

LANCASTER & MORECAMBE MODEL ENGINEERING SOCIETY Ltd

RISK ASSESSMENT 2011

Based on HSE Guideline - HSG 216
PASSENGER – CARRYING MINIATURE RAILWAYS
(CIRCA 2001)

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RISK ASSESSMENT 2011

Introduction to the Assessment

The Cinderbarrow Miniature Railway was constructed on a brown field site belonging to Lancashire County Council (LCC) between years 1996 and 1999 and became operational in 1998. The land occupied by the miniature railway is leased from the LCC. The Health & Safety Executive Guidelines issued by HMRI in 1992 in force up to the date of operation of Cinderbarrow was "TN3 - Guidelines on the Application of the HSW Act 1974 to Miniature Railways". In 2001, after Cinderbarrow became operational, the Guidelines in TN3 which were largely prescriptive were replaced by HSE Guidance on Safe Practice HSG216¹ which is wholly a risk management/assessment based document. Paragraph 12 of HSG216 states that it is not retrospective however paragraph 5 recommends the new guidance to clubs and societies.

In addition to HSG216 there is a companion document on the internet dated 2000 which is Entertainment Sheet 12 issued by the HSE entitled "Safe Operation of Miniature Railways, Traction Engines and Road Vehicles". This document is cross referenced by HSG216 and indicates that its publication was necessary because it would be too stringent to apply the Fairgrounds Guidance HSG175 to private clubs and societies. This document contains guidance on the methodology for risk assessment and is used in conjunction with consideration of HSG216.

The Cinderbarrow miniature railway has operated every year up to the date of the first formal issue of this Risk Assessment document since first operation of the railway without accident or incident. However there has been a general development of the railway system in that time and it is considered appropriate by the LMMES Committee that in the first instance a miniature railway installation risk assessment is carried out using the HSG216 guidelines intended for new miniature railways installations as a compliance review process for Cinderbarrow, followed in the second instance by an operational risk assessment format superseding the current annual risk assessment. This Risk Assessment process can be revisited as necessary when changes are made to the railway installation or other causes arise.

The current edition of the HSG216 (2001) is out of print and is, according to HSE Glasgow, undergoing a revision process. A date for a new edition is not available. The document copy used for this Risk Assessment was provided in PDF format by HSE Glasgow in March 2010 and is stored in the LMMES library together with this Risk Assessment document.

This Risk Assessment process is in 2 parts:

- Part 1: Miniature Railway Installation Compliance Assessment and Review in respect of HSG216.
- Part 2: Annual Operational Risk Assessment.

¹ Note: Full title of HSG216 is "Passenger-carrying miniature railways – Guidance on safe practice" referred to hereon as PCMR

Part 1

Miniature Railway Installation Compliance Assessment and Review in respect of HSG216.

1A Outline Description of the Miniature Railway Installation

The railway installation comprises two parallel 1250 ft (approx) closed loop ground level circuits where the outer track and inner track are designed to operate in opposite dedicated directions. The track caters for three gauges, 7¼, 5 and 3 ½ inches. The train movements on both tracks are controlled by semaphore style signals operated from a manned signal box. Additionally, to avoid congestion in the area of the stations, track points and sidings, there are automatic ground level signals at the halfway point (approx) for each track to provide distance separation between a train approaching the station and other following trains on the same track circuit. The signal box has a direct view of the station areas and approaching inner track trains and additionally there is a CCTV view of trains approaching on the outer track circuit. Each track circuit has a loop line to a ground level station and each has its own sidings. Each track circuit has a maximum gradient section of about 1:50 and the tightest curve is about 50 feet radius. There is an on-off access spur (to the front of the Members Building) from the traverser/steaming bays direct to the inner track circuit, which is used only to manoeuvre locos and their driving trucks to and from the steaming bay. This spur is the normal access route between the steaming bays and the track system and has a radius of about 30 feet. There is an alternative access spur (to the rear of the Members Building) connecting the steaming bays to the inner track system sidings area. This spur is intended to be used as the off-route in times when the track is busy, such as on open days, in order to relieve potential congestion at the normal access spur which on such occasions is dedicated as the on-route.

There are track points to connect the inner and outer tracks as well as connecting the inner track to the steaming bays. The ground level of the steaming bays (the same level as the Members car park adjacent to the inner track circuit) is about 30 inches below the level of the main track circuits and stations. As a consequence of the difference in levels the seven steaming bays are elevated about 30 inches above the ground and this provides for ash removal and a comfortable position from which to inspect and prepare locomotives. Each steaming bay is provided with compressed air, a 12 volt dc power outlet and a town's water connection. Locomotives (and driving trucks et al) are transferred from their road transport vehicle to a hydraulic table by a means provided by the owner of the locomotive. A traverser (a tracked manual mobile set of rails that are also centre pivoted to permit change of facing direction of the loco) is used to manoeuvre a loco et al from the hydraulic table to any of the steaming bays and/or directly to the track spurs that connects to the inner track system. There is a spur from the inner track to the carriage shed. The inner and outer track circuits are connected by various signal controlled points that are operated under supervision to manoeuvre a locomotive/train on-off the steaming bays across the inner track to the outer track circuit.

Within the closed loop track circuits there is a public picnic area managed by the LCC which is fenced off completely from the railway. Access to the private gated Society car park and the public car park/picnic area is via a vehicle and pedestrian access way that crosses the railway tracks adjacent to the signal box location. At a diametrically opposite location across the picnic area to this crossing there is a pedestrian only crossing place which is gated. The land area outside the closed loops is farmland and light woodland and is also appropriately fenced.

1B Operating Policy

From the inception of the Cinderbarrow railway installation the design of the installation and its operation has the safety of Members, guests and the invited public as a main theme. This policy has proved to be effective by the operating record since the installation was commissioned.

The track facility is for use by LMMES Members and authorised guests (with Members in attendance) for leisure purposes and this may or may not include the pulling of passenger carriages carrying members and/or guests.

The Operating Superintendent (O.S.) roams the station areas and controls the operation of the track and trains by radio communication with the signal box and platform station master(s) and the O.S. also

determines the bringing on and taking off of trains to the steaming bays and in/out of sidings and cross over between the two circuits.

On occasions when the public are invited to take rides on the trains they do so for no fee but are asked to consider a donation for the society. Public access to the track is strictly controlled by gated access to and from the platforms on and off the fenced in railway installation.

The recommended train speed is up to a fast walking pace and a circuit without stops takes about 3 to 4 minutes. Each train carrying public passengers has a guard on the last carriage that monitors the behaviour of passengers and confirms to the driver that a train is ready to depart a station. The guard carries a whistle and a red flag.

On each occasion that the track is used for the first time in a day the track is walked and inspected to see that the ballast is correctly laid, that there has been no damage by wildlife, and no vandalism has taken place. On each occasion that a locomotive enters a track circuit the driver makes an unloaded run of the train and carriages to check both the acceptability of the track for the locomotive and vice versa.

Each Tuesday throughout the year is a dedicated work-day where volunteer-Members maintain, improve and inspect the track system. A Maintenance Works Log Book provides entries for identified on-going work required and records work completed and any major works are referred for Committee assessment and scope. This Log Book is open for inspection and updating on a sign-in desk in the Society Members Building.

An Incident Book is kept on view at the sign-in desk.

The safe operation of the railway has been ensured by proven written down operating protocols issued to Members and Guests and these cover the following topics:

- Level Crossing Duties
- Guard's Duties
- Driving Skills

These protocols and safe practices are supported by a system of approvals whereby a member willing to carry out a task/activity that falls into the categories listed below is certified by a Nominated Senior LMMES Member by an endorsement on the Membership Card confirming that the said member has shown safe and proficient performance in that particular category following a period of monitoring:

- Level Crossing Keeper
- Guard
- Driver
- Station Master
- Shed Master (inc Traverser)
- Signaller
- Operating Superintendent

1C Boiler Safety

The Society operates a Boiler Hydraulic Testing and Boiler Steam Testing scheme managed by three LMMES Members approved at the AGM and qualified to carry out these tests and to issue certificates in accordance with the Northern Association of Model Engineers (NAME) procedures as laid down in the Written Scheme of Work (generally known as the Blue Book) and associated documentary record keeping.

Visiting locomotives or other steam raising equipment must have and declare current hydraulic and steam test certificates (not copies) in accordance with NAME or Southern Federation of Model Engineers procedures before they can be permitted to have a fire in the grate or to otherwise pressurise the boiler and steam system on LMMES premises.

1D Insurance

The Society maintains appropriate insurance cover as recommended by, and obtained through, the Northern Association of Model Engineers (NAME). The insurance is underwritten by Royal Sun Alliance.

Part 1E: Miniature Railway Installation Compliance Assessment and Review in Respect of HSG 216

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
10	Implementation: Tracks crossing a public highway.	<i>HSE's Railway Inspectors will inspect those miniature railways below 350 mm gauge which operate under statutory provisions because they cross a public highway or have other works authorised by a private Act of Parliament or an order under the Light Railway Act 1896. They will advise whether this guidance or the "Railway safety principles and guidance (RSPG)" need to be applied.</i> <i>TN3 wording on this topic is shown at the end of the table. See also Ref 67 and 68.</i>	Refer to PCMR Ref 67 and 68
12	Implementation: Applicability of HSG 216.	<i>Any new miniature railways that are constructed should follow this guidance and it is also recommended to operators of existing miniature railways. There is no need to apply this guidance retrospectively but in cases where there are wide variances, or an accident has occurred, you need to consider improving safety by adopting it.</i>	This compliance review risk assessment is a voluntary compliance review of HSG216
14	Risk Assessment:	<i>Miniature railway operators need to introduce procedures to identify hazards and assess risks to determine what control measures should be adopted to avoid risk or reduce it to acceptable levels.</i>	This compliance review risk assessment is a voluntary compliance review of HSG216
17	Risk Assessment:	<i>For an existing miniature railway, a risk assessment needs to be carried out for the ongoing infrastructure and operation.</i>	This compliance review risk assessment is a voluntary compliance review of HSG216
Step 4	Risk Assessment:	<i>You can keep paper or electronic records but make sure these are easily accessible.</i>	Paper records backed up by an electronic copy are retained.
20	Track	<i>You need to ensure the stability of the gauge, line and level of the track under all conditions of load and temperature.</i>	The gauge is maintained by slotted sleepers and hydraulically pressed-in-place, and track line and level is subjected to ongoing maintenance and weekly inspections during the running season.
21	Track	<i>Drainage needs to be provided if required.</i>	The site of the track is self draining due to elevation above local terrain.
24	Track	<i>Sleepers immediately on each side of a rail joint should be pitched so that they minimise the risk of dipped joints.</i>	Rail joints are minimised and the rigidity and track support have proven effective.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
25	Track	<i>The rail should be of a suitable weight and profile for the maximum axle loadings and speed of the trains on the railway</i>	Rail is 10 x 20 black bar on edge hydraulically pressed into slots in Keruin sleepers and this methodology has proven effective.
26	Track	<i>The fixings attaching the rails to the sleepers or support should be able to hold the rails to gauge and withstand vibration and any temperature. The fixings used to secure the ends of the rails should hold them in vertical and horizontal alignment and, where appropriate, accommodate expansion and contraction.</i>	Rail is steel bar on edge hydraulically pressed into slots in Keruin sleepers together with periodic welded spacer bars. This design/methodology has proven effective over 12 years of operation with only minimum maintenance being necessary.
27	Track	<i>When curved track is required, the radius should be as large as is possible, with transition both before and after the curve. The minimum acceptable radius of curved track depends on the gauge, type of stock used and the operating speeds.</i>	Main track loops and points have a minimum radius of about 50 feet with gauge widening in some areas in consideration of the recommendations in TN3
28	Track	<i>On curved track it may be advisable to provide super-elevation...</i>	Provided where required.
30	Track	<i>Ensure that the track does not move out of alignment when there are changes in temperature.</i>	Expansion joints are fitted to the main track circuits at locations that have been determined from experience of track movements in hot weather.
35	Track	<i>The ballast should be of a hard, crushed, angular material.... Shingle or crushed beach stones do not provide sufficient resistance and are not recommended for use.</i>	Ballast is crushed limestone and granite and has proven effective over the years since first operation
36	Track	<i>The finished level of all of the ballast should be level with the top surface of the sleepers.</i>	Ballast is maintained at top of sleeper height by regular attention.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
37	Track	<i>Where the layout requires facing points they need to be kept to a minimum and have some form of route indication. There needs to be a means of establishing that the switchblades are fully 'home' in the correct direction for the signalling.</i>	Points and signals are interlocked. Operation over 12 years has shown the system to be reliable.
38	Track	<i>The gauge of the track should be maintained through any points in either direction. Check rails should be provided to ensure that the wheels are unable to take other than the intended direction of travel. The moving switchblades should be manufactured to fit against the appropriate fixed rail and may need to be recessed accordingly to ensure they allow the wheels to pass in the correct direction.</i>	
39	Track	<i>The clearances of flangeways and crossings need to be compatible with the profile of the wheels in use.</i>	This consideration is accounted for in the Layout.
40	Track	<i>At remote locations a system using spring-loaded points or weighted levers may need to be installed at turning or passing loops. You need to indicate the direction in which the points are set. Note: In all cases the driver is responsible for ensuring the points are set for the correct route and the switchblades are fully home before passing over them.</i>	The consideration is not applicable to the Cinderbarrow track layout.
41	Track	<i>Portable track (consisting of pre-formed track panels complete with rails, fixings and sleepers) needs to be erected so that the track is level. Any packing necessary to achieve this levelling should be of suitable size and material to ensure that it can bear the loads imposed upon the tracks andetc.</i>	Portable track is not used at Cinderbarrow.
44	Infrastructure Clearances	<i>Wherever possible, the clearances should ensure that passengers cannot reach out and strike any passing trains, structure or other object (including trees). Where this is not possible, warning indications need to be displayed.</i>	The track layout takes account of the recommendations in TN3
45	Infrastructure Clearances	<i>All structures and earthworks should be designed to ensure that there is a clearance of adequate width on each side of the widest stock used on the line to allow for passengers to get off trains in an emergency.</i>	
46	Infrastructure Earthworks	<i>Earthworks (usually embankments and cuttings) need to be designed and constructed with suitable materials to provide adequate support and stability.</i>	The embankment of the track has proved stable over the years since first operation.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
47	Infrastructure Earthworks	<i>Any earthworks need to be graded to provide long-term stability while allowing the use of mechanical machinery for grass cutting etc and safe access for maintenance. Precautions may be required in steep-sided cuttings to ensure materials do not fall onto the line.</i>	Adequate clearance is provided for grass cutting and passenger egress in an emergency. Steep sided cuttings have been avoided in the track route design.
48	Bridges, Tunnels & Viaducts	<i>Bridges and viaducts should be strong enough to bear the weight of the trains. If walkways and handrails are provided on bridges and viaducts, they need to be strong enough to bear the weight of the vehicles on them and also the likely number of passengers who may use them.</i>	There are no bridges, tunnels or viaducts.
49	Bridges, Tunnels & Viaducts	<i>Tunnels and bridges should be designed with adequate width and headroom to ensure safety in cases where it is necessary for passengers to get off the train.</i>	There are no bridges, tunnels or viaducts for passenger traffic.
50	Fencing	<i>Consider fencing off areas where the public are likely to congregate, especially around station areas where there will be flows of pedestrians.</i>	Public areas are fenced from the track and passenger flow management barriers are provided.
51	Fencing	<i>Unfenced track is acceptable provided drivers have a clear and unobstructed view of the areas on both sides of the track. Where this is not the case, consider providing fencing or regulating train speeds.</i>	The entire circuit is fenced on both sides of the track.
52	Stations	<i>Stations should be designed with straight platforms where practicable but in all cases there needs to be good visibility for the train crew of the full length of the train. They should be on as level gradient as is possible. Any buildings or canopies need to be built and located so as not to interfere with the driver's line of sight.</i>	Both platforms at Cinderbarrow comply with these objectives.
53	Stations	<i>Platforms should be long enough to accommodate the longest train operated and wide enough for the greatest number of passengers likely to use them at any one time. Platform buildings or other obstructions should be designed to avoid undue restrictions to the movement of passengers. Where the layout permits, provide separate loading and unloading platforms or a barrier system to prevent the platform becoming overcrowded.</i>	Both platforms at Cinderbarrow comply with these objectives.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
54	Stations	<i>The level of the platform should allow ease of access to the rolling stock in use and avoid the possibility of people trapping their legs or feet. The platform surface needs to be of a suitable material to minimise the risk of slips or trips and have a gentle slope away from the edge of the platform to ensure objects left unattended do not roll onto the track. The edges of the platform surface should be marked with a white line.</i>	Both platforms at Cinderbarrow comply with these objectives. The edges are yellow lined.
55	Stations	<i>The public areas of stations should be designed to allow the unimpeded movement of passengers when those areas are at their busiest. Where passenger numbers are higher than usual, there may be a need to introduce additional measures for crowd control.</i>	Both platforms at Cinderbarrow comply with these objectives and this has been demonstrated over the years since first operation.
56	Stations	<i>All floors, steps, treads etc should be designed with due consideration to the environmental conditions and should minimise the risks of slipping and tripping. All columns, posts, seats and other obstructions in the public areas should be clearly visible.</i>	Both platforms at Cinderbarrow comply with these objectives.
57	Signalling	<i>Any miniature railway that has more than one train in operation needs a system to prevent conflicting movements. The system of control needs to be as simple as possible, while ensuring the safe operation of the railway.</i>	When more than one train is running on a track circuit and the public are passengers the signal box must be manned. There is a signalling system to prevent conflicting movements of trains.
58	Signalling	<i>The primary function of any control or signalling system is to:</i> <ul style="list-style-type: none"> • <i>prevent collisions between trains;</i> • <i>give indications of the route that has been set;</i> • <i>control access of trains to a section of the line; and</i> • <i>protect level crossings.</i> 	
59	Signalling	<i>Where the safety of operation of a miniature railway can be ensured by a system of driving on a line-of-sight basis, no signalling system may be required. Train speeds need to be regulated so that the driver can stop within line of sight at all times.</i>	The tracks at Cinderbarrow comply with these objectives.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
61	Signalling	<i>There are various types of suitable control systems in addition to full signalling. These include one engine in-use, tokens giving authority over specific areas of the line and two-way radio communication. There may be cases where it is advisable to use a mixture of systems, in which case you need to ensure that the basic functions listed earlier are ensured. The choice of signalling system needs to be supported by an appropriate risk assessment.</i>	The tracks at Cinderbarrow comply with these objectives.
62	Signalling	<i>The signals need to be spaced at appropriate intervals for the frequency, speed and braking performance of all trains using the line. Signals may include visual indications passed to the train crew by means of coloured lights, semaphore signals, fixed markers, coloured flags or similar manual operations. Where these are to be used during the hours of darkness or reduced levels of visibility, they need to have supporting lighted indications.</i>	The tracks at Cinderbarrow comply with these objectives.
63	Signalling	<i>Signal aspects need to be visible for an adequate length of time on the approach to the signal and when a train has stopped at the signal. Where an adequate sighting cannot be obtained, another signal, which repeats the main one, may be provided on the approach.</i>	The tracks at Cinderbarrow comply with these objectives.
64	Signalling	<i>Any signalling system provided should ensure that, in case of failure, all signals return to danger. Points should remain in the same position as they were at the time of the failure.</i>	The tracks at Cinderbarrow comply with these objectives.
67	Level Crossings	<i>Where there is a level crossing of a road which provides access to public vehicles, you need to ensure that the requirements of the Level Crossings Act 1983 (as amended by the Level Crossings Regulations 1997) are complied with. You should consult HSE's Railway Inspectors in the early stages of planning, as they are the authority that will give ultimate approval. The requirements are contained in the Railway safety principles and guidance, Part 2 Section E 'Level crossings' (available from HSE Books).</i>	This topic is the subject of a separate Sub-Committee review process.
68	Level Crossings	<i>Where a level crossing is authorised, you need to ensure adequate co-operation between the railway and the person responsible for the road, paying particular attention to the visibility for both road and rail traffic.</i>	

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
69	Loco & Stock	<p><i>Locomotives need to be:</i></p> <ul style="list-style-type: none"> • <i>constructed to provide safety and reliability in service;</i> • <i>provided with a system to give an audible warning of approach; and</i> • <i>provided with a system to ensure safety when the locomotive is left unattended or stabled.</i> 	<p>Safety has been demonstrated over the years since first operation.</p> <p>A steam or wind operated whistle is provided for each train.</p>
72	Boiler Systems	<p><i>The Regulations require that boilers are properly designed and constructed from suitable materials. They also require that examinations are carried out in accordance with a written scheme of examination detailing the various items to be included and the frequency of examinations.</i></p>	<p>The LMMES is a member of the Northern Association of Model Engineers (NAME) and follows the NAME Code of Practice for the Examination & Testing of Miniature Steam Boilers.</p>
73	Boiler Systems	<p><i>The Regulations require inspections to be carried out by a person who is competent to examine that particular piece of equipment. They also require that adequate records of the examinations are kept. The maximum intervals between examinations should be specified and each report should indicate the latest date of the next examination.</i></p>	<p>The LMMES is a member of the Northern Association of Model Engineers (NAME) and follows the NAME Code of Practice for the Examination & Testing of Miniature Steam Boilers.</p>
74	Boiler Systems	<p><i>When a boiler is to be used other than in the course of a business by a member of a club or society or by a private individual, the examination arrangements provided by one of the miniature associations or federations may be used. These procedures need to cover aspects provided for in PSSR. Boilers having certificates issued under these arrangements may still be acceptable as visitors on lines operating as a business but this will depend on the insurance cover and management of the particular railway concerned.</i></p>	<p>The LMMES is a member of the Northern Association of Model Engineers (NAME) and follows the NAME Code of Practice for the Examination & Testing of Miniature Steam Boilers, and, carries Insurance for train operations through NAME which is carried by Royal Sun Alliance.</p>
75	Rolling Stock	<p><i>Passenger-carrying vehicles need to be stable, with enough protection to ensure that they minimise the risk of people being able to move their feet into a position of danger, trap any of their limbs or strike lineside objects. Arrangements should also be in place to make it impossible for a passenger to trap a limb between the vehicles.</i></p>	<p>The track is entirely ground level and passenger carriages are of 2 types, sit-in and sit-astride, and both types include foot troughs to ensure the lower body is contained within the carriages. The gap between carriages is large and maintained by rigid bar couplings which prevent limbs becoming trapped. Verbal precautions are also given before each train is permitted to leave a station.</p>

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
76	Rolling Stock	<i>Rolling stock should have adequate suspension, buffers and couplings to ensure that it can be operated safely.</i>	The safety and stability of the rolling stock has been proven adequate in the years since first operation.
77	Couplings	<i>The design of any coupling should be adequate for the purpose and ensure that the rolling stock is securely coupled in all circumstances, eg when propelling or in a derailment. You need to prevent over-riding in the event of a collision. There are a number of different coupling systems which may be appropriate including three-link with side buffers, bars secured with pins and combined central buffer/coupling. The use of scale couplings of the three-link, instanter or screw type are not recommended as in scale form they have insufficient strength to ensure safety in all circumstances.</i>	When hauling passengers the carriages are rigidly connected with bar and pin links.
78	Couplings	<i>Safety chains should be considered between the locomotive and tender or driving truck. Their use between other vehicles in a train could prevent a division even if the main coupling fails.</i>	When hauling passengers the carriages are rigidly connected with bar and pin links.
79	Couplings	<i>On miniature railways where propelling of trains takes place, you need to consider ensuring the lateral stability of the vehicles within the train during this operation.</i>	Propelling operations are not permitted when public passenger hauling.
80	Brakes	<i>A braking system is required which is adequate for the loaded train weight, normal speed of running, gradients and operating methods. This system needs to be capable of bringing the train to a stop in normal and emergency conditions, in a safe distance.</i>	There is an ongoing project to have all trains fully braked. All trains for public passenger hauling are braked.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
81	Brakes	<i>If the braking system is of a continuous type, operating on the coaches and locomotives, it should be capable of being worked from the locomotive by the driver, in emergency by the guard (if carried) or be applied automatically in the event of a division of the train. Brakes used as the normal 'service brake' should be capable of being applied gradually to stop the train smoothly.</i>	Vacuum braked coaches comply with this intent.
82	Brakes	<i>When the brakes have been applied, they should remain on in order to hold the vehicle(s) for an adequate length of time.</i>	
83	Brakes	<i>Lightweight trains may be operated with a non-automatic brake of adequate power. Where small locomotives are used, it is common to provide a braked 'driving truck', rather than rely on the locomotive brakes.</i>	
84	Brakes	<i>If locomotives are using one of the various propulsion systems involving a chain, gear or hydraulic drive, the transmission system cannot be relied upon to provide an adequate train braking system. The severance of any chain or gear drive to the wheels would lead to the driver being unable to control the speed of the train. The brakes need to act directly onto the wheels or axle-mounted discs and not be of the sled or skid type that operates on the rails in view of the danger of this type of system lifting the vehicles off the track.</i>	Brakes act directly on the wheels.
85	Wheels	<i>The wheels on any wheelset and the suspension of a vehicle need to be compatible with the rail profile, track geometry, infrastructure and vehicle or train speed.</i>	The track and Society vehicles have proven compatible.
86	Operation	<i>Any miniature railway, even a simple operation, needs to have operating rules to provide for safe operation in both normal and emergency situations. The rules should be appropriate to the railway, easy to understand by all staff and not too complex.</i>	Written guidance is provided for: <ul style="list-style-type: none"> ➤ Level Crossing Duties ➤ Guard Duties ➤ Driving Skills
87	Operation	<i>Miniature railways need to ensure that all staff involved are competent and have declared their medical and physical fitness for the duties they are to perform.</i>	Members joining the Society and an ongoing general observation by Members takes place towards this objective.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
89	Operation	<i>Miniature railways need to prepare procedures to cover safe operation, and in particular undertake a risk assessment for their operations. The attention to detail in the risk assessment needs to be commensurate with the scale of operations. Separate risk assessments may be required for operations of fixed and portable tracks. The results of the risk assessments and any control measures introduced to reduce risks should be recorded.</i>	This Risk Assessment document has been prepared as described in the "Introduction".
90	Operation	<i>Where people below the age of 18 are involved in any activities on a miniature railway, you need to ensure that a risk assessment has been carried out which takes into consideration the inexperience and reduced attention span of the individuals concerned. This requirement is in order to comply with the legislation in connection with young persons undertaking work and, provided they have been assessed as competent, does not preclude them from any particular activity (such as driving).</i>	The Society Rules do not permit direct involvement in the operation of trains by people below the age of 18 years.
92	Management of Operations	<i>It is recommended that for each running session you appoint a person in charge who has the authority to ensure that all procedures laid down are followed.</i>	An Operating Superintendent is nominated at the start of each running session and may be changed during the day. The nominated person is from a named list of experienced LMMES members.
93	Management of Operations	<i>The person in charge should have details of the emergency plans and a list of emergency contact telephone numbers. All of the staff involved should be made aware of the procedures in case of emergency. On all occasions that the railway operates, a record should be kept of the date, locomotives run on the track and staff in attendance.</i>	LMMES comply with this requirement.
94	Recording & Reporting Incidents	<i>A record needs to be maintained giving details of all incidents and near misses that happen during any operating session. Full details of the occurrence and the people involved, together with any witnesses, should be recorded. This record needs to be completed at the time of the event in order to ensure that full details are available in the event of their being required at a later date. The form shown in Appendix 2 provides some indication of the information that may need to be recorded.</i>	An Incident Diary is maintained on the sign-in desk.
98	Trains	<i>When trains are operating with more than one passenger-carrying vehicle, you need to consider providing a guard to ride on the train.</i>	Guards are provided on all trains regardless of the number of trains operating.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
99	Trains	<i>You need to consider the load of trains for various sizes of locomotives, taking into account the speed, braking and hauling capabilities. These should be reviewed if there are any changes in the operational circumstances. The main changes to be considered would be a reduction in the braking capacity or a change in the rail conditions (ie from dry to wet) reducing adhesion.</i>	The Operating Superintendent approves and monitors train configuration and operating circumstances and the Station Master manages the safe loading of a train.
100	Trains	<i>In darkness or reduced visibility, the train needs to carry a lighted red tail-lamp on the rear of the last vehicle. In other conditions it is recommended that some form of red indicator marks the rear of the train.</i>	Public passenger hauling is not permitted in hours of darkness.
103	Servicing of Locos	<i>The operations involved with the preparation and disposal of locomotives, such as using a blower to raise steam, dropping the fire and blowing down boilers, should be carried out carefully, in areas away from the public. Care needs to be taken to avoid the risk of injury to other staff and to avoid any spread of fire.</i>	Six fixed and elevated steaming bays arranged in a parallel manner with a 2-man space between each track provides a comfortable working area. Public are not permitted into the steaming bay areas.
104	Servicing of Locos	<i>Refuelling of diesel, petrol or gas-fired locomotives should be carried out well away from public areas and places where steam locomotives are being prepared or ash disposed of. Care should also be taken when charging or changing batteries in case any sparking could create hazardous conditions.</i>	Coal fired locomotives are fuelled in the steaming bays and at points around the track. The Society's petrol fuelled locomotive is fuelled in sidings away from the public and other hot locomotives and away battery powered locomotives. Gas fired locomotives are uncommon at LMMES and are treated as for petrol fuelled locomotives.
105	Pre Run Inspections	<i>A visual inspection of the track and adjacent areas should be made before starting any running session to ensure that it is safe for use. The person making this inspection needs to make any entry to this effect in the record of the running session and sign it.</i>	The tracks are walked before each days use of the circuits and the result is given verbally to the Operating Superintendent and is written into the Days Log at the sign in desk.
106	Pre Run Inspections	<i>A visual inspection of any locomotive should be made before it is used. In the case of a steam locomotive, a further inspection needs to be made during steam raising to look out for any leaks or failures. This latter inspection needs to include checking the water feeds to the boiler, blowing down the water gauges and observing the correct action of the safety valve(s). In all cases, the inspection should include the testing of the audible warning device and any braking system. Any defects found in these items should be remedied before the locomotive is used.</i>	Individual engine driver or owner tests and exercises the loco and driving truck (where appropriate) prior to entering the circuit under control of the Operating Superintendent. Each locomotive with its train makes an unloaded circuit of the track to test the train.

PCMR Ref	Guideline Topic	Guideline Extract	LMMES Status
107	Pre Run Inspections	<i>All items of rolling stock should be inspected before being used in any running session to ensure that they are safe for use.</i>	Rolling stock is moved/wheeled from the carriage shed to the nominated inner or outer track circuit and is checked at this time for serviceability.
110	Maintenance	<i>In order to ensure that any railway continues to remain serviceable, all items of trackwork, locomotives, rolling stock and buildings etc should receive adequate maintenance. The frequency and detail of the various examinations will vary according to the complexity of the individual piece of equipment and how much it is used.</i>	Each Tuesday throughout the year is a dedicated workday where volunteer members maintain, improve and inspect the track system and rolling stock. A Maintenance Works Log Book provides entries for identified ongoing works required and records works completed and any major works that are identified are referred to Committee for assessment and scope decisions. The Log Book is open for inspection and entries and updating on the sign-in desk.
111	Maintenance	<p><i>Any system of maintenance should ensure the following:</i></p> <ul style="list-style-type: none"> <i>• Regular maintenance (including, as necessary, inspection, testing, adjustment, lubrications and cleaning) should be carried out at suitable intervals, taking into account the level of use of the item of equipment concerned.</i> <i>• Any defects should be identified and remedied. If necessary, arrangements need to be made for the affected vehicle or infrastructure not to be used in the meantime. If the defect cannot be rectified immediately, it may be necessary to impose conditions which will ensure that safety is not compromised.</i> <i>• Regular maintenance and remedial work should be carried out properly (and to the same or improved standards of the original).</i> 	Refer to Item Ref 110
112	Maintenance	<i>Keep suitable records of the work inspections and any work carried out.</i>	Refer to Item Ref 110

Part 2: Annual Operational Risk Assessment

Ranking System is Event Severity to Health x Likelihood = Ranking Value. Likelihood assessment based partially on site incident history.

Ranking of 0 = Risk is Negligible due to Applied Control Action; no action required; but don't be complacent

Ranking of 1 = Risk is Low but monitor the situation

Ranking of 2 = Risk is Medium; consequence should be avoided; take further action to reduce risk.

Ranking of >3 = Risk is High; take immediate action to reduce risk.

TABLE "A" ACCESS AND EGRESS

ITEM REF:	CONSIDERATION	POSSIBLE CONSEQUENCE	EVENT SEVERITY 0=Neg 1=Low 2=Med 3=High	LIKE-LIHOOD 0=Neg 1=Low 2=Mod 3=High	RANKING	CONTROL ACTION
A1	Personnel access to LMMES leased area by unauthorised persons when site is unoccupied by members.	Tripping, falling, and bumping into objects.	1	0	0	Lease area is fenced and gates locked to protect against inadvertent access. Signal posts are removed and stored when site is closed. Stumbling hazards are no different that a rural area. No sharp protuberances.
A2	Personnel access to LMMES leased area when members are present.	Tripping, falling, and bumping into objects.	1	0	0	Members are familiar with the railway paraphernalia of an active miniature railway. Signed in guests are discouraged from wandering on the track and access to the workshop. Vehicle access is gated to prevent inadvertent entry by the public.

A3	Personnel access to LMMES buildings/facilities when members are present.	Normal access incidents to and within a building.	0	0	0	Members Meeting Room complies with Building Regulations including Disabled Access provisions. Workshop access is restricted by Notice to Members who as members of a miniature engineering society have awareness of the necessary precautions and behaviour in a workshop.
A4	Normal public access to the railway platforms.	Tripping, falling, and bumping into objects. Crowd control.	1	0	0	Properly paved and fully fenced access paths are provided. Public access is only permitted when the platforms are attended by LMMES members and are otherwise locked shut. Queuing for a train ride and exiting a train is carried out in segregated pathways to avoid confusion and crowding.
A5	Public egress from permitted areas.	Walking directly into moving vehicle traffic.	3	0	0	Exit points from the LMMES fenced area are gated with self closers causing a person to stop before leaving the LMMES area.
A6	Access for pedestrians and vehicles to Picnic Area Car Park and LMMES Car Park so crossing the Miniature Railway Tracks during public carrying events.	Collision between a train and a car or a pedestrian.	3	0	0	The level crossing roadway is manned by LMMES controlling traffic at all times that trains are operating. Railway track gates are closed at any time when the level crossing is not manned so preventing locomotives from crossing the roadway. Flashing lights and audible warnings given at the crossing when a train approaches the crossing so warning the public and the LMMES's crossing traffic manager. A Standing instruction/Protocol applies to the correct manning of the crossing.

A7	Access for pedestrians and vehicles to Picnic Area Car Park and LMMES Car Park so crossing the Miniature Railway Tracks when no public passenger carrying is taking place.	Collision between a train and a car or a pedestrian.	3	0	0	Locomotive drivers give priority to road traffic by halting before attempting to cross the road. A Standing Instruction/Protocol applies to this activity.
A8	Pedestrians crossing the track.	Collision between a train and a pedestrian.	3	0	0	The entire track installation is fenced from free public access. A single crossing place is provided for pedestrians at the north easterly curve of the track. This crossing place belongs to the LCC and has gates operated by the public for them to pass through at will and over the track. Warning signs are provided. Locomotive drivers are provided with a whistle marker ahead of the crossing and the track curve is a natural slowing down measure.
A9	Confined spaces.	Asphyxiation.	3	0	0	The only potential confined space is the carriage shed, however this space is through ventilated by fixed openings from both longitudinal ends and at 4 places in the roof.
A10	Escape routes	Trapped personnel.	3	0	0	The track installation is entirely open air and there are no dead end paths to impeded escape from any particular point in the track or station areas.

TABLE "B" LIFTING, FALLING, DROPPED OBJECTS

ITEM REF:	CONSIDERATION	POSSIBLE CONSEQUENCE	EVENT SEVERITY 0=Neg 1=Low 2=Med 3=High	LIKE-LIHOOD 0=Neg 1=Low 2=Mod 3=High	RANKING	CONTROL ACTION
B1	Falling from height.	Injury.	3	0	0	Generally there are no fixed elevated stages. All pedestrian access walking areas above local ground level are fenced.
B2	Dropped objects	Injury	3	0	0	There are no personnel access levels above local ground level and there are no bridges over the track.
B3	Lifting and Overloading.	Bodily strains.	2	0	0	The usual heavy lifts are the locomotives and driving tracks et al and other than these items there are normally no heavy man lifts to be made.
B4	Locomotive handling.	Injury when moving and handling heavy loads from road vehicles and or trailers to the steaming bays and onto the tracks.	2	0	0	The hydraulic lifting table in the steaming bay enables heavy loads to be rolled and not manually lifted when transferring from vehicle road transport to the tracks. A table skirts prevent accidental contact with the lifting mechanism. Attempted overloading of the table trips the hydraulic circuit. A traverser is used to transfer locomotives, driving tracks et al from the hydraulic table to the steaming bay rails and from the rails to the track spurs onto the main track circuits.

B5	Traverser movements	Trip, fall and run over.	2	0	0	The traverser is pulled and not pushed so avoiding the running over of a user. On open days the traverser is operated by LMMES Members.
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TABLE "C" COLLISION AND DERAILMENT

ITEM REF:	CONSIDERATION	POSSIBLE CONSEQUENCE	EVENT SEVERITY 0=Neg 1=Low 2=Med 3=High	LIKE-LIHOOD 0=Neg 1=Low 2=Mod 3=High	RANKING	CONTROL ACTION
C1	Members working on the track for maintenance, repair et al when the track is not operational. Housekeeping, grass cutting etc.	Industrial type injury exposure to worker and those close by.	1	1	0	All track works involve low level activities therefore hardhats are not specified. Members are presumed to carry out activities with which they are familiar and competent and use of tools for which they are familiar or have been trained to use.
C2	Members working on the track for maintenance, repair et al when the track is operational.	Possible impact by a moving train or locomotive.	2	0	0	Hi-Vis jackets are mandatory for anyone within the fenced area of the track circuits. Locos have audible warning means. Track spacing provides a safe ground area providing a means of avoiding a railed vehicle. Work location marked by hazard cones. O.S. monitors track working and has radio communication with signal box.
C3	Train-train collision.	Personal injury. Derailment consequences.	2	0	0	The OS ensures that it is not possible for two locomotives to be on the same track circuit forward facing moving normally in opposite directions so avoiding a high speed collision. Shunting and manoeuvring is carried out under OS control and at very low crawling speeds.

C4	Tail gate collisions.	Personal injury. Derailment consequences.	2	0	0	Signalling is provided to maintain segregation distances and additionally there is line of sight operation. Driving training also enhances safety.
C5	Derailment.	Personal injury. Derailment consequences.	2	0	0	<p>Due to the low travelling speed permitted together with low centre of gravity of loaded trucks and locomotives the derailments experienced have only ever caused the wheels to run onto the sleepers. There have been to date no derailments that did not leave the train in an upright position. There have been no personal injuries.</p> <p>There has been to date no damage to locomotives or any secondary events such as unplanned releases of steam or spillage of fuel.</p> <p>The situation is continually observed/monitored.</p>

TABLE "D" FUEL, EXPLOSION, & CORROSIVE FLUID HAZARDS

ITEM REF:	CONSIDERATION	POSSIBLE CONSEQUENCE	EVENT SEVERITY 0=Neg 1=Low 2=Med 3=High	LIKE-LIHOOD 0=Neg 1=Low 2=Mod 3=High	RANKING	CONTROL ACTION
D1	Volatile Fuels.	Fire/explosion when refuelling petrol, diesel or gas fuelled locomotives and refuelling maintenance machinery such as lawn mowers.	3	1	1	<p>Refuelling is only permitted in the open area rear of the Members building where there are normally no naked flames or other hot surfaces. Fuels are not stored in quantity.</p> <p>The fuel bunker is a separate store remote from occupied buildings and public spaces. The key to the lock of this bunker warns of no smoking on the key tab and the bunker lid is internally labelled the same. The outside of the bunker is not labelled as such due to the possibility of vandalism if the contents are advertised.</p>
D2	Low Volatile Fuels	Burns and uncontrolled fire in Steaming Bays.	1	0	0	<p>Fuels permitted in this area are lumped coal, wood and small quantities of paraffin.</p> <p>Permitted car parking local to the steaming bay can be no closer than 8 feet to the lighting off of locomotives due to the access way and rails of the traverser.</p> <p>There are no open fires in the steaming bay and hot ash is collected in purpose built tray.</p>

D3	Steam Generation.	Scalds and Burns	2	0	0	<p>Boiler steam emission is a controlled event issuing mainly from relief valves and such jets are directed upwards away from persons local to the event. Steam from relief valves condenses in the air close to the point of release and burns are not experienced.</p> <p>Burns from hot surfaces are usually limited to finger ends as the extent of hot surfaces is limited by locomotive size, however members/guests steaming their locomotives are expected to be familiar with their locomotives and so avoid such minor contact burns.</p> <p>Public are not permitted in the steaming bays.</p>
D4	Acids and Alkalis.	Burns	0	0	0	These products are not stored at Cinderbarrow.
D5	Compressed air. Distribution to signalling system.	Signal line failure.	1	0	0	Pneumatic distribution lines and connectors are small bore systems specifically designed for the purpose they are used for. Signal lines in public areas are routed underground in conduits. Signal box relays and distribution is underneath a counter and not in direct line of signal box personnel.
D6	Compressed air. Steaming Bays.	Pressure and flying objects.	1	0	0	The air supply to the steaming bay distribution system is automatically controlled to 30 psig.
D7	Compressed air. Hand tools.	Burst tool casings.	0	0	0	There are no compressed air outlets points for air tools.

TABLE "E" ELECTRICAL HAZARDS

ITEM REF:	CONSIDERATION	POSSIBLE CONSEQUENCE	EVENT SEVERITY 0=Neg 1=Low 2=Med 3=High	LIKE-LIHOOD 0=Neg 1=Low 2=Mod 3=High	RANKING	CONTROL ACTION
E1	240 Volt AC systems.	Electric shock	3	1	1	Systems are designed and installed in accordance with regulatory requirements and PAT procedures are followed accordingly.
E2	12 Volt DC systems.	Electric shock	2	1	1	These are related to battery operation and charging systems. The operators of battery powered locomotives are reasonably expected to be familiar with their equipment and only use the Society facilities for topping up during a running day and this action takes place in the open air. Instruction for the use of the Society battery charging systems are adjacent to the chargers.
E3	24 Volt DC Systems	Electric shock	3	1	1	
E4	Welding Equipment	Electric shock	1	0	0	Welding equipment is brought onto the site as and when required by experienced users.

TABLE "F" VISITING LOCOMOTIVES

ITEM REF:	CONSIDERATION	POSSIBLE CONSEQUENCE	EVENT SEVERITY 0=Neg 1=Low 2=Med 3=High	LIKE-LIHOOD 0=Neg 1=Low 2=Mod 3=High	RANKING	CONTROL ACTION
F1	Visiting locomotives.	Dangers from unfamiliarity with Cinderbarrow operations.	na			Refer to the following Items.
F2	Unfamiliarity with methodology for handling heavy loads.	Strain injury. Dropped objects.	2	0	0	LMMES Members supervises the steaming bay operations during an open day when visitors are welcomed. The LMMES Member supervising operates the hydraulic lift and the traverser and the Visitor is responsible for the means of bridging the gap between the trailer or vehicle and the hydraulic lift as only he is familiar with the weight and manoeuvrability of his locomotive.
F3	Unfamiliarity with methodology for locomotive movements onto and off the track circuits.	Confusion resulting in an incident.	3	0	0	LMMES Operating Superintendent (OS) for the day controls the on and off track movements by direct contact with the locomotives driver and radio to the signal box. Semaphore signal at the track circuit entry point also provides the right of way permission to the driver.

F4	Visitor credentials with regard to pressure integrity of the locomotive and validity of insurance cover.	Impaired indemnity. Boiler accident.	3	0	0	<p>Access to the steaming bay is not permitted without prior submission to LMMES reception desk of the following proof:</p> <ul style="list-style-type: none"> ➤ NAME or SFed insurance cover for the day of operation of the locomotive. ➤ NAME or SFed current boiler hydraulic test and steam test certification.
F5	Unfamiliarity with the Cinderbarrow track.	Collision. Derailment.	3	0	0	<p>Visiting drivers and attendants are briefed on the track operations and etiquette including at least the permitted directions of travel, restrictions on reverse travel, signal location and procedures, and level crossing operations.</p> <p>The OS maintains control of the locomotive movements in accordance with the rules and procedures.</p>