HSC
Health & Safety Commission

Rail safety: Proposals for Regulations on train protection systems and mark 1 rolling stock

This consultative document is issued by the Health and Safety Commission in compliance with its duty to consult, under Section 50(3) of the Health and Safety at Work etc Act 1974, bodies which appear to it to be appropriate, before submitting proposals for the making of Regulations.

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to reach the section no later than 21 August 1998

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Responses to this consultative document are invited on the basis that anyone submitting them agrees to their being dealt with in this way. Responses, or parts of them, will be withheld from the Information Centres only at the express request of the person making them. In such cases a note will be put in the index to the responses identifying those who have commented and have asked that their views, or part of them, be treated as confidential.

CONSULTATIVE DOCUMENT

Further single copies of this document may be obtained from HSE Books – see back cover

RAILWAY SAFETY: PROPOSALS FOR REGULATIONS ON TRAIN PROTECTION SYSTEMS AND MARK 1 ROLLING STOCK

INTRODUCTION

1 This consultative document contains proposals by the Health and Safety Commission (HSC) to -

(1) require the installation of train protection systems, whose purpose is to prevent collisions between trains, buffer-stop collisions, and derailments due to excessive speed; and

(2) require the withdrawal or improvement of 'Mark 1' passenger rolling stock, which does not meet modern standards of crashworthiness and usually has hinged doors without central locking which can be opened whilst the train is in motion.

The proposals take the form of the draft Railway Safety Regulations, to be made under the Health and Safety at Work Act. These are at **Appendix 1.** A glossary of terms used in this Consultative Document is at **Appendix 2**.

CONSULTATION

2 We are legally obliged by HSWA to consult before submitting proposals for new regulations to Ministers so that we can take your comments into account. We will acknowledge receipt of all comments sent to us and we will briefly try to answer any questions raised. When we send the draft to the Minister we will write to all those who have responded with final details of the proposed new regulations.

WHAT WE WOULD LIKE YOU TO DO

3 We would like you to let us know what you think about our proposals. You may like to use the reply proforma on the back of this document, but do not feel obliged to do so. (If you prefer not to use the proforma for your reply, you may still find it a useful source of reference.) We are interested to receive any comments you

wish to make. **Please send them to the address on the front cover by the date shown**.

OPEN GOVERNMENT

4 To make our consultation process as thorough and as open as possible, we make the comments we receive available to the public at our information centres in Sheffield and London. Copies are available at a small charge to cover our costs.

5 However if you state clearly that you do not want your views to be made public, we will respect your wishes.

BACKGROUND TO THE PROPOSALS

6 Driving a train is an activity in which human error can result in a catastrophic accident if, as is often the case, there are no technical protective systems which prevent the error or permit recovery from it. This is in marked contrast to other railway activities, such as the operation of signals where the equipment which is now provided almost eliminates the risk of serious harm arising from human error. The existing automatic warning system sounds a warning to the driver at the approach to signals showing caution or danger; however if the driver acknowledges the warning but then fails to control the speed of the train, the system will do nothing further to prevent a possible disaster. It would be surprising if such errors did not occur from time to time. In fact, the majority of accidents which result from passing signals passed at danger happen in this way.

7 Thanks to technical advances such as improved signalling systems and the automatic warning system, major railway accidents have become less frequent over the years. Modern train design also means that accidents usually have less catastrophic consequences. Nevertheless the potential for disaster is still there, as shown by the accident at Southall last September in which seven people died. This continuing risk lies at the heart of our concern about two characteristics of Britain's

railways: the very limited usage of 'train protection' systems which can apply the train's brakes automatically in certain danger situations, and the continuing wide use of 'Mark 1' rolling stock with its comparatively weak passenger compartment structure.

8 Both of these issues are highly relevant to the risk of passenger fatalities and injuries arising from collisions and derailments. Tackling them would result in a significant further improvement in the standard of safety for railway passengers. The installation of train protection is a preventive measure; it helps to prevent collisions and derailments. Removing or improving Mark 1 rolling stock, on the other hand, is a mitigating measure; in the event of an accident there will be fewer fatalities and injuries, because passengers will be protected by more crashworthy vehicles. It will also greatly reduce the risk of passengers falling from slam doors on moving trains, since almost all later stock is equipped with central door locking.

9 Some progress has already been made on both train protection and Mark 1 rolling stock. A number of train protection measures are being introduced or are planned, although largely on a selective basis, as explained below. Mark 1 vehicles, now over 25 years old in most cases, are being gradually replaced by more modern ones and are likely to disappear from the core fleets on the main network by 2006 or 2007 under current franchising arrangements.

10 We have considered whether these developments are sufficient, and whether the timescales for new measures are satisfactory and firm enough, to allay our safety concerns; and whether sufficient powers are already available to HSE to hold the railway industry to its plans and to secure improvements to plans where necessary. We have concluded that the only way we can be sure that the necessary degree of progress will be made is by proposing new Regulations, covering both train protection systems and Mark 1 rolling stock. The argument is developed below.

Recommendations of accident inquiries

11 In his report of the Inquiry into the railway accident at Clapham in 1988, an accident which resulted in the deaths of 35 passengers and 69 major injuries, Sir Anthony Hidden recommended that automatic train protection (ATP) should be fully implemented within 5 years of selecting a specific type of system, and that high priority should be given to densely trafficked lines. However, after carrying out some work on a pilot ATP system, British Rail concluded in 1994 that the cost of network-wide fitment of the system would be disproportionate to the benefits. This conclusion was later confirmed by Railtrack. The HSC, and Ministers, accepted this conclusion on the basis that -

(1) the money which would have to be spent on network-wide fitment of ATP could be better spent on other safety measures; and

(2) Railtrack was planning a number of other train protection measures, including the selective installation of a new Train Protection and Warning System (TPWS).

12 The Hidden report also recommended that British Rail should, after carrying out its proposed research programme into the structural integrity of Mark 1 rolling stock, seek HMRI's agreement to the structural changes needed to strengthen all relevant rolling stock with a subsequent life span of eight years and over. However In 1991, British Rail reported that no method had been identified for improving the crashworthiness of Mark 1 rolling stock which could be considered 'reasonably practicable' given the limited residual life of the stock. The Health and Safety Executive (HSE), which includes HM Railway Inspectorate (HMRI), accepted this finding in the belief that an undertaking given by British Rail to phase out Mark 1 stock by 1999 would be met.

13 The Hidden recommendations have been reinforced in a number of subsequent accident inquiry reports. In particular, the report into the accident at Cowden in 1994, in which 5 people died, made the following recommendations:

(1) ATP should be fitted on all new high-speed railways;

(2) every major resignalling scheme submitted for approval which does not include ATP should demonstrate that full consideration has been given to fitting ATP later, including designing the scheme in a way which minimises the cost of adding ATP later; and

(3) in the absence of the complete replacement of Mark 1 rolling stock, which would be the preferred solution, there should be an urgent programme of research into the practicability of improving the crashworthiness of older rolling stock. The results of this research should be discussed with HMRI and an agreed implementation programme drawn up.

Other developments

14 In 1995, British Rail submitted to HMRI a further report which confirmed the earlier view that no reasonably practicable modifications to improve the crashworthiness of Mark 1 rolling stock were available. After considering this report, HSE engaged WS Atkins to make a fresh study of possible crashworthiness improvements. This led to more detailed research into the feasibility, effectiveness and cost of a 'cup and cone' device for preventing carriages from riding over one another in a collision, which has now been tested and found to be feasible and effective. The research is continuing.

15 In July 1996, the House of Commons Transport Select Committee recommended that a strategy be agreed between the Health and Safety Executive and the Office of the Passenger Franchising Director for phasing out Mark 1 rolling stock by not later than 2003. In our response to the Select Committee, we indicated

that work was in hand to review the available options for achieving the withdrawal of Mark 1 stock to a clearly stated timetable.

16 In July 1997 HSE conducted an informal consultation exercise to seek views on a number of options for the future of Mark 1 rolling stock. This current document carries forward that consultation exercise, and extends the consultation process to cover train protection systems.

17 In November 1997 the prototype of a rebodied Mark 1 train, the 'Networker Classic' was unveiled. The train has been developed by a manufacturer, Adtranz, in conjunction with Angel Train Contracts, one of the rolling stock leasing companies.

18 In September 1997, two trains collided near Southall, West London, resulting in 7 fatalities and 5 major injuries. The HSC has established an inquiry to examine the causes and make recommendations, though it will not begin to hear evidence whilst a prosecution remains a possibility. A potentially calamitous near-accident in the area of Paddington in January 1998, also involving two trains, is also being investigated by HMRI. These are but the two latest examples of the continuing accidents and near-accidents, whose persistence demonstrates the need for an effective train protection system. No Mark l rolling stock was involved in either incident; had it been otherwise the number of casualties at Southall might have been much higher still. It would be wrong for us to speculate on the causes of either incident at the present time, but major train incidents inevitably result in renewed concern about train protection issues.

19 This document now considers the issues of train protection and Mark 1 rolling stock separately in greater detail, setting out proposals on each and indicating the links between the two issues where appropriate.

TRAIN PROTECTION SYSTEMS

Current position

20 A number of train protection systems, in a broad sense of the term, are already in use on Britain's railways. However the more sophisticated systems, which incorporate automatic braking as a primary rather than secondary feature, are installed on a highly selective basis.

Automatic Warning System

21 The most basic form of train protection is the Automatic Warning System (AWS), which has been standard on the main railway network for many years. Magnets are fixed between the rails at a distance of about 200m before a signal. This activates a bell in the driver's cab if the signal show a clear line ahead, and sounds a warning if the signal indicates 'caution' (single or double yellow) or 'danger' (red). If the driver fails to acknowledge a warning within a few seconds by pressing a button, the brakes are automatically applied. The system is intended to keep drivers alert to adverse signal aspects, and to help maintain train speeds in poor visibility. Its effectiveness in preventing collisions is incomplete, because the warning can so easily be overriden. Particularly on busy lines and during peak periods where trains frequently proceed through successive yellow signals, the warning may sound so often that drivers may become desensitized to it and may occasionally fail to respond to signals correctly.

Driver Reminder Appliance

22 AWS is now being supplemented by a Driver Reminder Appliance (DRA). The DRA is set by the driver whenever he stops at a red signal. If the train has been standing, for example at a station, there is a risk of the driver forgetting to check the signal before departing. The device prevents the train from starting until the driver

has reset it, which should remind him to check that the signal has cleared. The programme of DRA fitment should be complete by the end of 1998.

Automatic Train Protection

23 With the advent of micro-electronic technology in the 1980s, a number of much more sophisticated train protection systems have been developed which give a very high level of protection against collisions due to failure to obey signals, derailments due to excessive speed, and buffer-stop collisions. Known collectively as Automatic Train Protection (ATP), these systems generally monitor the speed of the train, and compare the train's speed with a safe speed which the system calculates on the basis of the train's distance from red signals, the braking characteristics of the train and other factors. If this calculated speed, which is indicated on the cab display, is exceeded by more than a set margin, automatic braking is applied until the train slows down sufficiently. ATP should prevent the great majority of 'signals passed at danger' (SPADs). However if a train does pass a red signal, the system will initiate an emergency stop. The driver cannot override the system. A version of ATP is operational on the Chiltern lines. Another is operational on Heathrow Express trains, and is expected to become operational on Great Western trains shortly.

Automatic train control

24 Automatic train control (ATC) incorporates all the functionality of ATP. However it goes one step further by dispensing with the need for a driver, although there may be an operator who performs other tasks such as opening and closing doors. ATC is installed on, for example, the Docklands Light Railway.

'Trainstop' systems

25 The London Underground and some other urban rail systems have a system which applies the brakes automatically when a train passes a red signal. The layout

of signals and junctions, combined with low maximum speed and fast-acting brakes, are such that it should be possible to bring a train passing a red signal at full speed to a halt before it can cause a collision.

Industry plans

26 Railtrack is committed to installing a version of ATP on new high-speed lines. It is also committed to installing Transmission Based Signalling (TBS) on the West Coast Main Line. TBS is a new generation of signalling which uses radio transmissions and incorporates in-cab signalling display. It incorporates full ATP functionality.

Train Protection and Warning System (TPWS)

27 A prototype Train Protection and Warning System (TPWS) has recently undergone successful operational tests. TPWS incorporates the existing AWS, but provides a higher degree of train protection. Transmission beacons are placed on the track which can initiate emergency braking to halt the train if it is either about to pass a red signal (the 'train stop' facility) or has exceeded a maximum permitted speed by more than a set margin (the 'speed trap' facility). Speed traps can be fitted at the approach to signals in order to slow down a train travelling at above the permitted speed sufficiently to avoid most of the more serious SPADs, where the train overshoots the signal by such a large distance as to cause an actual danger such as a collision or a derailment. They can also be fitted at any other location where a speed restriction is required, for example at the approach to buffer stops, sharp curves, or track under maintenance. Unlike AWS, the driver will not be able to override the system. TPWS has been designed to be simple to fit to existing track and trains.

28 Compared with AWS and DRA alone, the addition of TPWS should reduce the risk of collision or derailment significantly. However, because the system does not monitor the train continuously, it will give less complete protection than ATP. In

particular, TPWS is unlikely to be totally effective if a train approaches a red signal at high speed. The extent to which TPWS is effective at high speeds will depend largely on the siting of the beacon relative to the signal, and the speed at which a train will be 'tripped' by the beacon. Generally, the further back the detector is placed from the signal, and the lower the permitted speed at that point, the more effective the system will be in preventing serious SPADs. Technically, it may even be possible to place two speed traps at different distances from a signal, each set to trip at different speeds, and this is something that we might wish to require in some cases, for example perhaps where the line speed on the approach to a signal is relatively high. However, beyond a certain point you begin to run up against certain practical difficulties, and a balance has to be struck between achieving maximum train protection and the need to operate an efficient railway. This is still under consideration. However, whatever decisions are arrived at on such points of detail, HSE believes that TPWS will be effective in preventing most serious SPADs.

29 Railtrack has provisional plans to install TPWS selectively over the next few years. However these plans are still at a formative stage, and do not give a clear picture of the expected extent of fitment. Railtrack's 'Green Paper' on TPWS suggests that its approach may prove more narrowly targeted than we would wish, with the result that some signals and locations where TPWS would bring benefit would not be covered. Moreover, Railtrack's decision as to whether to proceed with TPWS at all depends on the outcome of the consultation exercise initiated by that Green Paper.

Benefits of train protection

30 Over the last 30 years, train collisions and derailments have resulted in 269 passenger fatalities and some 9,000 passenger injuries. Many of these collisions and derailments were SPAD-related; over the same 30-year period, SPAD-related accidents resulting in fatalities have occurred at a virtually constant rate of 3 accidents every per 5 years. There is no doubt that a large proportion of these accidents could have been prevented by TPWS. Some of them would probably also

have been prevented by AWS had it been operational at the time, but it is undoubtedly true that others would only have been prevented by a train protection system as least as sophisticated as TPWS. There are yet other accidents which TPWS or even ATP would not have prevented, such as the Clapham accident which resulted from a faulty wire in the signalling system, and derailments caused by track conditions or obstructions. Such factors make it difficult to quantify the reduction in risk which a general upgrade from AWS to TPWS would bring about. Uncertainty over the precise arrangements for TPWS fitment (see paragraph 28) compound the difficulty. However, we are satisfied that TPWS will reduce the current level of risk to passengers significantly and bring real benefit.

31 We would expect the reduction in risk provided by TPWS to translate into a reduction in the number of serious SPADs. A train protection system can only intervene when it becomes apparent that the driver is not likely to stop the train before the red signal. By this point, it will no longer be possible to prevent a SPAD, but an effective train protection system will be able to prevent the train from overrunning the safety margin beyond the signal. A measure of the effectiveness of a train protection system is thus its ability to reduce the number of SPADs which exceed the signal safety margin. Railtrack maintains a database in which SPADs are classified according to their nature and severity. It is possible to deduce from this the number of SPADs which overrun the signal safety margin. Less serious SPADs will continue to occur and may possibly even increase as a result of the successful intervention of train protection systems which ensure that SPADs which would otherwise have been serious are in fact minor.

32 The number of serious SPADs is currently in the region of 170 per year. As TPWS is introduced, we would expect this number to reduce by at least two-thirds. The risk of serious accidents will reduce correspondingly, but the reduction will not be as great because accidents also result from other causes, such as signalling failures and human failures during abnormal working when normal systems are inoperative. Nevertheless we would expect the risk of collisions and derailments to reduce by roughly one-half.

33 How this reduction in risk translates into improved accident figures is to some extent a matter of chance, especially in the short term. Over the past 10 years, there have on average been 64 collisions and derailments a year involving passenger trains. We would expect to see a reduction in the frequency of these accidents. However the trend may not become obvious for some years, partly because these accidents are comparatively rare events, and partly because whether an incident is a near-miss, a glancing collision or a major crash may be largely a matter of chance.

34 The effect of risk reduction on numbers of fatalities and injuries may take longer still to become apparent. This is because the consequences of an accident depend to a large extent on chance factors such as the number of passengers and whether the rolling stock was of Mark 1 or of more modern design. A single disastrous accident such as Clapham can seriously distort annual fatality and injury figures, perhaps masking an underlying flat or improving trend in accident numbers.

35 What we can say for sure is that train protection will reduce the risk of collisions and derailments - our best estimate is that the risk might be halved. This will in turn make a major accident, and therefore major loss of life in a single accident, less likely to occur. TPWS is likely to achieve much of the benefit which would be provided by full ATP, at significantly lower cost.

The case for Regulations on train protection

36 The case for Regulations on train protection rests on five main planks:

(1) train protection systems can significantly reduce the risk of major train accidents;

(2) a system has been identified (TPWS) which we consider to be a reasonable minimum requirement;

(3) we cannot be sure that TPWS will be introduced widely or within an acceptable timescale without compulsion;

(4) enforcement action under existing duties[1] requiring 'reasonably practicable' measures would be difficult, because of uncertainty over the precise meaning of 'reasonably practicable' in this context; and

(5) the introduction of network-wide train protection systems will boost public confidence in the safety of rail travel.

Our proposals for train protection

37 It is 40 years since AWS was first introduced widely on Britain's railways. Since then, technology has changed out of all recognition, and offers the possibility of important further safety improvements. The public expects to see these technical advances reflected in Britain's railways and its safety systems; and is relatively intolerant of railway accidents which place the lives of many people in danger. At present, only a small proportion of the railway is protected by technically advanced train protection systems. We believe that it is now time to move decisively forward.

38 ATP and further developments such as TBS are advanced systems which offer a high degree of protection. We believe that one of these systems, or an equivalent system, should be fitted to all new high-speed lines, and that this will be reasonably practicable. They should also be considered for fitment during major resignalling schemes. Fitting ATP to existing lines and signalling, however, has proved technically challenging, relatively costly, and in some cases prone to reliability problems. It is less clear that we would be justified in insisting on ATP

[1] The existing duties are in section 3 of the Health and Safety at Work Act 1974 (a general duty to protect public against risks to health and safety arising from work activities), and regulation 5 of the Railway Safety (Miscellaneous Provisions) Regulations 1996. The 1996 Regulations, and supporting HSE guidance, are included in *Railway safety miscellaneous provisions* (L98, £7.50), available from HSE Books.

being fitted network-wide, especially if other train protection systems are available which provide much of the benefit of ATP.

39 We are satisfied that TPWS will be relatively simple to fit to existing track and trains, and that it will provide a significant reduction in the risk of train collisions and derailments. We think that it is reasonable to require TPWS (or an equivalent or better system) to be fitted throughout the main railway network, and to all trains on the network. This includes freight trains which, although they do not carry passengers, can place passengers in other trains at risk. **We therefore propose to set a general requirement for the fitting of train protection systems throughout the network.** Draft regulation 3(1) of the draft Regulations places a legal duty on both infrastructure controllers and train operators to do so.

40 Since TPWS is not a continuous monitoring system and is only effective where beacons are placed on the track, it is necessary to decide which locations should be fitted. We believe that train protection should be fitted -

(1) at, and on the approach to, any signal where if a train passes a signal at red it could travel into the path of another train. This would exclude signals on plain line (ie not protecting junctions, cross-overs or stations) and also those where a train passing through at red would be automatically diverted onto another line and away from danger, unless the location falls within (3) below;

(2) on the approach to buffer stops at the end of passenger platforms; and

(3) on the approach to any speed restriction which involves reducing speed from at least 60mph by at least one-third. These are considered to the circumstances where excessive speed carries the greatest risk of derailment or passenger injury. Such speed restrictions may be permanent or temporary and may be imposed on the approach to junctions, curves, and engineering works.

The proposed legal standard is within the definitions of 'train protection system' and 'relevant location' in draft regulation 2.

41 It will be for Railtrack and train operators to decide, in conjunction with HMRI, which locations are to be fitted with TPWS (or an equivalent system) in accordance with the above criteria, and also the detailed arrangements for its operation (such as the precise siting and settings of 'speed traps'). The 'approvals' regime, under which HMRI approval is required for significant modifications to railway equipment and rolling stock, provides a framework within which such detailed issues can be discussed and agreed. The relevant Regulations are the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994.

42 In a project of this size, with a finite period for completion, it is appropriate that HMRI should have the opportunity to consider and influence the train protection programme, including such issues as which lines should be fitted first, and be able, if necessary, to insist that the programme be firmed up or altered. **We propose, therefore, that train protection should be required to be introduced in accordance with a programme approved by HSE** (draft regulation 3(2)). Whilst the programme is being implemented, each part of the train protection system which is brought into service should be maintained in service (draft regulation 3(2)). Once the programme is complete, regulation 3(1) requires the train protection system as a whole to be kept in service.

43 In order to allow a reasonable period for an installation programme to be produced and approved, we propose a six-month lead-in period between the date the Regulations are made and the date they come into force (see draft regulation 1). As the programme is implemented, it will probably become necessary to add detail or to make amendments. HSE will then need to approve a revised programme in substitution for the old. The draft Regulations provide for this by defining 'approved' as 'approved for the time being in writing', which enables HSE to withdraw approval from an existing plan.

44 We believe that it should be possible to fit train protection throughout the network and to all trains within five years without cutting corners, prejudicing other necessary safety measures, or causing significant operational difficulties. **Accordingly we propose to set a deadline of 1 January 2004 for the fitting of train protection systems.** This deadline is written into draft regulation 3(2).

45 It is important that a general requirement for train protection at the level of TPWS should not detract from the need to retain higher levels of protection where these are already provided by existing ATP or equivalent systems, and indeed to instal or extend such systems where it is reasonably practicable to do so. Railtrack is already committed to maintaining ATP on the Chiltern and Great Western lines, to introduce ATP on new high-speed lines, and to introduce TBS on the West Coast Main Line. **We therefore propose that, where it is reasonably practicable, train protection systems should be introduced which automatically control the speed of the train to ensure as far as possible that it does not pass a stop signal and does not exceed the permitted speed throughout its journey**. This is achieved within the definition of 'train protection system' in draft regulation 2. The proposed deadline for the installation of such systems, where they are reasonably practicable, is also 1 January 2004.

46 There may be occasions when a train protection system fails and it would cause unacceptable operational difficulties to take the train out of service immediately. In such circumstances it is reasonable, and consistent with accepted practice, that trains should be allowed to operate. However, the fault should be remedied as soon as reasonably practicable, and if the fault is in the train's equipment (rather than in track equipment) the train should not be allowed to start a new journey but only to complete a journey which it has already started. In addition, suitable measures should be taken to mitigate the risk of collision or derailment during this time; these might include, for example, operating trains at a lower speed and/or the provision of an additional person in the cab. **We propose that if a train protection system fails and provided these conditions are met, there should**

be no breach of the law. This is achieved by the legal defence provided in draft regulation 3(4).

47 Our proposals for train protection build on regulation 5 of the Railway Safety (Miscellaneous Provisions) Regulations 1996[2]. Regulation 5 is a general duty, placed on the infrastructure controller, to ensure so far as is reasonably practicable that measures are taken (including the provision of equipment) to prevent collisions between rail vehicles, collisions with buffer stops and derailments due to excessive speed. That duty covers train protection systems in principle, but it is subject to 'reasonable practicability'. Our proposals overlay the existing general duty with a specific and unqualified requirement for train protection set at the level of TPWS, and additionally require a higher level of train protection equivalent to ATP where reasonably practicable.

Exclusions and exemptions

48 We propose a number of exclusions from the requirement for train protection, as follows:

(1) **Railways used by London Underground Limited where there is a 'train stop' system.** This system does not fully meet the definition of 'train protection system' in the draft Regulations but, as explained in paragraph 25 above, it has other features which combine to provide an equivalent level of safety. Draft regulation 3(3) treats the London Underground 'train stop' system as equivalent to a train protection system. The 'train stop' system will therefore be required to be in service at all times, subject to the legal defence described in paragraph 46 in the event of an engineering fault.

(2) **Any railway on which the line speed is 25 mph or less.** This will exclude a large number of self-contained heritage railways and other minor passenger

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[2] The Regulations and supporting HSE guidance are in *Railway Safety Miscellaneous Provisions,* (L98 , price £7.50) obtainable from HSE books - address and telephone at the back of this book.

railways. We do not believe that it would be reasonable to require train protection systems in these circumstances as the risk will be relatively small.

(3) **Any part of a railway which is used solely for the carriage of freight.** This will exclude freight branch lines and other freight-only lines. The focus of our proposals is passenger safety.

(4) **Any part of a railway in a factory, mine or quarry, harbour or harbour area , unless used for the carriage of fare-paying passengers; any part of a railway used solely for the purpose of carrying out a building operation or work of engineering construction, or within a maintenance or goods depot**. Again this is because our focus is on passenger safety.

The definition of 'railway' in draft regulation 2 contains specific exclusions covering (2) and (3) above. Railways in factories, mines, quarries, harbours etc (ie those mentioned in (4) above) are excluded by aligning the definition of 'railway' with the definition of 'railway' in the Railways (Safety Case) Regulations, which itself contains those exclusions.

49 Railways which are excluded in this way will, however, be bound by the more general requirements of regulation 5 of the 1996 Regulations as well, of course, as by their other existing duties.

50 We are not aware that any further exclusions will be necessary. It should be possible to fit TPWS to all trains, including steam and other historical locomotives, freight locomotives, and self-propelled engineering vehicles without undue difficulty.

51 **We propose that HSE should be able to grant exemption from the requirement for train protection, provided the exemption will not prejudice safety**. Draft regulation 5 is a standard provision which is included in most health and safety regulations. HSE will be able in appropriate cases to place conditions

and/or a time limit on the exemption. It is not expected that exemptions will be granted widely, but they may be appropriate in some cases, for example:

(1) railways operating at above 25 mph which can demonstrate that their operating conditions and/or safety features compensate for the lack of a full train protection system; and

(2) any parts of a railway which are laid along a street or other public place and are, therefore, to all intents and purposes sections of tramway. This possibility comes about because, legally, a 'railway' can include some street-running sections provided the system is a whole is not 'mainly' street-running. It would not be appropriate to require train protection systems on street-running sections, where there will be no signalling and vehicles are driven 'by line of sight' (able to halt within the distance the driver can see ahead).

MARK 1 ROLLING STOCK

What is Mark 1 rolling stock?

52 The term 'Mark 1 rolling stock' is used in the railway industry to denote a series of passenger rail vehicles, manufactured between 1951 and 1974, which share certain characteristics. Mark 1 vehicles have a steel frame and a steel-panelled body mounted on a steel underframe. The body has few energy-absorbing properties and nearly all of the vehicle's structural strength is concentrated in the underframe. No safeguards are built in to prevent the underframe of one vehicle riding over the underframe of another in a collision. In everyday use, Mark 1 stock does not pose unacceptable hazards to the travelling public. However, the relatively weak body and the absence of override protection means that in a collision passengers are less well protected than they would be in more modern vehicles, increasing the risk of fatalities and serious injuries. Vehicles

tend to be forced upwards and to slice into the passenger space of other vehicles, resulting many casualties. Most Mark I vehicles also have 'slam' (hinged) doors without central locking which, though safe in normal use, can be opened by passengers while the train is in motion. A number of fatalities occur each year as a result of passengers falling from Mark 1 trains, and many injuries result from misuse of the doors as trains approach stations.

53 Mark 1 vehicles do not meet the standards of construction which apply to new vehicles in relation to crashworthiness and door safety. Their construction contrasts with that of later vehicles, which are of monocoque construction and offer much greater crash resistance because of their more rigid body, inbuilt crumple zones, and safeguards against overriding. More modern vehicles also provide better internal safety (for example fewer sharp edges), and higher levels of comfort and convenience.

54 There are currently nearly 2,300 'Mark 1' vehicles still in passenger service on the main network (plus others in charter fleets and on heritage railways), mainly dating from between 1959 and 1974. They are operated by ten of the train operating companies holding franchises to operate passenger train services (TOCs), but the majority are operated by three TOCs: Connex South Eastern, Connex South Central, and South West Trains. The vehicles are leased from three rolling stock leasing companies (ROSCOs).

Current plans

55 Although a number of Mark 1 vehicles have been replaced in recent years, and others are due for replacement in the next two to three years, it is clear that a substantial number will, without intervention, continue in service for some years yet. The number is expected to reduce from 2,300 to about 1,300 by the end of the year 2000, under existing franchise contract commitments. However, the remaining 1,300, operated by Connex South East, Connex South Central and South West Trains, are not expected to be phased out completely until 2007 under current

plans. These vehicles are mainly used on the busy commuter routes in Southern England. Connex South East is committed by the terms of its 15-year franchise to replacing its remaining fleet of 400 or so Mark 1 vehicles by 2006. The franchises held by Connex South Central and South West Trains expire in 2003; their 900 or so Mark 1 vehicles are expected to be taken over by the holders of the successor franchises and to be replaced by 2006 or 2007.

56 There is no absolute guarantee that all Mark 1 stock will be withdrawn by any specific date. Because the Franchising Director's functions relate to service levels and value for money, not to safety, he is not in a position to say at this stage whether it would be proper for him to require the withdrawal of Mark 1 stock as part of the successor franchise contracts in 2003 or 2004. Furthermore, there is nothing to prevent Mark 1 stock from being from reintroduced in the future by other train operators who may be permitted access to the railway network alongside the TOCs, under "open access" arrangements.

What are the risks?

57 The historical record suggests that over the past thirty years there have been about 150 fatalities in railway accidents which might have been prevented if the rolling stock involved had given a level of crashworthiness equivalent to that provided by post-Mark 1 designs. Almost half (19 out of 39) accidents involving Mark 1 stock have resulted in more than three deaths, including totals of 35 at Clapham and 49 at Hither Green, whilst only two of the 16 accidents involving post-Mark 1 stock have resulted in more than three fatalities. Since Clapham, there have been seven further accidents involving Mark 1 stock resulting in fatalities, the most recent of which was the accident at Cowden in 1994. Five people died in that accident, and the number might have been much greater but for the fact that the accident occurred early on a Saturday morning when there were few passengers.

58 Past accident figures suggests that whilst Mark 1 stock remains in service in significant numbers, there will be the equivalent of about one passenger fatality per

year which is attributable to the poor crashworthiness of Mark I stock. However, railway accidents tend to involve multiple casualties, especially where Mark 1 stock is concerned. The average number of fatalities is about three times as great in accidents which involve Mark 1 stock as in accidents which involve more modern stock. Thus whilst the average loss of life due to the continued use of Mark 1 stock would equate to one fatality per year, over an expected further service period of eight years or so it is more likely that this would be concentrated into one or two major accidents, typically resulting in approximately five fatalities each. Much larger accidents, on the scale of Clapham or Hither Green, are of course possible, and in the overall historical record appear as events occurring once every 20-30 years. The reduced numbers of Mark 1 stock now in use will make such events somewhat less likely, but the risk is far from negligible.

59 The risk to any individual passenger on the railway is relatively low, especially compared to travel by road. However, the strong possibility of a major train accident somewhere on the network in the next few years, the unusually high level of uncertainty, and the nature of the avoidable hazards inherent in Mark I stock all suggest the need for early positive action to re-establish a firm deadline for the withdrawal of unmodified Mark 1 stock. This is the thinking which led to the informal HSE consultation exercise in 1997 which set out options for the future of Mark 1 rolling stock, including requiring its modification or withdrawal.

60 We have considered whether the arguments for taking action on Mark 1 rolling stock remain valid if, as we propose, train protection systems are introduced progressively over the next few years. It is true that the safety consequences of the continuing operation of Mark 1 stock are exacerbated by the complete absence, beyond the standard AWS and DRA, of train protection systems on the routes worked by most Mark 1 stock. With the introduction of TPWS or equivalent systems, the risk of major collisions and derailments will reduce significantly - perhaps by about one-half. Nevertheless, a major accident will always remain a possibility, and in the event of such an accident it is almost certain that the number of fatalities and serious injuries will be much higher if Mark 1 stock is involved.

61 There is also a number of fatalities, usually between two and four a year, and a larger number of injuries, resulting from falls from the slam doors of Mark 1 rolling stock, which do not have central locking. In addition, many people are injured every year as a result of doors being struck by open doors on Mark 1 trains. The benefits of central locking are illustrated by the drop in slam door fatalities (excluding suicides) from about 18 a year in the early nineties to about 3 a year now, following the fitting of central locking to all InterCity trains. The great majority of vehicles without central locking are now Mark 1, and fatalities are therefore unlikely to reduce further until Mark 1 stock is withdrawn or central locking is fitted.

Ways of improving crashworthiness

62 There are potentially three ways of addressing the crashworthiness problems of Mark 1 rolling stock:

(1) Withdrawal - phasing Mark 1 vehicles out of service and replacing them as necessary by new vehicles.

(2) Rebodying - replacing the body of Mark 1 vehicles by a new, stronger, body, but retaining the existing underframe and bogies.

(3) Modifying Mark 1 vehicles (short of rebodying) to improve crashworthiness.

Rebodying

63 A prototype vehicle consisting of a completely new body shell but using an old Mark 1 underframe, bogies, electrical equipment and braking system has been built. This rebodied vehicle, the 'Classic', is being developed jointly by Angel Train Contracts and Adtranz. Built to modern structural standards, the train provides much greater crash-resistance than a Mark 1 train because of the greater rigidity of the body, the incorporation of crumple zones, and the provision of over-ride protection.

It is, in effect, no longer a Mark 1 train. It is expected to deliver nearly all the safety improvements of totally new trains in terms of crashworthiness, door safety and internal safety features, and similar standards of seating comfort and appearance. The cost is estimated at about £250,000 per vehicle, compared with about £700,000 for a completely new vehicle.

64 Like brand new trains, rebodied trains would be subject to the approvals regime administered by HMRI (see paragraph 41). In general terms, HMRI is likely to require that the train should provide a level of crashworthiness which meets or comes very close to today's standards, as illustrated by the relevant structural standards inherent in Railtrack Group Standards. It should also meet current standards on door safety. The 'Classic' design prototype has already successfully passed the Railtrack and HMRI approval processes.

Modifications

65 In the absence of any positive initiatives from within the industry, a comprehensive research programme is being undertaken jointly by WS Atkins, Halcrow Transmark and HSE to develop a "cup and cone" anti-override device. In a head-on or end-to-end collision, the "cones" lock into the "cups", effectively locking vehicles together and preventing one vehicle overriding another. Not only the two colliding vehicles but all vehicles within each modified train would lock together in this way. Some consequential modifications would be necessary, including the removal of buffers and alteration of couplings. Although little structural change would be made to the Mark 1 body, and the modified vehicles would therefore not meet current crashworthiness standards for new vehicles, it appears that override prevention alone would be likely to deliver much of the crashworthiness benefit of new or rebodied vehicles, at significantly lower cost. There are two caveats. The device is unlikely to be effective at collisions with closing speeds of over 35-40 mph; and it will not improve resistance to damage from side impact or derailment, although it should reduce the likelihood of derailment following a head-on or end-to-end collision.

66 The concept of the cup and cone has undergone extensive development and appears to offer a practical solution. Full-scale assemblies, including sections of underframe incorporating the cup and cone device and modified couplings, are currently being tested on a rig. These tests involve simulating collisions between vehicles. It is expected that this stage will be completed and the results available by the end of June. The latest estimate of the cost is about £9,000 per vehicle.

Slam door modifications

67 In order to examine the practicability of slam door modifications, a four-car Class 421 (Mark 1) train, with 3-4 doors a side per vehicle, was fitted with central door locking. The train was subjected to tests which recreated the manner and frequency of door use on busy routes. Positive information has been gained on the technical feasibility and costs of fitting. Whilst there are some Mark 1 trains which have more carriages, or more doors per carriage, there is no reason to think that such trains could not be converted or would not be practical for use on busy urban routes. The cost of these modifications is likely to be in the order of £27,000 per vehicle. The cost of modifying trains with more doors will be greater, but not proportionately so.

The 1997 consultation exercise

68 In July 1997 HSE wrote to interested parties in the railway industry , seeking comments on a number of options for the future of Mark 1 rolling stock. The letter was sent to Railtrack, the TOCs, the ROSCOs, the Association of Independent Railway Preservation Societies (now the Heritage Railways Association), the trade unions, the rail user consultative committees, and also to the Rail Regulator and the Franchising Director.

69 Three broad options were set out:

(1) to take no action, relying on the franchising process to bring about the eventual withdrawal of Mark 1 rolling stock;

(2) to take enforcement action to secure crashworthiness improvements and door modifications, if reasonably practicable. Research was being carried out into the feasibility of modifications to improve crashworthiness; and

(3) to develop Regulations to secure the withdrawal or rebodying of the stock by an early date (perhaps 2003), or by 2007 if crashworthiness and door modifications are carried out.

70 Nearly all the key parties accepted that early withdrawal or modification of Mark 1 rolling stock is desirable. However, a number of commercial or practical difficulties were seen. In particular, difficulties were seen in requiring action by 2003, given that two of the three franchises primarily affected were due to expire at about the same time and that the third, longer, franchise permits Mark 1 stock to continue until 2006.

Further developments

71 Since the consultation exercise the following developments have occurred:

(1) the 'cup and cone' device is showing itself to be feasible and effective in tests, indicating that the option of modifying rather than replacing vehicles is likely to be available;

(2) the rebodied train is now under operational test and promises to offer a further alternative to replacement by totally new trains; and

(3) the Southall accident has again shown the continuing potential for major railway accidents.

The case for Regulations on Mark 1 rolling stock

72 A number of factors point to the appropriateness and need for Regulations on Mark 1 rolling stock:

(1) Mark 1 rolling stock has already exceeded its expected life in many cases, and its crashworthiness falls well below modern standards. In a major accident involving a Mark 1 train it is almost certain that many more people would be killed or injured than if the train had been more crashworthy;

(2) about three people are killed each year in falls from Mark 1 vehicles because of the lack of central locking;

(3) two alternatives are available to withdrawal: rebodying and (much cheaper) modification;

(4) we are now satisfied that it would be very difficult to secure crashworthiness and slam door modifications under existing legislation (see paragraph 36(4));

(5) although under the proposals set out earlier in this document train protection systems will be introduced by 2004, they will not prevent all collisions and derailments by any means, nor will they prevent fatalities and injuries associated with slam door without central locking;

(6) like any system, train protection can fail, In that event, the train is likely to complete its journey without the benefit of train protection. When major accidents occur, it is not uncommon for them to be associated with abnormal operating conditions such as this; and

(7) there is a level of public and political concern arising from the continued operation of Mark 1 rolling stock despite the recommendations of Hidden and

of the report of the Cowden Inquiry, both of which called for action on Mark 1 in addition to train protection.

73 It would be possible to prepare Regulations requiring the withdrawal or rebodying of Mark 1 rolling stock by a date in 2006, which would ensure that what we believe can be achieved under the franchising process is in fact delivered. However, it would mean Mark 1 rolling stock, with its known problems, continuing in service for eight more years, and we doubt that this timetable is likely to be acceptable. Something must be done to reduce the possibility of a further major accident with multiple fatalities.

74 We are satisfied that it is practicable to replace, or rebody, all remaining Mark 1 vehicles by the end of 2002. Given the uncertain and worrying risk of a major accident, and the gravity of the possible consequences, we believe that it would also be right to set such a requirement. **We therefore propose that, in principle, Mark 1 rolling stock should be withdrawn from passenger service, by 1 January 2003.** In making this proposal we also take account of the Transport Select Committee's recommendation in 1996 that Mark 1 stock should be phased out by 2003, and of public expectation that that recommendation will be fulfilled. Draft regulation 4(1) places duties on both the train operator and the infrastructure controller. The duties are expressed as a prohibition on the operation of 'Mark 1 rolling stock'. The deadline of 1 January 2003 is written into draft regulation 1.

75 Given that rebodied stock delivers nearly the safety improvements of brand new stock, **we propose that rebodied Mark 1 vehicles should no longer be treated as 'Mark 1' and that they should be allowed to remain in service indefinitely**. This is achieved by defining 'Mark 1 rolling stock' in draft regulation 2 in such a way as to exclude rebodied stock. The definition covers stock which not rely mainly on the underframe for its longitudinal strength, as well as stock which has hinged doors without central locking. Neither description applies to rebodied stock.

76 In addition, we propose to give some flexibility for cases where train operators or ROSCOs are prepared to modify Mark 1 vehicles short of complete rebodying. **We propose that any Mark 1 vehicles which are modified so as to provide structural arrangements for preventing vehicles from overriding one another should be allowed to operate until 1 January 2007**. Draft regulation 4(3) achieves this. Under draft regulation 1, the modifications would be required to be carried out by 1 January 2003. The modified vehicles would then be required (by regulation 4(1) to be withdrawn by 1 January 2007.

77 **We seek your views on whether, in order to be allowed to operate until 2007, Mark 1 vehicles should also be required to undergo door modifications so as to eliminate hinged doors without central locking.** The draft Regulations already contain the appropriate provisions: paragraph (b) of the definition of Mark 1 rolling stock and draft regulation 4(3)(b). If, following this consultation exercise, we decide that door modifications should not be required, those provisions would be deleted.

78 There are two main reasons why we believe it right to limit the length of time which modified (as opposed to rebodied) vehicles would be allowed to continue in operation:

(1) the modified vehicles would still not be up to modern standards of crashworthiness. Whilst they would stand up much better to front or rear impact, they would be as vulnerable as ever to side impact and to derailment damage, and there would be no improvement in internal design; and

(2) without a time limit the Regulations would potentially allow Mark 1 stock (albeit modified) to continue in service for longer than if the Regulations had not been made. Setting a limit of 2007 - the date by which the current stock would be likely to be withdrawn under the franchising process in any event - avoids this.

79 The various options for improving or withdrawing Mark 1 rolling stock, and the proposed deadlines for each, are shown in the form of a flow chart on page 36.

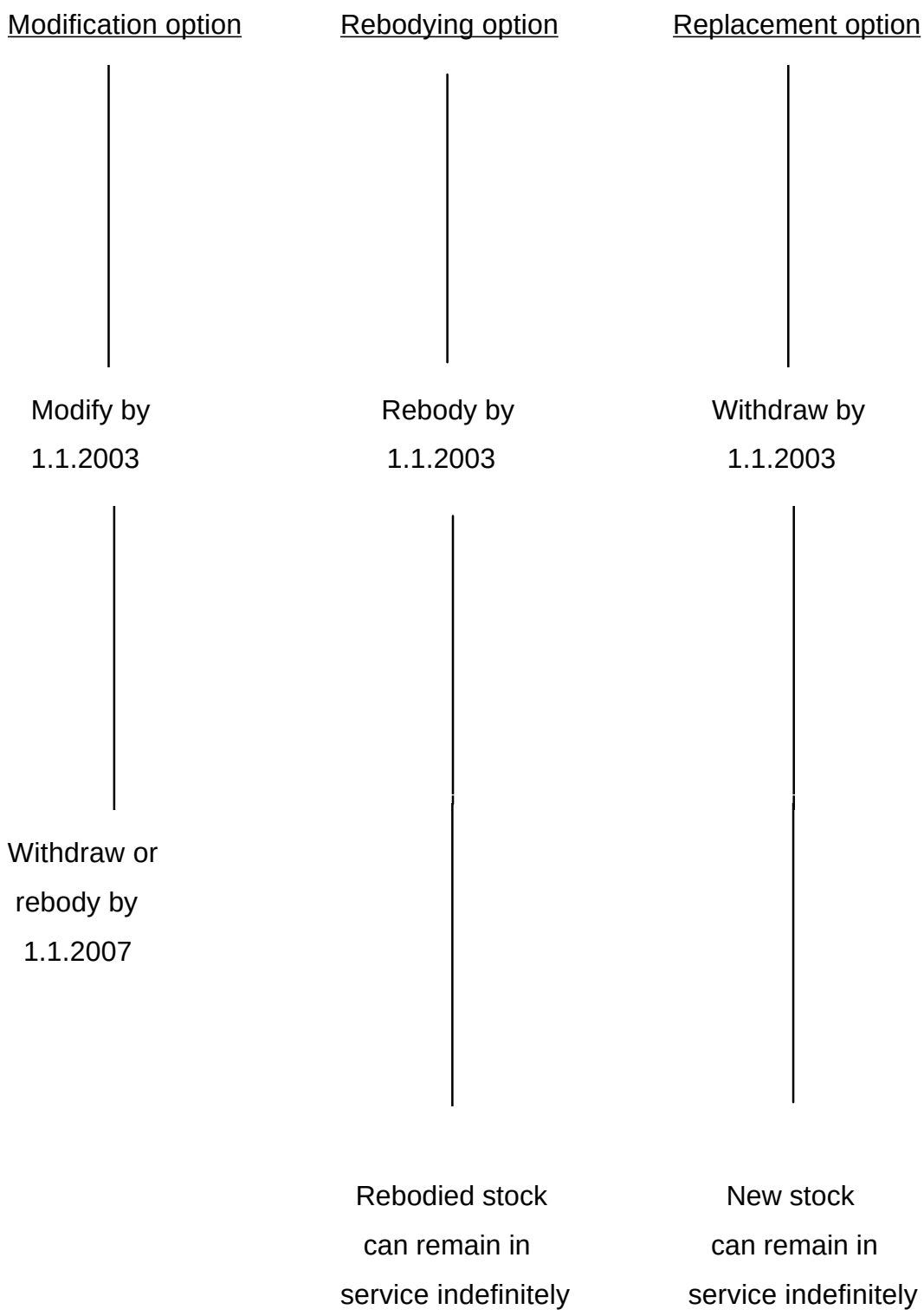
80 The approach which we propose will enable the TOCs and ROSCOs to decide whether to undertake stop-gap measures with limited life, and without some of the safety benefits of new or rebodied stock, or to advance the date of investment in new or rebodied stock. This is likely to be largely a matter of commercial judgment.

81 We are aware that this deadline may have implications for the franchising process. However it would not be right to allow that soluble difficulty to deter us from making proposals for tackle this important safety issue.

82 A small number of historical vehicles operate on the main network which pre-date the 'Mark 1' classification but which share similar crashworthiness characteristics. **We propose that our proposals should extend in principle to all passenger vehicles which share the crashworthiness characteristics of Mark 1 stock, whether or not they are actually 'Mark 1' vehicles in the sense that phrase is used in the railway industry.** This is achieved by the proposed definition of 'Mark 1 rolling stock' in draft regulation 2, which is expressed in terms of performance, rather than specific classes of vehicles.

83 A significant number of passenger vehicles are still in operation which do not share the crashworthiness characteristics of Mark 1 vehicles, but which have slam doors without central locking. The number of these vehicles is reducing, but about 100 or more may remain in service after 2003. Although not Mark 1 vehicles in the generally accepted sense, these vehicles fall within paragraph (b) of the definition of 'Mark 1 rolling stock' in the draft Regulations, and will therefore have to be withdrawn, rebodied or modified by 1 January 2003. If they are modified, only slam door modifications would be required, since the vehicles already meet the crashworthiness standard set by draft regulation 4(3)(a). **We would be interested in any views you may have on this aspect of our proposals.**

PROPOSED DEADLINES FOR ACTION ON MARK 1 ROLLING STOCK



Exclusions and exemptions

84 As for the proposed requirements on train protection, we believe that it would be reasonable to exclude railways which operate at low speed, where the risk of a major accident is smaller and the likely consequences of an accident less disastrous. **We propose therefore that any railway on which the maximum operating speed is 25 mph or less should be excluded from the proposed provisions on Mark 1 rolling stock.** This will exclude a large number of self-contained heritage railways and other minor passenger railways.

85 We are not convinced that any further exclusions would be appropriate. However, your comments are invited.

86 **We propose that, as for the proposed requirements on train protection, HSE should be able to grant exemption from the provisions on Mark 1 rolling stock, provided the exemption will not prejudice safety**. Draft regulation 5 is a standard provision which is included in most health and safety regulations. HSE will be able in appropriate cases to place conditions and/or a time limit on the exemption.

87 It is not expected that exemptions will be granted widely. However, they may appropriate in some cases, for example:

(1) some relatively low-speed railways (but where the maximum operating speed of above 25 mph), such as certain heritage or other minor railways. It is expected in most cases that the railways will need to show that their operating conditions and/or safety features compensate for the limited crashworthiness of the vehicles and the lack of central door locking. These might include such features as 'buffer cars' at the front and rear of the train to lessen the impact of a collision on passenger vehicles; and, so far as door

safety is concerned, the provision of inward-opening doors or other measures or operating characteristics which make falls from slam doors unlikely;

(2) any parts of a railway which are laid along a street or other public place (as for train protection exemptions; see paragraph 51 above).

88 It may also be appropriate to grant exemption for certain historical vehicles which operate on the main network, subject to appropriate conditions. This would, however, be subject to the overriding consideration that such exemptions should not prejudice safety. Comments on this aspect are invited.

AMENDMENTS TO RIDDOR

89 SPADs are considered 'dangerous occurrences' under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 and are required to be reported to HSE. However, paragraph 72(2) of Schedule 1 to those Regulations excludes two categories of SPAD from the reporting requirement: those where the red signal was not displayed in sufficient time for the driver to stop safely at the signal and those where automatic train protection was in operation.

90 We propose that the requirement to report SPADs should be amended so as to apply to all SPADs. All reports of SPADs potentially provide useful information to HSE, however they arise. Instances of signals being displayed shortly before a driver passes a red signal are potentially troubling, as they could indicate problems in the signalling system. Similarly, there is cause for concern where automatic train protection is fitted but for one reason or another the system has failed to stop a SPAD, particularly where the protection has failed. Draft regulation 6 has the effect of requiring all SPADs to be reported.

ECONOMIC APPRAISAL

Train protection systems

91 The overall cost of fitment of TPWS, to the extent required by our proposals, is estimated at between £99.1 million and £101.7 million. These figures are in present value terms and cover the one-off installation costs and the maintenance costs over a 30-year period, minus savings of £3.2 million a year from reduced damage to infrastructure and rolling stock and reduced operational disruption costs. Set against these costs are safety benefits of between £88.2 million and £231.0 million in present value terms over 30 years, which represent fatalities and injuries avoided (using Railtrack's own valuations of train crash fatality prevention). These safety benefits take account of our proposals for the replacement, rebodying or modification of Mark 1 rolling stock, without which they would have been slightly higher.

Mark 1 rolling stock

92 The three options, of replacing, rebodying or modifying Mark I rolling stock have been appraised separately, in each case over a 30-year period:

(1) Rebodying by 2003 appears to be the most advantageous option, taking both safety and commercial benefits into account. On present estimates, the cost of rebodying the Mark 1 fleet, compared with a 'base case' which assumes that Mark 1 stock continues unmodified until it is replaced by new stock by 2007, is between £0.4 million and £10.3 million. This takes both one-off costs and annual maintenance costs into account, and assumes that rebodied stock lasts for 15 years and is then replaced by new trains. Set against these figures are safety benefits of about £15.4 million, all gained before 2007. This

suggests that rebodying would yield an overall net saving to society of between £5.1 million and £15.0 million in present terms over the 30-year appraisal period.

(2) Replacement by 2003 by totally new trains would cost between £51.7 million and £151.9 million. This results in a net cost to society of between £36.3 million and £136.5 million after safety benefits of £15.4 million are taken into account.

(3) Modifications would involve improving crashworthiness and perhaps also eliminating slam doors. The assumption is that modified stock would be replaced by new trains by 2007. Crashworthiness modifications are estimated to cost between £6.6 million and £10.2 million in present value terms, compared with safety benefits of £4.7 million to £5.7 million. Modifications to slam doors are estimated to cost between £23.6 million and £27.9 million, compared with expected safety benefits of around £8.4 million gained. In each case the safety benefits are all gained before 2007. Both types of modification appear, therefore, to result in a net cost to society, although in the case of crashworthiness modifications this cost appears modest and could be as little as £1 million.

93 In considering the different figures attaching to each option, it should be remembered that operators will be free to decide which of the three options to choose; and that there may be commercial advantages attaching to new build which we have been unable to quantify. The figures take account of the safety benefit of TPWS that would already be in place under our proposals (ie the safety benefit quoted above has already been reduced to take account of the introduction of TPWS). They make use of Railtrack's current valuations of safety benefit, and it should be noted that in the case of fatalities resulting from falls from slam doors Railtrack's valuation is less than half the figure used for fatalities resulting from

crashes, because of the much greater public aversion to major collisions compared with slam doors accidents.

94 A copy of a full cost benefit assessment can be obtained on request from the HSE contact named on the front cover.

CONCLUSION

95 Comments are invited from all interested parties on all aspects of these proposals. We will also be happy to consider any alternative proposals which you may have to address the concerns expressed above. You may like to use the reply proforma at the end of this document, but do not feel obliged to do so. We are interested to receive any comments you wish to make.

S T A T U T O R Y I N S T R U M E N T S

1998 No.

HEALTH AND SAFETY
TRANSPORT

The Railway Safety Regulations 1998

Made - - - -	*199-*
Laid before Parliament	*199-*
Coming into force	*199-*

The Secretary of State, in exercise of the powers conferred on him by sections 15 (1), (2) (4)(a), and 82(3)(a) of, and (5)(b) and paragraph 1 (1) (a) of Schedule 3 to, the Health and Safety at Work etc. Act 1974 ("the 1974 Act") and for the purpose of giving effect without modifications to proposals submitted to him by the Health and Safety Commission under section 11 (2) (d) of the 1974 Act after the carrying out by the said Commission of consultations in accordance with section 50 (3) of that Act and of all other powers enabling him in that behalf, hereby makes the following Regulations:

Citation and commencement

1. These Regulations may be cited as the Railway Safety Regulations 1998 and shall come into force on *[date 6 months after the date of making of the Regulations]* except regulation 4 which shall come into force on [1 January 2003].

Interpretation

2. (1) In these Regulations, unless the context otherwise requires-

"approved" means approved for the time being in writing;

1974 c 37; section 15 and 50 were amended by the Employment Protection Act 1974 (c37) Schedule 15, paragraphs 6 and 16 respectively; the general purposes of Part 1 referred to in section 15 (1) were extended by section 117 of the Railways Act 1993 (c. 43).

"buffer stop" means a buffer stop at the end of a passenger platform;

"the Executive" means the Health and Safety Executive

excessive speed" in relation to-

(a) an approach to a stop signal or buffer stop, means such speed as would prevent the train from stopping at that signal or buffer stop,

(b) an approach to part of the railway where there is a speed restriction, means such speed as would prevent the restriction from being complied with when the train enters that part;

"infrastructure controller" has the meaning assigned to it by regulation 2(1) of the Railways (Safety Case) Regulations 1994**(a)**;

"line speed" means the highest of the permitted speeds on the railway concerned;

"Mark I rolling stock" means rolling stock which has-

(a) a structural underframe which provides its own longitudinal strength and has a passenger compartment created on the underframe which relies mainly on the underframe for its longitudinal strength; or

(b) hinged doors for use by passengers for boarding and alighting from the train (other than doors which have a means of centrally locking them in a closed position while the train is moving);

"permitted speed" means the maximum speed permitted on the part of the railway concerned;

"railway" has the meaning assigned to it by regulation 2(1) of the Railways (Safety Case) Regulations 1994 except that it does not mean-

(a) any part of a railway used solely for the carriage of freight;

(b) a railway where the line speed is 25 miles per hour or less;

S.I.: 1994/237.

"relevant location" means-

(a) a place where there is a stop signal the passing by a train of which could cause the train to travel into the path of another train;

(b) an approach to a stop signal referred to in sub-paragraph (a) of this definition;

(c) an approach to part of the railway where there is a speed restriction if-

(i) the permitted speed on that approach, is 60 miles per hour or more; and

(ii) in order to comply with the restriction, a train travelling at the permitted speed on that approach would need to have its speed reduced by one third or more;

(d) an approach to a buffer stop;

"speed restriction" means a permitted speed other than the line speed;

"stop signal" means a signal conveying to the driver of the train an instruction that he should stop the train except that it does not include a signal provided for shunting purposes only or a hand signal;

"train protection system" means equipment which-

(a) causes the brakes of the train to apply automatically if the train passes a stop signal or travels at an excessive speed on the approach to a stop signal, buffer stop or part of the railway where there is a speed restriction;

(b) is installed so as to operate at every relevant location;

except that where it is reasonably practicable to install it, it means equipment which automatically controls the speed of the train to ensure, so far as possible, that a stop

signal is not passed and that the permitted speed is not exceeded at any time throughout its journey.

(2) Any reference in these Regulations to a person operating a train or rolling stock is a reference to the person operating a train or rolling stock for the time being in the course of a business or other undertaking carried on by him (whether for profit or not), but it does not include a self-employed person by reason only that he himself drives or otherwise controls the movement of a train.

(3) Any reference in these Regulations to–

(a) a numbered regulation is a reference to the regulation in these Regulations so numbered, and

(b) a numbered paragraph is a reference to the paragraph so numbered in the regulation in which the reference appears.

Use of a train protection system

3 (1) No person shall operate, and no infrastructure controller shall permit the operation of, a train on a railway unless a train protection system is in service in relation to that train and railway.

(2) Until [1 January 2004] it shall be sufficient compliance with paragraph (1) if–

(a) a programme for the installation and bringing into service of a train protection system in relation to that train and railway has been approved by the Executive and is being implemented; and

(b) each part of the system which has been brought into service under that programme is maintained in service.

(3) It shall be sufficient compliance with paragraph (1) if the train is being operated on a railway-

(a) used (exclusively or not) by London Underground Limited; and

(b) in relation to which there is in service equipment which causes the brakes of the train to apply automatically if the train passes a stop signal.

(4) In any proceedings against a person for an offence for contravening paragraph (1) it shall be a defence for that person to prove that–

(a) at the relevant time the train protection system (or, where paragraph (3) is relied on, the equipment referred to therein) or a relevant part had failed, or had been taken out of service, because of an engineering fault;

(b) in the case where the fault is in equipment on the train, the train had commenced its journey before the discovery of the fault;

(c) it was not reasonably practicable to remedy the fault sooner; and
suitable measures had been taken after the discovery of the fault to mitigate the risk of trains colliding and derailing.

Prohibition of Mark I rolling stock

4 **(**1) No person shall operate, and no infrastructure controller shall permit the operation of, any Mark I rolling stock on a railway.

(2) Paragraph (1) shall not apply to rolling stock which at the relevant time is being exclusively operated other than for the carriage of fare paying passengers.

(3) Until [1 January 2007] paragraph (1) shall not apply to Mark 1 rolling stock which has been modified so as to ensure that–

(a) there are structural arrangements for preventing, in the event of a collision, the underframe of one vehicle riding over the underframe of another vehicle so modified (whether or not the other vehicle is part of the same train); and

(b) there are no hinged doors for use by passengers for boarding and alighting from the train (other than doors which have means of centrally locking them in the closed position while the train is moving).

Exemption certificates

5 (1) Subject to paragraph (2) below, the Executive may, by certificate in writing, exempt any person or class of persons, railway or class of railways, train or rolling stock, or class of train or rolling stock from any prohibition imposed by these Regulations any such exemption may be granted subject to conditions and to a limit of time and may be revoked by a certificate in writing at any time.

(2) The Executive shall not grant any such exemption unless, having regard to the circumstances of the case, and in particular to–

(a) the conditions, if any which it proposes to attach to the exemption; and

(b) any other requirements imposed by or under any enactment which apply to the case;

it is satisfied that the health and safety of persons who we likely to be affected by the exemption will not be prejudiced in consequence of it.

Amendments

6 In paragraph 72 of Part IV of Schedule 2 to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 in sub-paragraph (1) the words ....."unless" to the end of the sub-paragraph, and sub-paragraph (2), shall be deleted.

[1998] Parliamentary Under Secretary of State,
Department of the Environment,
Transport and the Regions.

S.I. 1995/3163.

APPENDIX 2

GLOSSARY OF ACRONYMS

ATC	Automatic Train Control
ATP	Automatic Train Protection
AWS	Automatic Warning System
DRA	Driver Reminder Appliance
HMRI	HM Railway Inspectorate
HSC	Health and Safety Commission
HSE	Health and Safety Executive
HSWA	Health and Safety at Work Act
ROSCO	Rolling Stock Leasing Company
SPAD	Signal Passed at Danger
TBS	Transmission Based Signalling
TOC	Train Operating Company
TPWS	Train Protection and Warning System

Proposed Regulations on train protection systems and Mark 1 rolling stock

Reply proforma

We would like you to tell us what you think about our proposals. This reply form may make this easier, but please feel free to say more.

Name of organisation, company or individual				
	What are your views?	**Agree**	**Disagree**	**Comments**
1	A requirement should be set in Regulations requiring the installation of train protection systems.			
2	The train protection system should apply the brakes if the train travels (a) past a stop signal (b) at excessive speed on the approach to a stop signal or buffer stop (c) at excessive speed on the approach to a speed restriction			
3	The locations to be covered are signals, and the approach to them, where if a train passed the signal at red it could travel into the path of another train; the approach to buffer stops; and the approach to speed restrictions which involve reducing speed from at least 60 mph to a speed at least one-third lower.			
4	All trains (both passenger and freight) operating at these locations should be fitted with train protection equipment.			
5	Where reasonably practicable, a train protection system should be installed which automatically controls the speed of the train to ensure that it does not pass a stop signal or exceed the permitted speed at any time.			
6	Unless completed within 6 months of the Regulations being made, the installation of a train protection system should be in accordance with a programme approved by HSE.			
7	There should be a deadline of 1 January 2004 for the full introduction of train protection systems.			

	What are your views?	Agree	Disagree	Comments
8	Trains should be permitted to operate if the train protection system is faulty, but the fault should be remedied as soon as reasonably practicable and measures should be to mitigate the risk of collision or derailment. If the fault is in the train's equipment, the train should only be allowed to finish a journey already started.			
9	Railways used by London Underground Ltd which have a 'train stop' system, railways operating at 25mph or less, and freight-only lines should be excluded.			
10	In principle, Mark 1 rolling stock for passenger use should be prohibited by a set deadline, unless it is completely rebodied to modern standards.			
11	The deadline for the withdrawal of Mark 1 rolling stock should be 1 January 2003.			
12	However, Mark 1 rolling stock which is modified (by 1 January 2003) to prevent vehicles riding over each other in a collision should be allowed to operate until 1 January 2007.			
13	Do you think that Mark 1 rolling stock should also be required to be modified (by 1 January 2003) to incorporate central door locking? If so, should this requirement apply to all passenger stock which has slam doors without central locking, whether or not it is 'Mark 1' stock?			
14	The provisions on Mark 1 rolling stock should also apply to any other rolling stock which has little longitudinal strength except for the underframe, eg heritage rolling stock.			
15	HSE should be able to issue exemptions if health and safety will not be prejudiced.			
16	Do you agree with the economic appraisal?			

	What are your views?	Agree	Disagree	Comments
17	Do you have any alternative proposals for dealing with the concerns expressed in this document?			
18	Is there anything else you would like to add?			

Thank you for completing this reply form. Please send it to:

Michael Madeley, Railway Policy, 5th Floor SW,
Health and Safety Executive,
Rose Court, 2 Southwark Bridge, London SE1 9HS

CONSULTATIVE DOCUMENT

The full text of this and other Consultative Documents can be viewed and downloaded from the Health and Safety Executive web site on the internet:

www.open.gov.uk/hse/condocs/

Consultative Documents are available from:
HSE Books, PO Box 1999
Sudbury, Suffolk CO10 6FS
Tel: 01787 881165
Fax: 01787 313995

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