



Steam Locomotive Driver Training Work Book

Name: _____

CONTENTS

- 1 How to use this training book.....2**
- 2 List of reference material.....2**
- 3 Role and responsibilities of a driver.....3**
- 4 Preparing a steam locomotive.....6**
- 5 Moving a steam locomotive.....13**
- 6 Conducting train operations.....14**
- 7 Shutting down and stabling a steam locomotive.....22**

1 HOW TO USE THIS WORKBOOK

This workbook is intended to provide you with a systematic approach to the learning of the skills, knowledge and understanding you need to fulfil the role and responsibilities of a Steam Locomotive Driver with Redwater Creek Steam & Heritage Society (RCSHS). A mentor who is already a qualified and experienced steam locomotive driver will be appointed by RCSHS to assist you in this learning process.

To attempt to qualify as a steam locomotive Driver at RCSHS you must have a High Risk Standard Boiler Licence and be deemed ready for assessment by your mentor. You will also be required to pass a Rail Safety Critical Worker (category 2) medical before you can be appointed as a driver. Your assessment will comprise a theory assessment and a practical assessment. Your appointed mentor will advise you when you are ready for assessment.

The first part of the booklet includes a simple summary of the structure and contents and the learning activities contained in the booklet for the development of what you need to know and what you need to be able to do. It describes the mutual roles of you and your mentor and summarises other publications issued by the RCSHS that you need to use, such as safety management system, safe working rules, rail safety requirements, operating and service manuals, checklists, standard procedures, timetables, route maps, etc.

There are 7 topic areas covered by the booklet. Each topic section outlines the theory and practical for a number of listed sub-topics. The outline gives a basic framework of what you need to know and be able to do in the topic area concerned. However, you will need to **build your knowledge** further by having discussions with your mentor and by reading the relevant sections of the publications issued by the RCSHS.

Each topic section also contains space for you to write your own notes on the various sub-topics based on discussions with your mentor and your own experiences during training and guided practice.

2 LIST OF REFERENCE MATERIAL

The following is a list of key reference material which will be available to you during the course of your learning activities:

- The RCSHS job description for a **driver on a steam locomotive**, describing a driver's role and responsibilities
- RCSHS safety management system
- RCSHS standard operating procedures
- Pre-operational checklists
- Prescribed readings for this work book
 - Lubrication of Steam Engines
 - Selection of Oil for Steam Engines

Your **mentor** will work with you in the following ways:

- Help you to develop the required understanding and skills through interactive discussions and explanations,
- Demonstrate required tasks and equipment functions,
- Assist you to obtain, read and interpret RCSHS documents and manuals as well as applicable regulatory requirements,
- Observe and comment on your practice of the required skills in real and simulated situations, and
- Periodically check of what you have learnt (i.e. your knowledge and understanding and what you are able to do).

At all times, if you are in doubt or need to clarify an issue, check with your mentor or other qualified and experienced steam train drivers.

3 ROLE AND RESPONSIBILITIES OF A DRIVER

FUNCTIONS AND DUTIES OF A DRIVER ON A STEAM LOCOMOTIVE

The role of a driver on a steam locomotive may involve a variety of tasks including:

Duties prior to locomotive service

- Signing on and checking roster, notice boards, operational instructions, timetables locomotive availability and other information needed to operate the locomotive and train.
- Conducting all required pre-operational checks
- Carrying out a mechanical examination of the train consist and continuity test
- Recording, rectifying, isolating defects and deficiencies (as applicable) or reporting to Rolling-stock Manager
- Oiling and lubricating the locomotive
- Supervising the raising of steam in conjunction with fireman
- Supervising fireman
- Adherence to safe working rules when preparing and positioning a locomotive for service
- Operating the locomotive controls correctly as per standard operating procedures

- Securing the locomotive

Duties during a journey

- Providing leadership and guidance to the fireman and working collaboratively with the fireman and other members of the train crew throughout a train journey
- Working effectively with other volunteers, members of the general public, and all persons they come into contact with (i.e. respectfully)
- Handling a train safely and effectively during a journey
- Adhering to safe working rules
- Following standard operating procedures:
 - when shunting rollingstock
 - when coupling and uncoupling the locomotive to rollingstock
 - when conducting a train examination
 - when handling the locomotive and train during a journey
 - when there is a train disabled in a section
 - when there are worksites on track
 - for the protection of worksites on track
- Taking required precautions and following standard operating procedures when approaching and traversing level crossings
- Adhering to all speed limits during a journey, 15 kph maximum
- Giving and interpreting all audible, hand and other signals correctly
- Using radio and other communication equipment correctly
- Coupling a steam locomotive to other locomotives
- Handling a train safely and effectively during a journey
- Observing all hand signals, track side signs and status of level crossings. These are to be called by one locomotive crew member and acknowledged by the other
- Halting and securing a train in an emergency as per standard operating and emergency procedures
- Identifying faults and defects that may occur on the locomotive and its equipment and conducting associated trouble-shooting activities
- *Dealing with abnormal situations that may occur during train operations, including applicable emergency communication and evacuation procedures*
- Handing over a locomotive to a relieving crew

Duties after service

- Uncoupling a locomotive from rollingstock (during these processes the driver and fireman will follow the standard operating procedures for the type of braking system used on the RCSHS)
- Moving the consist to its stabling position
- Cleaning the locomotive and rolling-stock
- Carrying out all required post-operational checks on the locomotive
- Securing the locomotive and rolling-stock
- Completing all required paperwork

Practical

Travel with a steam locomotive crew and observe the various functions as they are being performed by the driver on the locomotive. Clarify with the driver any aspects of these functions that are unclear.

Describe to your mentor the various functions and duties you must perform when working as a driver on a steam locomotive in service.

STATUTORY RESPONSIBILITIES INCLUDING RAIL SAFETY AND SAFE WORKING REQUIREMENTS AND REGULATIONS RELATED TO THE DRIVING OF TRAINS

Safe working rules must be adhered to at all times

A particularly important responsibility is to be aware of the hazards involved in working as a driver on a steam locomotive and following the rail operator's strategies for minimising or eliminating the risks involved. Examples of hazards that exist on steam locomotives include:

- Falling from heights
- Chemicals
- Fire irons
- Hot surfaces
- Moving work platform
- Oil spills on floors
- Dehydration and fatigue
- Noise

Hazard management strategies may include:

- Ensuring public safety (e.g. checking when the anybody is in the vicinity of loco before using injectors, blowing down, cleaning fires, etc.), Do not stand with feet near injector overflow.
- Using personal protective equipment (PPE) as required.
- Drivers are encouraged to have a first aid certificate.
- Using fire extinguishers and water hoses to control fire emergencies, including fire control strategies when working steam locomotives in fire danger periods
- Following the RCSHS established risk management procedures.

STANDARD PROCEDURES OF THE RCSHS APPLICABLE TO A DRIVER ON A STEAM LOCOMOTIVE, INCLUDING RECORD KEEPING AND THE REPORTING OF DEFECTS AND INCIDENTS

Make sure you have a copy of those standard procedures of the RCSHS that apply to the functions and duties of a driver of a steam locomotive. You should read these procedures and make sure that you are thoroughly familiar with them and can apply them when performing the tasks of a driver. It is important that you not only can follow these procedures but also understand their significance and the reasons why following them is so important. These procedures will include record keeping and the required action to be taken in the event of an equipment defect or a safety incident.

4 PREPARING A STEAM LOCOMOTIVE

IDENTIFYING AND DESCRIBING THE COMPONENTS OF A STEAM LOCOMOTIVE AND ITS ASSOCIATED EQUIPMENT

As a driver of a steam locomotive, it is important that you know and are able to identify the components of the locomotive and its associated equipment. For the locomotive and its equipment, you must be able to describe their:

- Purpose
- principal parts
- functions and operation
- potential defects and related action required to isolate, repair and/or report the defects as per standard procedures

Typical components of a steam locomotive and associated boiler equipment.

Ashpan - *The ash pan is positioned below the fire grate to contain ashes as they fall through from the fire bed. Some ash pans regulate, via the dampers, the amount of primary air entering the grate. The shape of the pan varies with the width of the grate and the position of the axles and the design of the locomotive. It may be formed in the shape of a hopper to facilitate emptying.*

Blower - *A blower is fitted on all locomotives to supply artificial draft for the fire when the engine is not working. A small pipe is fitted on top of the blast pipe in the smoke box and is perforated with small holes and bent in the form of a circle. By turning on the blower steam valve in the cab, a jet of steam is directed up the chimney. This creates a partial vacuum in the smoke box, causing the products of combustion to be drawn through the tubes and ejected out through the stack.*

Blower valve - controls the flow of steam to the blower ring.

Crosshead - A knuckle joint connection which joins the piston rod to the connecting rod.

Dampers - fitted control the draft through the boiler by regulating the amount of primary air that enters through the grate.

Crosshead gudgeon pin - the pin that joins the crosshead to the connecting rod (also known as a knuckle pin).

Piston rod - A rod that connects the piston in the cylinder to the cross-head.

Regulator or throttle - a valve that controls the delivery of steam to the steam chests and cylinders.

Safety valves - pressure relief valves to stop the boiler pressure exceeding the operating limit. They relieve the boiler of excess pressure above the registered pressure.

Slide bars - also known as **Guide Bars**, They contain and allow the free movement of the crosshead **also hold** the piston rod parallel to the guides and the piston in the cylinder.

Steam stop valve - (also known as the manifold or turret) isolates the boiler from the auxiliary equipment: i.e. L and R injectors, lubricators, blower, air compressor, vacuum ejector, etc.

Some Key Terms

Steam lap: Is the amount the outer edge of the valve overlaps the outer edges of the steam port when placed centrally over it. The purpose of steam valve lap is to cut off the steam supply to the end of the cylinder before the piston reaches the end of its stroke allowing the steam to be used expansively.

Exhaust lap: Is the amount the inner edges of the valve overlaps the inner edges of the steam ports when placed centrally over it. The purpose of exhaust valve lap are twofold: It delays the release of steam acting behind the piston allowing expansion and brings about an earlier cut-off of the exhaust steam, for compression to cushion the piston.

Lead: Lead is the amount of port opening for the admission of steam behind the piston for the commencement of its stroke. To ensure full steam supply to the cylinder to act on the surface of the piston at the commencement of its stroke, the valve commences to open just before the piston completes its stroke. This pre-admission also aids cushioning.

Angle of advance: *The angle by which the eccentric is fixed to the axle at 90 degrees plus lap and lead angle in the direction of rotation.*

Effect of "linking up": *(Notching up) Allows the use of the steam more expansively – uses less steam, less fuel and less water.*

Inside Admission: *Where steam is admitted to the cylinder via the inside edges of the valve and exhausts steam from the cylinder via the outside edges of the valve.*

Outside Admission: *Where steam is admitted to the cylinder via the outside edges of the valve and exhausts steam from the cylinder via the inside edges of the valve.*

Common Concerns

The reasons why **knocks** can occur in the operation of a steam locomotive and the action should you take if they occur.

*A **knock** generally occurs when the piston changes direction at each end of its stroke. Sometimes the exact location of a knock is hard to identify, it may be necessary to eliminate suspected each location by trial and error. Check your railways standard procedures for identifying and faultfinding 'knocks'. Knocks may be caused by:*

- Excessive clearance between Axle-box's and horn guides
- Piston Rod loose in crosshead
- Piston striking cylinder heads
- Excessive clearance between crosshead and guide bars
- Loose gudgeon pin in crosshead.
- Excessive clearance or looseness in Big End bearings and or fastenings
- Excessive clearance or looseness in Coupling Rod bushes or fastenings
- Part of the locomotive being struck by reciprocating and or rotating parts
- Water hammer

Priming: is the carryover of varying amounts of droplets of water in the steam (foam and mist), which lowers the energy efficiency of the steam and leads to the deposit of salt crystals on the super heaters and in the turbines. Priming may be caused by improper construction of boiler, excessive ratings, or sudden fluctuations in steam demand. Priming is sometimes aggravated by impurities in the boiler-water.

Some mechanical entertainment of minute drops of boiler water in the steam always occurs. When this boiler water carryover is excessive, steam-carried solids produce turbine blade deposits. The accumulations have a composition similar to that of the dissolved solids in the boiler water. Priming is common cause of high levels of boiler water carryover. These conditions often lead to super heater tube failures as well. Priming is related to the viscosity of the water and its tendency to foam. These properties are governed by alkalinity, the presence of certain organic substances and by total salinity or TDS. The degree of priming also depends on the design of the boiler and its steaming rate.

The following are the actions a driver should take if a locomotive is **priming**: (I:E: Water carrying over into the cylinders):

- Reduce the demand for steam by easing the Regulator.
- Place locomotive in full gear in the direction of running.
- Open drain cocks.
- Depending on the position of water in the gauge glass – blow down the boiler until the water level is visible.

Foaming: is caused by boiler water carry-over is the contamination of the steam with boiler-water solids. Bubbles or froth actually build up on the surface of the boiler water and pass out with the steam. This is called foaming and it is caused by high concentration of any solids in the boiler water. It is generally believed, however, that specific substances such as alkalis, oils, fats, greases, certain types of organic matter and suspended solids are particularly conducive to foaming. In theory suspended solids collect in the surface film surrounding a steam bubble and make it tougher. The steam bubble therefore resists breaking and builds up foam. It is believed that the finer the suspended particles the greater their collection in the bubble.

With foaming, the true water level in the boiler may be difficult to ascertain, this may bring uncertainty in the minds of the driver and fireman. Foaming is brought about by different conditions to priming. The actions a driver should take if a locomotive is **foaming** are:

- Reduce the demand for steam by easing the regulator
- Place locomotive in full gear in the direction of running
- Open Drain Cocks
- If Foaming is persistent, water in the boiler may need replacing by blowing down then topping for as long as foaming persists.
- Foaming may also cause priming

CONDUCTING PRE-OPERATIONAL CHECKS

Drivers will conduct a series of pre-operational checks as per RCSHS operating procedures for the steam locomotive concerned. This will usually include:

- Check fire ban status. Fit spark arrester if it is hot/windy/dry
- Refer to SMS and Daily Running Sheet for checklists.
- Setting the locomotive in position for examination and lubrication
- Conducting an examination of the **locomotive** including:
 - Checking the smoke box to ensure that the spark arrestor is in position and properly secured and that the smoke box is free from ashes at the start of the day.
 - Inspecting the boiler tubes from both the smoke box and firebox ends as check for leaking plugs and tubes at the start of the day.
 - Inspecting the left hand side, then underneath, then the right hand side of the locomotive using the operator's checklist for the locomotive concerned.

- Examining the **water gauge glass** for condition including checking that the water gauge glasses are in good condition and that spare gauge glasses and sealing rubbers are available

Practical

Under the supervision of your mentor, observe and practice how to conduct the required checks of the log book and then the pre-start examination of a steam locomotive and its associated equipment. Demonstrate to your mentor how to conduct the required inspection and checks

CHECKING BRAKE EQUIPMENT ON THE LOCOMOTIVE

A driver will follow the pre-operational checklist for checking the brake equipment of the locomotive issued by RCSHS for the type and class of steam locomotive concerned. This will typically include:

- Testing the driver's brake valves
- Test handbrake
- Testing the brake system for leakage

Practical

Under the supervision of your mentor, observe and practice the required brake test standard operating procedures for your steam locomotive. Demonstrate to your mentor how to complete all required brake tests.

RECORDING, RECTIFYING, ISOLATING AND/OR TAGGING DEFECTS AND DEFICIENCIES (AS APPLICABLE) OR REPORTING TO ROLLING-STOCK MANAGER

Where defects and deficiencies are found in the course of the inspection and the pre-operational checks, they will be recorded and rectified (where possible), isolated and tagged (where applicable) or reported to the Rolling-stock Manager.

Practical

Under the supervision of your mentor, observe and practice how to take appropriate action in the event of a number of simulated typical defects or deficiencies on your steam locomotive.

Demonstrate to your mentor what action you would take if various simulated defects or deficiencies were identified on your steam locomotive.

LUBRICATING THE LOCOMOTIVE

The prime purpose of lubrication on a steam locomotive is the reduction of friction by maintaining a thin film of oil or grease between two metal surfaces in contact with one another. If the film of oil/grease is broken at any time, friction increases, causing the parts to be overheated and possibly damaged. The higher friction also means that more power is required with consequent reduction in the performance of the locomotive.

It is therefore very important, that all bearings and other moving parts on the locomotive are well and constantly lubricated.

The driver with the assistance of the fireman must follow the pre-operational lubrication checklist issued by RCSHS for the type and class of steam engine concerned. Drivers must be vigilant at all times to ensure the correct oil is placed into the respective containers on the locomotive.

Dependent on the type of equipment lubrication may involve oiling and/or greasing. Check the following lubrication points and procedures for the type and class of steam engine concerned:

Lubricate with bearing oil (or grease where applicable) the following parts (where fitted) below the footplate:

- All axle boxes
- All oil cups
- Eccentric straps, expansion links
- Valve spindle glands
- Knuckle joints
- Spring gear equipment
- Motion gear
- Crosshead
- Guide bars

Never fill over the top of the syphon tube as this can cause the trimming not to feed, ensure that oil cups do not contain water from steam condensate by checking with a syringe. If oil cup is full or nearly so this is a sure indication that the trimming is not feeding. Ensure all trimmings are in place and operational. All steam locomotive drivers should be able to make a variety of trimmings in the case that one may need replacing. Your mentor will describe the process to you and demonstrate making trimmings.

Lubricate with bearing oil (or grease where applicable) the following parts (where fitted) above the footplate:

- Spot oil reversing shaft universal coupling pins
- Reach rod brackets

Lubricate the following parts steam cylinder oil (where fitted) above the footplate:

- Hydrostatic lubricators
- Mechanical lubricators

Where a hydrostatic lubricator is fitted, it must be checked and filled with the necessary quantity of steam cylinder oil.

All steam locomotive drivers should be able to make a variety of trimmings in the case that one may need replacing. All drivers must be able to demonstrate the correct method to make a plug, plug and tail trimming and tail trimming and describe where each type goes and why, your mentor will describe this process to you and demonstrate making trimmings.

Practical

Under the supervision of your mentor, observe and practice the required pre-start lubrication standard operating procedures for your steam locomotive.

Demonstrate to your mentor how to complete all the required lubrication tasks as a member of your locomotive crew.

Demonstrate to you mentor the correct method to make a plug, plug and tail trimming and tail trimming and describe where each type goes and why.

INITIAL MOVEMENT OF THE LOCOMOTIVE

Once the driver has checked that the required steam pressure has been achieved, the locomotive will be started and initially moved as per RCSHS operating procedures for the class of locomotive concerned. This will usually involve:

- Warming the cylinders and valve chambers;
- ensuring that the cylinder cocks are initially kept open for a short distance of travel as per standard operating procedures;
- ensuring all brakes are released prior to moving;
- ensuring that the locomotive is in full gear prior to moving off (and kept there for the first few turns of the driving wheels before notching up); and,
- opening the regulator sufficiently to lift the locomotive, taking care to open the regulator slowly to prevent slipping (severe slipping causes excessive wear and tear to the locomotive, disturbance of the firebed and blanketing of the spark arrestor - if slipping should occur, the regulator should be eased and, if necessary, sand applied).

Practical

Under the supervision of your mentor, observe the sequence of steps taken by a driver on a steam locomotive when starting the locomotive prior to service.

Demonstrate to your mentor how you can start a steam locomotive as per the standard operating procedures of your rail operator for the type and class of locomotive concerned.

CHECKING SYSTEMS ARE OPERATING CORRECTLY

Once steam has been raised and the locomotive has been moved into the yard, the driver will carry out a check that all of the locomotive systems are operating correctly. The driver will follow the RCSHS operating procedures of the railway for the type and class of locomotive concerned with the aid of a systems checklist.

Practical

Under the supervision of your mentor and using RCSHS operating procedures and associated checklist(s), observe and practice how to check that all of the systems on a particular type and class of steam locomotive are operating correctly.

Demonstrate to your mentor how to check that all of the systems on the steam locomotive are operating correctly as per RCSHS operating procedures.

5 MOVING A STEAM LOCOMOTIVE

ADHERENCE TO SAFE WORKING RULES

A critical aspect of a train driver's responsibilities is to follow the safe working rules of RCSHS. This includes moving a steam locomotive in the yard during its preparation for service.

You need to be thoroughly familiar with RCSHS yard instructions and safe working rules and be able to apply them when operating a steam locomotive at all times during both its preparation for service and stabling activities.

Practical

Demonstrate to your mentor your understanding of your responsibilities and how these are applied when moving a locomotive in the yard.

OPERATING LOCOMOTIVE CONTROLS

It is important that you are thoroughly familiar with the various operating controls for the type and class of the locomotive(s) you will be driving. You must know the purpose and function of each of the controls and how and when you should use them.

Practical

Discuss with your mentor the various train controls for the type and class of the locomotive(s) you will be driving including their purposes and functions and how and when each should be used. Your mentor will demonstrate how each control should be used.

Demonstrate to your mentor how you can operate the various locomotive controls in accordance with the operating procedures of RCSHS.

SECURING THE LOCOMOTIVE IN POSITION

Once in position the driver will secure the locomotive in accordance with the RCSHS operating procedures for the type and class of steam locomotive concerned.

6 CONDUCTING TRAIN OPERATIONS

FOLLOWING APPLICABLE SAFE WORKING PROCEDURES

RCSHS has a system of **safe working**, - i.e. a system of rules and equipment used to prevent conflict between trains (and between trains and track workers).

In safe working systems used on the tourism and heritage lines, the track is divided into sections within which only one train is normally permitted. The end points of these sections may be a place where trains may cross or pass (such as a Station or Crossing Loop), a place where trains leave the main line (a siding) or just a specially marked location (a Block Point). Permission for a train to enter a section is referred to as an Authority. Each form of safe working goes about the granting of these Authorities to trains in a different way.

Practical

Discuss with your mentor the safe working system used on your railway.

Demonstrate to your mentor how to interpret and apply the RCSHS safe working system when driving the train.

FOLLOWING CORRECT PROCEDURES WHEN THERE IS A TRAIN DISABLED OR FAILED IN A SECTION

It is very important that a train driver understands the RCSHS operating procedures that must be followed when there is a train broken down or failed in a section. **This is critical for the safety of the RCSHS personnel and passengers.**

Practical

Learn through observation and demonstrate to your mentor RCSHS operating procedures that are to be followed when there is a train broken down or failed in a section.

FOLLOWING CORRECT PROCEDURES WHEN THERE ARE WORKSITES ON TRACK

Work on running lines between train movements must leave running lines clear to run. In conjunction with the fireman the driver must remain vigilant and respond correctly to warning devices and hand signals from protection officers.

This is critical for the safety of the RCSHS personnel and passengers.

Practical

Discuss with your supervisor the safe working requirements for operating a train in a section where there are worksites on the track. Learn through observation and demonstrate to your mentor the standard procedures for when there are worksites on track. This may involve the mentor posing a series of simulated situations or case studies.

SHUNTING

When shunting rolling-stock to form a train, it is important that the driver follows the RCSHS operating procedures as they apply to shunting. The person carrying out the shunt may be the fireman or other qualified worker who for the purpose becomes known as the shunter. You should be familiar with all shunting signals provided by the shunter.

Practical

Sign for your copy of RCSHS operating procedures and safe working rules as they apply to shunting and understand the requirements and responsibilities described in them. If in doubt on any aspect of them ask your mentor. Observe how shunting activities need to be carried out.

Demonstrate to your mentor your understanding of shunting procedures and related safety requirements and how these are applied when shunting rollingstock either in the yard, or at a station, or siding.

COUPLING LOCOMOTIVE TO ROLLINGSTOCK

When coupling a locomotive to rollingstock to form a train, the driver will initially position the locomotive a short distance from the leading vehicle of the train.

The shunter will stand in a position of safety and where they can be seen by the driver and signal the driver to ease up to the leading vehicle. The driver will slowly move the locomotive and bring it to a standstill when the movement couples and then apply the locomotive's brake.

The shunter then couples the locomotive to the leading vehicle as per the railway's standard operating procedures.

It is the shunter's responsibility to make sure that the locomotive is correctly coupled to the train and that the brake pipe cocks are in the open position between the locomotive and the leading vehicle of the train.

It is critically important that the driver is able to see the shunter at all times when the locomotive or train is being moved. If the driver cannot see the shunter, he/she must immediately stop and not move the locomotive.

Practical

Under the supervision of your mentor during a train journey, observe how the driver works with the shunter to safely couple a steam locomotive to the leading vehicle of a train.

Demonstrate to your mentor how you can work with a shunter to couple a steam locomotive to the leading vehicle of a train as per RCSHS operating procedures.

HANDLING OF TRAIN

The handling of the train requires detailed route knowledge including the location of grades, stations, sidings, crossings, curves, speed limits, and other potential hazards such as lineside fires that may affect the running of the train.

Consideration of these route features and potential hazards enables the driver to anticipate the running requirements of the train and adjust the handling of the train accordingly. This also requires collaboration with the fireman to ensure that the management of the firebed and steam pressure is appropriate for both the current track conditions and those ahead. The driver needs to regulate the operation of the locomotive to ensure its safe operation.

Steaming: *The correct adjustment of regulator and reversing lever varies according to the speed, load and the gradient traversed. Skill in making these adjustments is mainly a matter of practice and experience with the type and class*

of locomotive concerned. When running at relatively high speed it is a good rule to bring the gear back sufficiently to prevent knocking and then place the regulator in a position which will maintain the desired running speed.

Drifting: *When drifting, locomotives must be placed in full, forward or backward gear according to the direction of running.*

Picking up a train at speed: *After a period of drifting, it is important that a driver is careful in the re-application of power. The application of power should be done gradually – carefully taking up the slack out of the draw gear and avoiding ‘drawgear shock’. Too rapid an application of power may cause failure of the drawgear as well as disturbing the fire bed and smokebox content resulting in the blanketing of the spark arrestors. There is also a risk of carrying over water if the regulator is opened too quickly. It is important to follow the RCSHS operating procedures for picking up a train at speed after a period of coasting.*

Practical

Under the supervision of your mentor during a train journey, observe how the driver handles the train and works collaboratively with the fireman to anticipate the road ahead and appropriately manage the fire bed and steam pressure, and control the speed and the power of the locomotive.

Discuss with your mentor the routes of the trains you will be driving and the ways in which the features and hazards along the road need to be considered and taken into account when handling the locomotive and managing the fire bed and steam pressure.

During a test drive of a train, learn and demonstrate to your mentor how you can handle the train and work collaboratively with the fireman to manage the fire bed and steam pressure to ensure that the train operates smoothly at the required speed and power levels to achieve timetable requirements and to comply with the rail operator’s standard operating procedures.

PRECAUTIONS AND PROCEDURES WHEN APPROACHING TRACK HAZARDS AND TRAVERSING POINTS AND LEVEL CROSSINGS

When operating a steam locomotive during a train journey, it is crucial for effective safe working that the driver ensures that correct procedures are followed when approaching level crossings and track hazards.

The driver and the fireman must work in partnership to closely observe level crossings and must at all times cross call and to scrutinise for any abnormal situations that might occur at level crossings.

Practical

Discuss with your mentor, the procedures for observance of fixed signals and level crossings and potential abnormal situations that can occur at level crossing and related action that needs to be taken should they occur.

Ride in the cab of a steam locomotive for a train journey and observe the teamwork of the locomotive crew and the way that the driver and the fireman work together in the observance of fixed signals, points and indicators and signs and the procedures for approaching and traversing level crossings.

Demonstrate during a train journey the action you must take as a driver in the observance of signals, point stand indicators, signs and level crossings.

ADHERING TO SPEED LIMITS

The maximum speed for RCSHS is 15 kmph

Speed limit for yard and entering the station is to be sufficiently slow to allow the driver to stop short of any obstruction.

Practical

During a train journey observe how the driver adjusts the speed of the train to comply with RCSHS operating procedures.

Under the supervision of your mentor during test drives, learn how to adjust the speed of the train.

Demonstrate to your mentor how to regulate the speed of the train to comply with the required speed limits.

INTERPRETING HAND SIGNALS

Drivers work directly with other qualified personnel in the safe and effective operation of locomotives and trains. A key skill required of all railway personnel concerned is being able to give and interpret the RCSHS railway hand signals. In various circumstances, these hand signals may be complemented by the use of flags and lights (e.g. where night work is involved). It is important therefore that you are proficient in giving such signals as per RCSHS operating procedures. You must also be able to recognise and correctly interpret signals given by others.

Note: If a hand signal is **not** received when one is expected, or a hand signal **cannot** be interpreted, the movement **must** be brought to an immediate and smooth **halt** until and correct hand signal is again received.

STOPPING AND SECURING A TRAIN IN AN EMERGENCY

When a train has been stopped such as in an emergency and has been brought to a stand and will remain stationary for a lengthy or unknown period and may be left unattended, the procedure for securing the train is as follows:

- Fully apply the locomotive hand brake.
- Place the reversing gear in centre position and open the cylinder drain cocks.
- Ensure that the fireman has checked the boiler water levels and confirm that the boiler will be left with sufficient water in it.
- Close the lubricator.
- Confirm that the fire is left in an appropriate state; this may involve dropping the fire (Note that by law a boiler cannot be left unattended with a fire on the grate and pressure on the gauge).
- Ensure that sufficient hand brakes of rolling-stock are applied to secure the train.

Practical

During a test drive of a train in conjunction with the fireman and under the supervision of your mentor, demonstrate the procedures you would follow as a driver during a simulated emergency stopping of the train. In the simulation, take all required measures to secure the train.

IDENTIFYING FAULTS AND DEFECTS AND CONDUCTING ASSOCIATED TROUBLE-SHOOTING ACTIVITIES

It is the role of the driver on a steam locomotive in conjunction with the fireman to identify any faults and defects on the locomotive and its associated components and equipment and to undertake related trouble-shooting activities.

The driver needs to be familiar with the types of faults and defects that could occur on the type of steam locomotive concerned and the trouble shooting processes typically used by drivers.

Practical

With your mentor discuss the faults and defects that could occur on the locomotive and the ways in which the driver can work in conjunction with the fireman to identify and to rectify typical faults and defects on the locomotive

DEALING WITH ABNORMAL SITUATIONS DURING TRAIN OPERATIONS, INCLUDING APPLICABLE EMERGENCY COMMUNICATION AND EVACUATION PROCEDURES

There are a range of abnormal and emergency situations that may occur during a train journey. You should be aware of recognising abnormal and emergency situations and RCSHS operating procedures for train crew in the event that they may occur.

The following are some examples of potential abnormal and emergency situations:

- failure of a fusible plug or other safety device (See below)
- a track obstruction
- trespassers crossing the track
- equipment failure
- wheel slip and uncontrolled slide
- incorrect information or failure in communications
- a passenger emergency (e.g. illness or injury)
- an ill crew member
- a passenger initiated alarm
- a derailment
- a collision
- a fire and explosion on the locomotive or train
- whistle failure

Note that you should refer to RCSHS operating procedures for the action to be taken by train crew in the event of **a locomotive breakdown**.

Failure of a fusible plug

A fusible plug is a safety device used to provide a warning that the water level in the boiler has already fallen to a dangerous level. The filled plugs are fitted in the top of the fire box crown. Under normal circumstances, the water covering the firebox crown prevents the core melting. If the water level falls below the top of the firebox crown, the plug overheats and the core melts. The resulting water and steam acts as a warning (and may perhaps subdue the fire to some extent preventing further damage).

In the case of a minor/partial fusible plug failure:

If partially fused the engine can still be driven with water being put in as needed to return the locomotive and train to the station to disembark passengers. The locomotive and train should then be returned to the loco shed and stabled as normally would be done.

In the case of a critical fusible plug failure:

Remove or extinguish the fire, if possible turn the blower on to keep steam from entering the cab. In some arrangements, where the fire cannot be easily dropped it may be necessary to smother the fire with earth or sand. However, any practice that requires the fire door to be open has risk of burning for the crew, so this must be done with due care, and with the blower operating. Do not inject feed water if water is below the sight glass.

The failure of a fusible plug indicates a very serious emergency situation and is a reportable occurrence. It is extremely important to know the emergency procedures of RCSHS in terms of action that must be taken in the event of the failure of a fusible plug.

Emergencies and Emergency Management Plans

Ensure you are familiar with RCSHS Emergency Management Plan and how it is applied in conjunction with the Emergency Services in your area.

You need to be familiar with your responsibilities in the case of emergency and the requirement not to undertake any activity that is likely to destroy any evidence unless it is essential to do so in the treating of injured persons.

Prior to allowing work to commence on site, RCSHS must ensure that it has undertaken an investigation to ensure that all necessary evidence has been obtained.

Notifiable Occurrences

Rail Safety Regulations require that all incidents which occur on a railway are deemed as either Category A or B. Refer to RCSHS operating procedures. In some instances, the Rail Safety Regulator may advise that an investigation will be conducted by that organisation and therefore nothing is permitted to be shifted until such time as the investigation has been undertaken. At times the Rail Safety Regulator may instruct RCSHS to undertake an investigation and report findings.

Practical

Check RCSHS documentation regarding abnormal and emergency situations and what action/s should be taken when they occur. In particular identify the role of the train driver in these situations.

Discuss potential abnormal and emergency situations that could occur at RCSHS with your mentor and the action you would need to take if they should occur. Discuss also the *Emergency Management Plan* of RCSHS and procedures related to *Notifiable Occurrences*

7 SHUTTING DOWN AND STABLING A STEAM LOCOMOTIVE

STABLING THE LOCOMOTIVE

Practical

Under the supervision of your mentor, learn how to stable the locomotive according to RCSHS operating procedures.

Procedure for stabling the locomotive

- Lubricator off
- Damper closed
- Water level to 2.0 cm of top of glass
- Ensure injectors are off (water handles vertical)
- Side tanks full
- Wood bunkers replenished
- Smoke box cleaned
- Chimney cover on
- Handbrake on
- Centre gear
- Steam cocks opened
- Regulator closed
- Fire to be burned down to hot coals

COMPLETING PAPERWORK

Prior to signing off make sure that all necessary paperwork has been completed. This may include:

- Log or record locomotive operations (at the station prior to stabling)
- Report operational problems and/or any defective components or equipment identified and details of any action taken or required
- Report any safety incidents as per RCSHS operating procedures and regulatory requirements

Practical

Under the supervision of your mentor, learn and demonstrate how to complete all required post-operational paperwork prior to signing off as per RCSHS requirements.