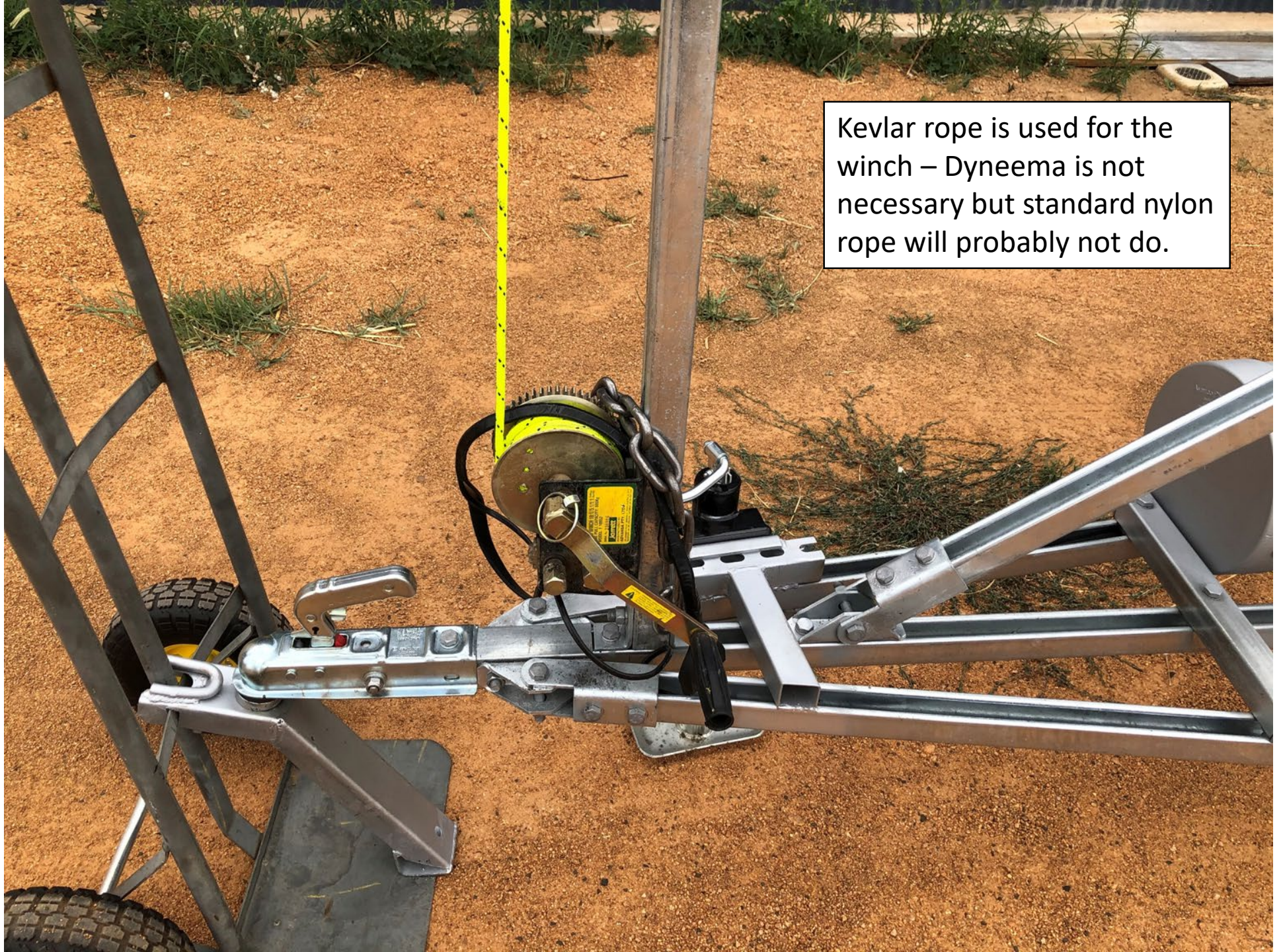








Kevlar rope is used for the winch – Dyneema is not necessary but standard nylon rope will probably not do.





The front end of the tube needs a thickness of foam to stop jolting action smashing the PVC end cap. A hole is added for access and cleaning. The tube is an important addition as it makes it easy to slide rear booms with rigging attached onto the trailer without parts getting caught and without detaching rigging from the cart core.













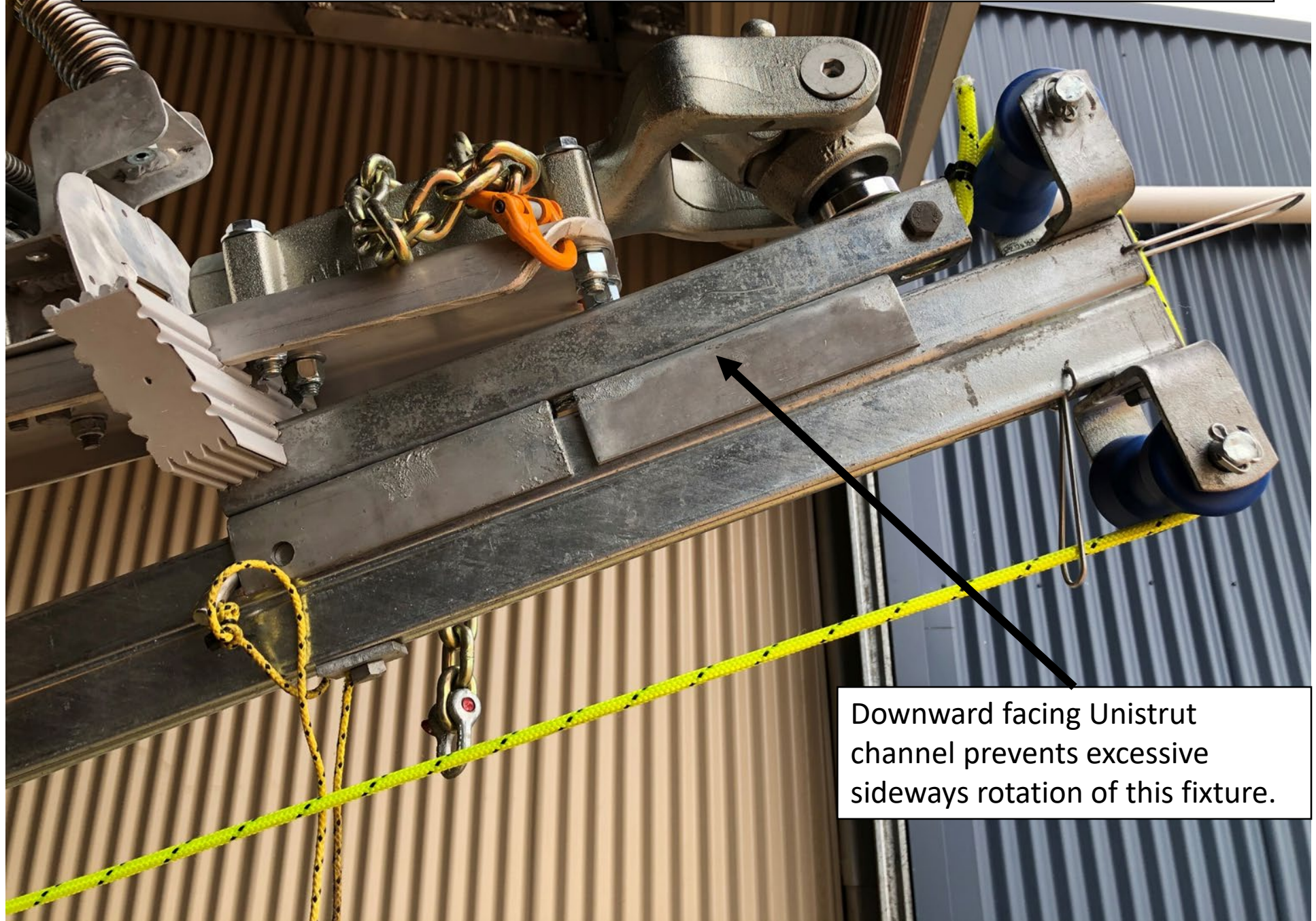
Rollers direct rope from the trolley to the winch

A tow ball fixture that drops onto a hand trolley is very useful.

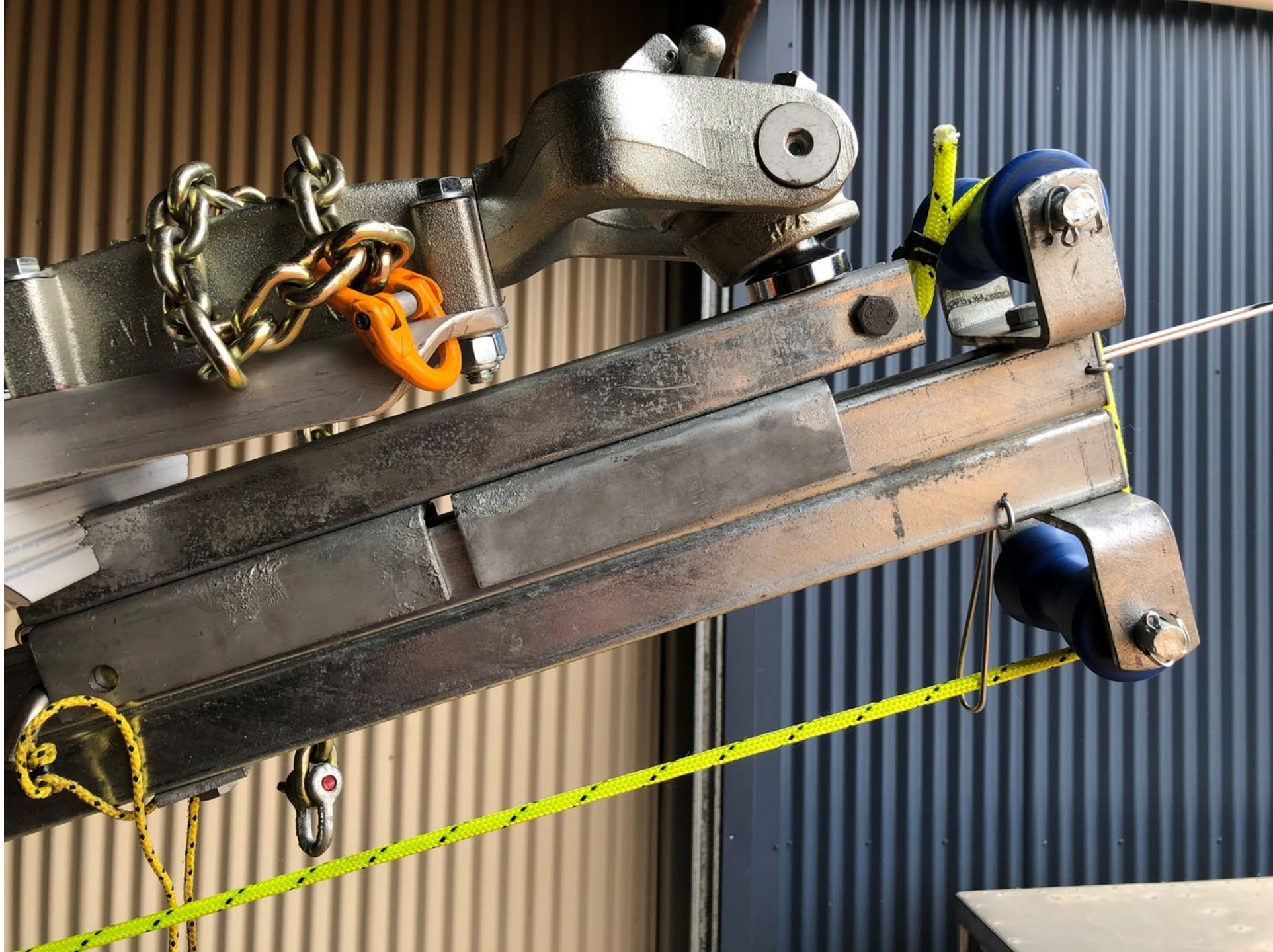


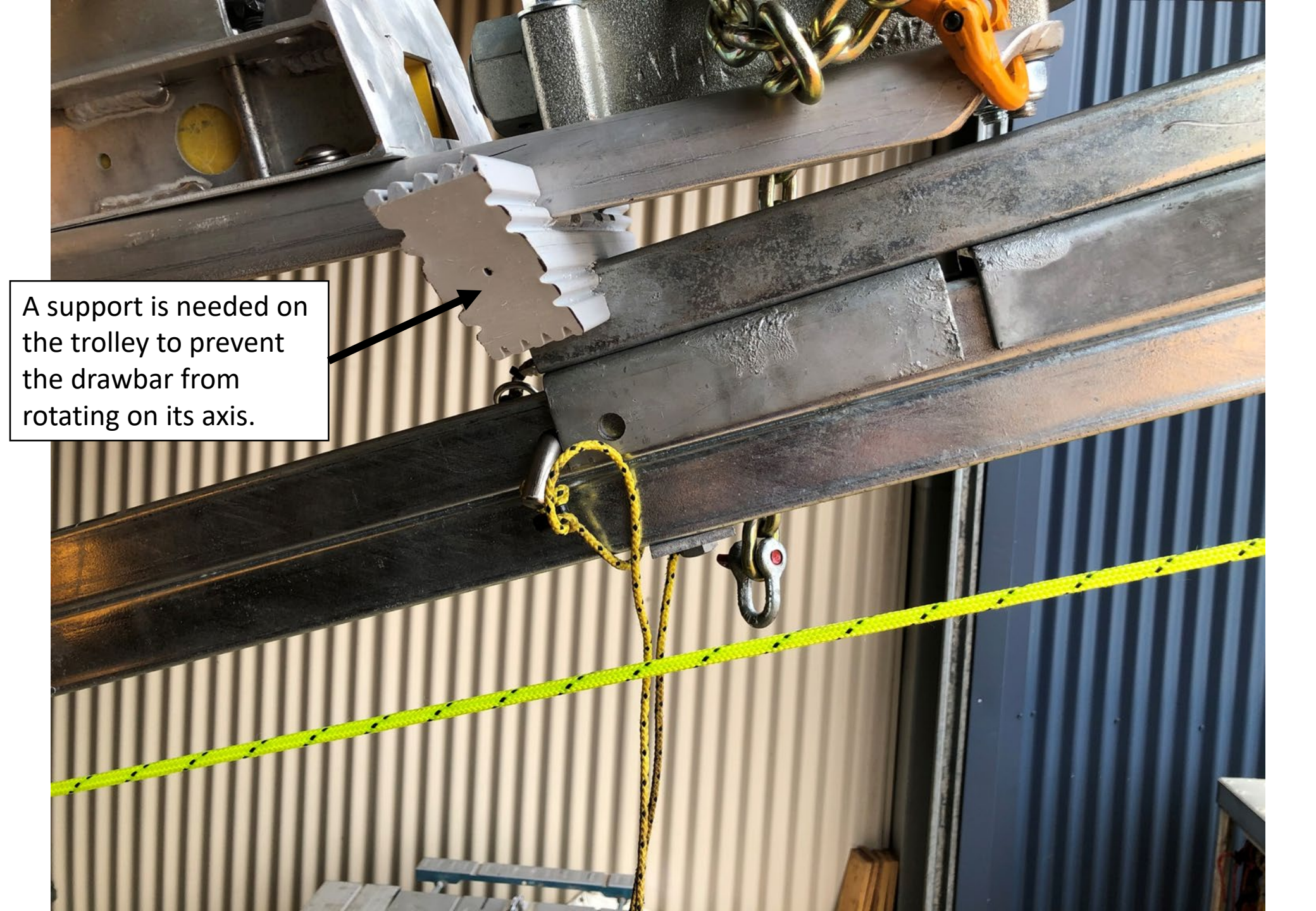
Spring-wire guides keep the rope on the pulleys when it goes slack.

Two small Unistrut 4-roller gantry trolleys exist within this fixture with the tow ball on it



Downward facing Unistrut channel prevents excessive sideways rotation of this fixture.

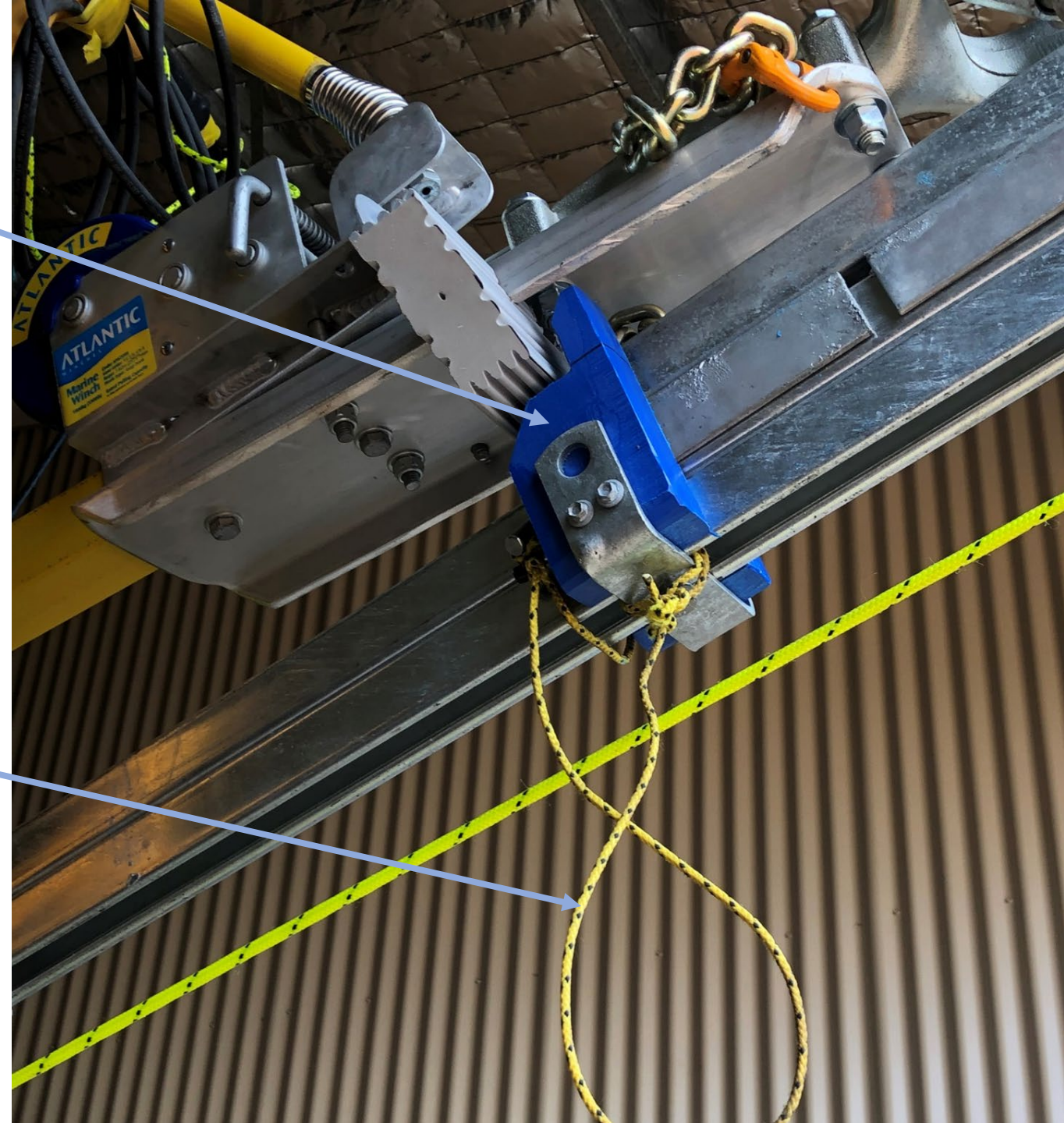




A support is needed on the trolley to prevent the drawbar from rotating on its axis.

A support has been added to the trolley track to take the weight and sideways movement of the trolley assembly – especially as the whole lot is jolted violently sideways when the trailer hits potholes at high speed (not present in previous photos).

A 12mm pin and R-clip is inserted through the trolley track as additional security to prevent the trolley rolling down the track and to take force off the winch assembly. Both are suspended by a long rope that dangles at eye height to remind people not to drive away without securing with the pin.



The rear lights bar can rest on the frame when not in use

Three Tarpaulins overlap forward, backwards, and forward to secure rigging during transit. They also cover the sloping rear end of the rear booms tube.

