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Unfinished business from Wodonga

adequate community response to this incident.

The Australian Design Rules (ADRs) have requirements that are directly relevant to the drawbar and its coupling. It would be wrong to assume that the ADRs are an all-embracing set of safety standards that, if complied with, will deliver the best safety outcomes. All technical regulations should be reviewed periodically to take account of real-world experience. The mechanical coupling between heavy vehicles is a safety-critical element. For a heavy mechanical coupling, five fundamental safety requirements exist, which are: (i) Multiple independent protections against failure. (ii) Correctly specified mating parts on each side of the coupling. (iii) Adequate mechanical strength and resilience proven by tests. (iv) Well-defined and practical coupling installation instructions. (v) Clear maintenance instructions, including a statement of wear limits. In consequence of the Wodonga incident, our industry should review aspects (i), (iii), (iv) and (v) to consider whether the rules are adequate.

The trailer separated because the bolt-in towing eye coupling came loose. It did this because the thread on the retention nut had been damaged by prior chattering movement. Photos of the parts are shown on the next page. The threads had been damaged because the nut was marginally loose. The manufacturer's torque specification for some bolt-in towing eyes is 1,500Nm. Putting this in context, this torque would be generated by the weight of an 80kg mechanic hanging off a 1.91m long handle. Such a torque cannot be achieved without specialised tightening equipment. It is arguable that the maintenance

requirements (v) are beyond the average workshop. The problem is that it is difficult to assess the nut torque without using a torque multiplier to try to loosen the nut at 1500Nm.

Despite the likely use of a retention pin on the nut, it broke off when the trailer was pulled and the threads jumped on the nut. The soft metal pin was no match for the shearing forces that occurred. Once it separated, the trailer continued straight when the roadway went left, leaving the trailer to wander onto the wrong side of the road. The trailer emergency brakes did not operate automatically because the trailer brake system was connected to the truck via coiled air lines. They allowed a considerable separation between the truck and trailer before the air-lines broke. Therefore, the emergency brakes did not operate immediately. There is a general principle applicable to machinery safety that is: 'there should be at least two independent protections against failure of a safety critical element'. The reason for this is to reduce the risk of failure of the safety-critical part or system. In the case of an automatic pin coupling and D-50 towing eye, the independent safety protections are 1: adequate coupling strength correctly specified, installed and maintained; and 2: an emergency brake that comes on immediately when the trailer separates. Neither of these protections were met and in total they were inadequate. Aspect 2 failed because coiled brake lines were used that could stretch to many meters before breaking. In my opinion, these protections, even if effective, are not adequate. Dog trailer drawbars should have safety chains as a third protection. The Australian Design Rule 38



requires trailers to have an 'efficient 'Emergency Brake System' which will cause immediate automatic application of its 'Brakes' in the event of the trailer accidentally becoming disconnected from the towing vehicle.' The implication is that the element that holds the emergency brakes off will operate "immediately" if the trailer coupling fails. There is no definition of "immediately" in the rule. In any case, "immediately" is impossible. However, a reasonable expectation is that the emergency brake controls are triggered when the separation of a trailer exceeds 500mm. I cannot say what the outcome of the Wodonga crash would have been if the brakes on the trailer had applied "immediately", but I do think the outcome could have been better. In July 2015 I published an article in this magazine ('Why electronic brake control and safety chains should be mandatory on new dog trailers') that made the case for mandating safety chains on dog trailer drawbars. The reasons for

this are relevant to the Wodonga crash. ADR 62 requires that towbars have safety chain attachments. It does not mandate safety chains on trailers with a single-axle-group such as centre-axle trailers and semi-trailers. The reason for this discrepancy is that separation of a single-axle-group trailer will probably result in the front of the trailer hitting the roadway, which might restrict operation of the emergency brakes. In my opinion the logic for excluding dog trailers from the safety chain requirement is false. A separated dog trailer will run until the emergency brakes operate. If the emergency brake control mechanism is ineffective, as in the Wodonga crash, safety chains would prevent the trailer wandering. ADR 62 Mechanical Couplings specifies dimensions and test forces for various types of couplings. It follows UN ECE Regulation 55 but is independent of it. ECE R55 defines classes of automatic pin couplings; there are several. For example, a 50mm towing eye couple

4 RULES THAT SHOULD BE REVIEWED:

1. Amend Clause 5.4 of ADR 38/05 to define "automatic application" of the emergency brakes. A suitable specification is that the emergency brake apply when the trailer separation exceeds 500mm.
2. Amend ADR 62/02 to require proof tests for mechanical couplings at 100% of the D- and V-values. The test should be done immediately after endurance testing of the sample.
3. Amend clause 14.3.1 of ADR 62/02 to specify the trailer types that must have safety chains attached. This should include all drawbar trailers.

should be coupled to a 40mm pin coupling. The operator must ensure that the correct parts are coupled — this is beyond the scope of ADR 62. ADR 62 requires a coupling to meet endurance testing requirements based upon a strength rating of the coupling called the 'D-Value', which the coupling manufacturer declares. The endurance testing requires the coupling to survive 2 million force cycles that are applied between +0.6D and -0.6D. There is no proof test for couplings, only an endurance test at 60 per cent of the D-value. This is also a failing of the design rule. A proof test after endurance testing would prove the rating. My list of items relevant to the Australian Design Rules that should be reviewed is shown in the text box. The question is now whether the road transport industry is prepared to accept the status quo or act to make improvements.

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