



# **Steam Locomotive Train Driver**

## **Mentor's Q&A**

***(Generic Version)***

### **Version 1**

June, 2011

## IMPORTANT NOTICE

This booklet is one of a series of generic training and assessment templates developed by the Association of Tourist & Heritage Rail Australia Inc (ATHRA) as guides for heritage railway operators seeking to develop or upgrade their local training and assessment resources.

This booklet and others in the series are not intended to be training resources in their own right but rather to be suitably customised, embellished and adapted by railway operators to match the specific context of their own railway, e.g. types of locomotives, rollingstock and associated equipment, the track layout and infrastructure, the local standard procedures and rules, the safety management and safeworking systems, the railway organisational structure, and the roles and functions of personnel in the railway, etc.

Railway operators seeking to use this booklet and others in the series should initially refer to the ***ATHRA Customisation Guidelines Booklet*** which provides important information on how the generic templates should be used.

### Disclaimer

The information contained herein is made available by the Association of Tourist & Heritage Rail Australia Inc (ATHRA) as part of a set of ***generic training and assessment templates*** for use by individual heritage railway operators.

It is intended that heritage railway operators will be able to create their own local training resources by suitably modifying, embellishing and customising the generic templates to meet their own requirements.

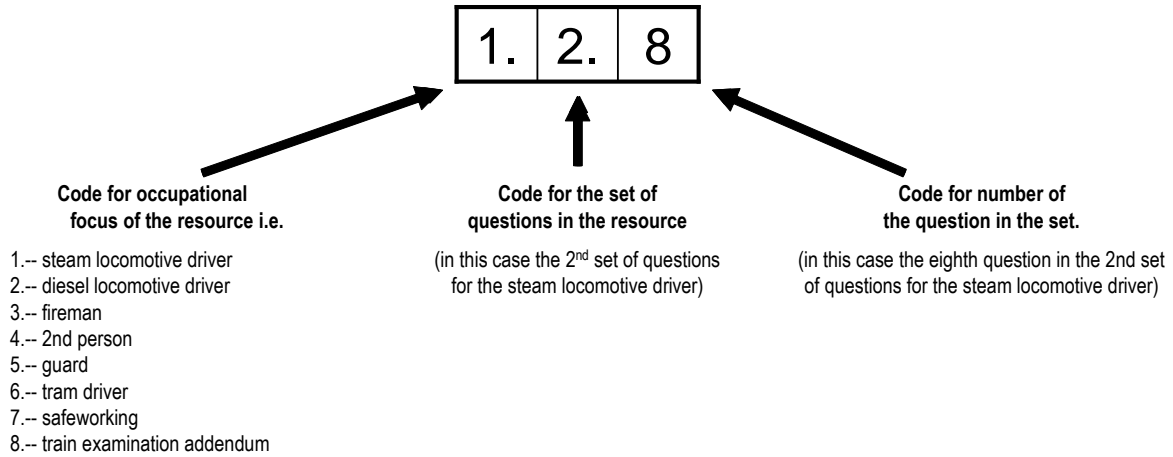
ATHRA does not assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information provided in these generic resources.

© Association of Tourist & Heritage Rail Australia Inc. 2011

# NOTES

## CODING SCHEME FOR THE ATHRA RESOURCES

The coding scheme for the ATHRA Resources is as follows:



## CUSTOMISATION OF QUESTIONS AND ANSWERS IN THE 'MENTOR'S Q&A'

As explained in the ATHRA Customisation Guidelines, this **Knowledge Checklist** and related **Mentors Q&A** are generic documents designed to be customized and adapted, if necessary, by local heritage railways to match their own railway configuration, equipment, procedures, safety management systems, etc. Questions in the booklet and related sample responses in the **Mentor's Q&A** may be modified by updating the content of the existing templates to incorporate appropriate information about the railway's own operating system, equipment, road, procedures, safety management system, etc. This may involve appropriate alteration to existing questions or the insertion of additional suitable questions.

To aid in the addition of questions, if needed, a blank row has been provided at the end of each set of questions in the generic checklist and Q&A. The following is a step-by-step process to incorporate any additional questions:

1. Using the mouse, select the blank row
2. In the 'TABLE' drop down menu at the top of the document select 'Insert'
3. Click on 'Insert rows below'
4. Repeat as many times as necessary until you have sufficient rows for the additional questions (including the original blank row in the generic document)
5. Insert the text for each of the additional questions
6. Insert the codes of the additional questions as per the coding scheme for the ATHRA training and assessment resources
7. Make sure there are matching questions and sample responses with the same code in both the **Knowledge Checklist** and the **Mentor's Q&A Booklet**

**Question Set 1.1    Role and responsibilities of a train driver on a steam locomotive**

QUESTION	SAMPLE RESPONSE
<p>Q1.1.1            What are the <b>key tasks</b> performed by a steam locomotive train driver?</p>	<ul style="list-style-type: none"> <li>• Signing on for locomotive duties and confirming that the relevant fireman has signed on</li> <li>• Checking roster, notice boards, operational instructions, locomotive availability and other information needed to drive a steam locomotive</li> <li>• Following safeworking rules and standard operating procedures:</li> <li>• Providing leadership and guidance to the fireman and working collaboratively with the fireman and other members of the train crew throughout a train journey</li> <li>• Conducting all required equipment and system checks including lubricating the locomotive</li> <li>• Recording, rectifying, isolating and/or tagging defects and deficiencies (as applicable) or reporting to relevant personnel</li> <li>• Starting and operating the locomotive</li> <li>• Operating the locomotive controls</li> <li>• Moving the locomotive to required position and securing it prior to and after service</li> <li>• Shunting rollingstock including coupling and uncoupling the locomotive</li> <li>• Coupling a steam locomotive to other steam locomotives for double heading operations, or when working with a diesel locomotive (where required)</li> <li>• Handling a train safely and effectively during a journey</li> <li>• Observing all fixed signals, point stand indicators, check points, track side signs and level crossings and adhering to all speed limits during a journey</li> <li>• Calling all signs and signals to the fireman and receiving acknowledgement from the fireman (or vice versa)</li> <li>• Taking required precautions and following standard operating procedures when approaching and traversing level crossings</li> <li>• Giving and interpreting all audible, light, hand and other signals correctly</li> <li>• Dealing with abnormal situations that may occur during train operations, including applicable emergency communication and evacuation procedures</li> <li>• Stabling and securing the locomotive</li> <li>• Completing all required paperwork</li> </ul>

<p>Q1.1.2</p> <p>What is the <b>relationship</b> between the steam locomotive driver and the fireman?</p>	<ul style="list-style-type: none"> <li>• The driver and the fireman are a team.</li> <li>• The driver provides leadership and guidance to the fireman.</li> <li>• The fireman must at all times cooperate with the driver and carry out his instructions when working on the locomotive.</li> </ul>
<p>Q1.1.3</p> <p>Is the train driver responsible for <b>observing fixed trackside signals, point stand indicators, check points and trackside signs</b>?</p>	<ul style="list-style-type: none"> <li>• Yes. The driver, assisted by the fireman, must always be on the alert to observe any fixed trackside signals, point stand indicators, check points and trackside signs so that he may operate the locomotive or brake as per safeworking requirements to ensure the safety of the train, its crew and passengers.</li> <li>• All signs and signals must be called by either the driver or fireman and be acknowledged by the other person concerned.</li> </ul>
<p>Q1.1.4</p> <p>Describe the <b>key safeworking rules</b> that apply to you as a train driver?</p>	<ul style="list-style-type: none"> <li>• Candidate's response should paraphrase the rail operator's safeworking rules as they apply to steam locomotive drivers on the railway concerned.</li> </ul>
<p>Q1.1.5</p> <p>What are the <b>potential consequences</b> of not following safeworking rules and other regulations applicable to the train driver's and fireman's roles on your railway?</p>	<ul style="list-style-type: none"> <li>• A serious accident, possibly involving fatalities.</li> <li>• Possible injury to self, colleagues and the public.</li> <li>• Possible damage to own locomotive / train, other trains or railway facilities.</li> </ul>
<p>Q1.1.6</p> <p>What is the location and purpose of instruction plates outlining headways and limits of authority?</p>	<ul style="list-style-type: none"> <li>• The candidate will describe, for their railway, the location and purpose of instruction plates outlining headways and limits of authority.</li> </ul>
<p>Q1.1.7</p> <p>For your railway, describe the yard limits, commencement of yard limits and end of yard limits associated with train running.</p>	<ul style="list-style-type: none"> <li>• The candidate will describe the yard limits, commencement of yard limits and end of yard limits associated with train running in their railway.</li> </ul>

<p>Q1.1.8</p> <p>What are the steam locomotive train driver's <b>initial duties</b> after signing on?</p>	<ul style="list-style-type: none"> <li>• Candidate should outline the rail operator's requirements and standard procedures for the initial duties of a steam locomotive driver after signing on. This will probably include: <ul style="list-style-type: none"> <li>– checking roster, notice boards, operational instructions, tram availability and other information needed to operate a tram</li> <li>– conducting all required pre-start checks</li> <li>– checking that the tool kit, fire extinguisher, first aid kit and other locomotive equipment is on the locomotive and is in good working order</li> <li>– recording, rectifying, isolating and/or tagging defects and deficiencies (as applicable) and/or reporting to relevant personnel</li> <li>– oiling and greasing the locomotive</li> <li>– firing and starting the locomotive as per operating manual and standard procedures</li> <li>– checking systems are operating correctly</li> <li>– checking the brakes</li> <li>– starting the turbo and checking the head and marker lights</li> <li>– obtaining authority to move and position a steam locomotive</li> <li>– adherence to yard instructions and safeworking rules when preparing and positioning a locomotive for service</li> <li>– operating the locomotive controls correctly as per standard operating procedures</li> <li>– moving the locomotive to required position prior to service</li> <li>– securing the locomotive in position</li> </ul> </li> </ul>
<p>Q1.1.9</p> <p>What <b>action</b> must you take if you find a defect during a shift as a driver of a steam locomotive?</p>	<ul style="list-style-type: none"> <li>• The candidate should outline the rail operator's standard procedures for the action, recording and reporting that needs to be taken by a locomotive crew in the event of an identified defect.</li> </ul>
<p>Q1.1.10</p> <p>What <b>action</b> must you take if you are involved in a safety incident during a shift as a driver of a steam locomotive?</p>	<ul style="list-style-type: none"> <li>• Candidate should outline the rail operator's standard procedures for the action, recording and reporting that needs to be taken by a locomotive crew in the event of a safety incident.</li> <li>• Ensure that the train is secured,.</li> <li>• If emergency services are in attendance observe the requirements of the senior combatant agency on site.</li> </ul>

<p>Q1.1.11</p> <p>What <b>action</b> must you in the case of a limit of authority overrun during a shift as a driver of a steam locomotive?</p>	<ul style="list-style-type: none"> <li>• Candidate should outline the rail operator's standard procedures for the action, recording and reporting that needs to be undertaken in the event of a limit of authority overrun.</li> <li>• Take action to provide protection against any approaching train</li> <li>• Work under the direction of train control to clear the section</li> <li>• In all instances a written report must be furnished.</li> </ul>
<p>Q1.1.12</p> <p>Where can you obtain a <b>copy</b> of the duties of a driver, the safeworking rules applicable to fireman and other key reference documents a fireman needs?</p>	<ul style="list-style-type: none"> <li>• Candidates should indicate the ways in which the rail operator concerned makes available to steam locomotive drivers the safeworking rules and other key reference documents they need to understand and fulfil their roles and responsibilities.</li> </ul>
<p>Q1.1.13</p> <p>Give three examples of <b>hazards</b> that exist when driving a steam locomotive.</p>	<ul style="list-style-type: none"> <li>• Dependent on the railway concerned, examples of possible responses include: <ul style="list-style-type: none"> <li>– Falling from heights</li> <li>– Working in confined spaces</li> <li>– Working under wires</li> <li>– Chemicals</li> <li>– Fire irons</li> <li>– Hot surfaces</li> <li>– Scalding/burns</li> <li>– Moving work platform</li> <li>– Oil spills on floors</li> <li>– Dehydration and fatigue</li> <li>– Noise</li> <li>– Flashbacks</li> <li>– Working with electric lights and power</li> <li>– Exposed steam pipes</li> <li>– Broken hand rails</li> <li>– Leaking fittings</li> </ul> </li> </ul>

<p>Q1.1.14</p> <p>What personal protective equipment (PPE) must be used by steam locomotive drivers when carrying out their duties and functions?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the personal protective equipment (PPE) that must be used by steam locomotive drivers when carrying out their duties and functions as per the safety management plan and standard operating procedures of the rail operator concerned.</li> </ul>
<p>Q1.1.15</p> <p>Give two examples of <b>risk management strategies</b> to control hazards when driving a steam locomotive.</p>	<ul style="list-style-type: none"> <li>• Dependent on the railway concerned, examples of possible responses include: <ul style="list-style-type: none"> <li>– Taking required precautions when using oil as the locomotive fuel</li> <li>– Ensuring public safety (e.g. checking when the public is in the vicinity of loco before using injectors, blowing down, cleaning fires, etc.)</li> <li>– Using personal protective equipment (PPE)</li> <li>– Using fire extinguishers and water hoses to control fire emergencies, including fire control strategies when working steam locomotives in bushfire conditions</li> <li>– Following the railway's established risk management procedures.</li> </ul> </li> </ul>



<p>Q1.1.16 Give five reasons why <b>route knowledge</b> is so important for a steam train driver.</p>	<ul style="list-style-type: none"> <li>• Adjusting train operations to allow for rising and falling grades in specific sections of track</li> <li>• Following safeworking procedures when approaching and traversing level crossings</li> <li>• Adjusting train operations to comply with speed restrictions</li> <li>• Adjusting train operations when approaching stations</li> <li>• Remaining vigilant when approaching fixed signals, point stand indicators, check points, track side signs and level crossings</li> <li>• Remaining vigilant when approaching sections where there are specific hazards (e.g. curves, bridges, etc.)</li> <li>• Adjusting train operations when approaching stations and sidings that allow crossing with other trains (on single lines)</li> <li>• Location of water and coal stores to allow topping up of fluid levels of locomotives during a journey</li> <li>• Location of ash pits to enable the cleaning of the fire grates on the locomotive during a journey</li> </ul>
<p>Q1.1.17 What are the procedures for <b>handing over</b> a steam locomotive to a replacement crew?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the procedures for handing over a steam locomotive to a replacement crew as per the standard operating procedures of the rail operator. concerned</li> </ul>
<p>Q1.1.18 <i>Blank for additional question</i></p>	<ul style="list-style-type: none"> <li>•</li> </ul>

## Question Set 1.2 Preparing and starting a steam locomotive

QUESTION	SAMPLE RESPONSE
<p>Q1.2.1</p> <p>What are the <b>principal components</b> of steam locomotive(s) on which you will be working? What is the purpose of each?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the principal components of the steam locomotive(s) and their purpose as described in the relevant manual(s) provided by the rail operator.</li> </ul> <p>A sample indicative list for a steam loco is provided in 1.2.1 of the 'Steam Locomotive Driver's Performance Checklist' This would need to be modified and customised to match the type(s) and class(es) of steam locomotive and the railway concerned</p>
<p>Q1.2.2</p> <p>How does the driver work with the fireman to <b>light the fire</b> on the locomotive?</p>	<ul style="list-style-type: none"> <li>• The candidate will describe the rail operator's standard operating procedures and checklist for the lighting of fire on the type and class of steam locomotive concerned.</li> <li>• For example, this may include the following activities completed in conjunction with the fireman: <ul style="list-style-type: none"> <li>– ensuring adequate ventilation within a confined environment such as a locomotive shed</li> <li>– conducting pre-light up procedures</li> <li>– lighting the fire as per standard operating procedures for the locomotive concerned</li> <li>– raising steam as per standard operating procedures for the locomotive concerned</li> <li>– using a blower when raising steam including taking required precautions</li> <li>– minimising smoke generation while raising steam</li> <li>– testing and operation of the water gauge glass fittings</li> <li>– testing the injectors as per standard operating procedures</li> </ul> </li> </ul>
<p>Q1.2.3</p> <p>What <b>tasks</b> does a driver complete before they commence the pre-start checks on the locomotive?</p>	<ul style="list-style-type: none"> <li>• The candidate will describe the standard operating procedures for the locomotive and rail operator concerned for the tasks to be undertaken prior to conducting pre-start checks.</li> <li>• The driver will usually have checked the roster, signed on, checked that the fireman has signed on, and interpreted the day's train activities. They will also have confirmed the allocation of locomotives and located the locomotive to be checked and prepared in the yard.</li> </ul>

<p>Q1.2.4      What <b>pre-start checks</b> will be carried out by the driver</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the processes involved in carrying out the pre-start checks required under the standard operating procedures of the rail operator. These will typically include: <ul style="list-style-type: none"> <li>– firing the boiler in conjunction with the fireman as per standard operating procedures,</li> <li>– setting the locomotive in position for its examination and lubrication</li> <li>– conducting a visual examination of the locomotive using the railway's checklist for the type and class of steam locomotive concerned,</li> <li>– confirming with the fireman that the levels of water, coal and sand on the locomotive have been appropriately topped up, and</li> <li>– confirming with the fireman the operational readiness of the.... <ul style="list-style-type: none"> <li>• tool kit.</li> <li>• fire extinguisher.</li> <li>• first aid kit.</li> <li>• communication equipment.</li> <li>• head and marker lights</li> <li>• data loggers</li> </ul> </li> </ul> </li> </ul>
<p>Q1.2.5      What are the procedures for <b>oiling and greasing</b> a steam locomotive?</p>	<ul style="list-style-type: none"> <li>• The candidate will describe the rail operator's standard operating procedures and checklist for conducting oiling and greasing tasks in conjunction with the fireman for type and class of steam locomotive concerned.</li> <li>• For example, this may include: <ul style="list-style-type: none"> <li>– lubricating the parts below the footplate (i.e. eccentric straps, expansion links; valve spindle glands; knuckle joints; and spring gear equipment)</li> <li>– lubricating the parts below the footplate (i.e. precision air reversing gear lubricator and its piston rod gland; spot oil reversing shaft universal coupling pins; reach rod brackets; tender brake gear bearings; and air operating cylinder)</li> <li>– lubricating with cylinder oil the following parts (where fitted) above the footplate (i.e. superheater damper door cylinder; and auxiliary oil cups for the piston rod and valve spindles of the locomotive)</li> <li>– Checking the oil levels showing in the gauge glasses or on the dip stick of the mechanical lubricators.</li> <li>– Where a hydrostatic lubricator is fitted), the fireman must fill the lubricator with the prescribed quantity of cylinder oil</li> </ul> </li> </ul>
<p>Q1.2.6      What is involved in <b>raising steam</b>?</p>	<ul style="list-style-type: none"> <li>• The candidate will describe the standard operating procedures for raising steam for the locomotive and rail operator concerned.</li> </ul>

Q1.2.7	What is a <b>feedwater injector</b> ?	<ul style="list-style-type: none"> <li>• An instrument operated by steam to force water into the boiler.</li> </ul>
Q1.2.8	How many types of <b>feedwater injector</b> are used on a steam locomotive?	<ul style="list-style-type: none"> <li>• Only one type of feed water injector is used on any steam locomotive. However there are two of them on each loco. Injectors are either lifting or non-lifting. They are usually located one on either side of the boiler. Injectors may be classified as lifting and non-lifting. The lifting injector is placed above the high water line in the tank, requiring a vacuum created by starting the injector to fill the suction pipe with water. The non lifting injector is placed below the bottom of the water tank, the suction pipe is always flooded. All injectors work upon the same general principle, differing only in the details of construction.</li> </ul>
Q1.2.9	Describe the correct procedures for using the <b>injectors on the locomotive</b> ?	<ul style="list-style-type: none"> <li>• The candidate will describe the standard operating procedures for using the <b>injectors on the locomotive</b> for the injector for the locomotive and rail operator concerned.</li> </ul>
Q1.2.10	How does the driver check the <b>braking system</b> of the locomotive?	<ul style="list-style-type: none"> <li>• The candidate will describe the rail operator's standard operating procedures and checklist for testing the braking system of the type and class of steam locomotive concerned.</li> </ul>
Q1.2.11	Describe the procedures for starting a <b>turbo</b> and checking the lights on a locomotive.	<ul style="list-style-type: none"> <li>• The candidate will describe the rail operator's standard operating procedures for starting a turbo and checking the lights for the type and class of steam locomotive concerned.</li> </ul>
Q1.2.12	What action should a driver take if <b>defects or deficiencies</b> are identified during checks or during operations?	<ul style="list-style-type: none"> <li>• The standard operating procedures for taking action on identified defects and deficiencies may vary from one rail operator to another. The candidate will describe the standard operating procedures for the rail operator concerned.</li> <li>• At the least, the defects and deficiencies must be recorded and reported.</li> <li>• Depending on the rail operator's policies and procedures, the driver may <u>also</u> be required to .... <ul style="list-style-type: none"> <li>– rectify the defects and deficiencies,</li> <li>– Isolate them, and/or</li> <li>– tag them.</li> </ul> </li> </ul>

<p>Q1.2.13</p> <p>What are the procedures for the <b>starting and initial movement</b> of the steam locomotive?</p>	<ul style="list-style-type: none"> <li>• The candidate will describe the rail operator's standard operating procedures and checklist for the starting and initial movement of the type and class of steam locomotive concerned.</li> <li>• For example, this may include the following activities completed in conjunction with the fireman: <ul style="list-style-type: none"> <li>– blowing out superheater elements as per standard operating procedures</li> <li>– warming the cylinders and valve chambers,</li> <li>– ensuring that the cylinder cocks are initially kept open for a short distance of travel as per standard operating procedures,</li> <li>– ensuring that the locomotive is in full gear prior to starting (and kept there for the first few turns of the driving wheels before notching up,</li> <li>– ensuring all brakes are released prior to starting, and</li> <li>– 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).</li> </ul> </li> </ul>
<p>Q1.2.14</p> <p>How does the driver <b>check that the systems</b> on the locomotive are operating correctly?</p>	<ul style="list-style-type: none"> <li>• The candidate will describe the rail operator's standard operating procedures and systems checklist for checking that the systems on the locomotive are operating correctly for the type and class of steam locomotive concerned.</li> </ul>
<p>Q1.2.15</p> <p>Describe how a <b>piston rod</b> is made steam tight in a cylinder?</p>	<ul style="list-style-type: none"> <li>• A stuffing box in which soft packing is compressed around the rod by a gland, which is forced inwards by nuts and studs. Steam gland packing is a compressed fibre material usually impregnated with graphite for lubrication purposes.</li> </ul>
<p>Q1.2.16</p> <p>Describe one (1) method for connecting the <b>piston rod and connecting rod</b> to the crosshead?</p>	<ul style="list-style-type: none"> <li>• Piston rod passes through the crosshead and secured with a nut.</li> <li>• The small (or little) end of the connecting rod is connected to the crosshead pin.</li> </ul> <p>(Many piston rods are fitted into a taper in the cross head, with a large cotter to stop it coming out. The con rod is connected via a gudgeon pin.)</p>

<p>Q1.2.17</p> <p>Explain the following terms:</p> <p>a) <i>Saturated steam</i></p> <p>b) <i>Superheated steam</i></p>	<ul style="list-style-type: none"> <li>• <b>Saturated Steam:</b> Steam taken directly from a boiler steam space and is characterised by having a constant temperature, volume and density for any given pressure. Because saturated steam is always generated in the presence of water it contains water droplets in suspension (This is the vapour seen issuing from cocks).</li> <li>• <b>Superheated Steam</b> is steam that has passed through elements where its temperature is raised above the corresponding <a href="#">saturation temperature for the pressure...</a></li> </ul>
<p>Q1.2.18</p> <p>What are the advantages and disadvantages of using of using <b>saturated steam</b> for driving reciprocating steam engines?</p>	<ul style="list-style-type: none"> <li>• <b>Advantages:</b> <ul style="list-style-type: none"> <li>– The wetness of saturated steam acts as a lubricant for all the components it comes in contact with, including: the governor, slide valves and the piston and its rings.</li> <li>– The gland packing relies on a small steam leak and the resultant condensate to keep it lubricated and to prevent it from drying out.</li> <li>– Assists in distributing the steam oil fed from the lubricator.</li> <li>– Most reciprocating engines are designed to operate on saturated steam.</li> <li>– For a given pressure the temperature is constant.</li> </ul> </li> <li>• <b>Disadvantages:</b> <ul style="list-style-type: none"> <li>– When using saturated steam an amount of heat is given up in heating steam lines and the engine, as a result much of the steam is converted back to water. <ul style="list-style-type: none"> <li>▪ This is an economic loss as no mechanical work has been performed.</li> <li>▪ The condensate formed can cause damage such as broken pistons or forcing the cylinder covers off the engine due to its incompressibility.</li> </ul> </li> </ul> </li> </ul>

<p>Q1.2.19</p> <p>What are the advantages and disadvantages of using of using <b>superheated steam</b> for driving reciprocating steam engines?</p>	<ul style="list-style-type: none"> <li>• <b>Advantages:</b> <ul style="list-style-type: none"> <li>– The hotter the steam is the less work it has to do.</li> <li>– Uses less coal.</li> <li>– Uses less water</li> <li>– Gives greater efficiency</li> <li>– Super heated steam has a less volume than saturated steam at the same pressure and therefore provides greater power and efficiency.</li> <li>– With sufficient super heat, expansion can take place in the engine forming less condensation, which can damage the engine.</li> </ul> </li> <li>• <b>Disadvantages:</b> <ul style="list-style-type: none"> <li>– Lubrication must be provided, as super heated steam is an invisible odourless gas that does not have any lubricating properties.</li> <li>– Engines using high temperature super heat must be supplied with the correct grade of lubricant designed to resist vaporization and oxidization.</li> <li>– The temperature of the steam supplied to the engine can only be accurately determined with a temperature gauge.</li> <li>– Safety Note: Because superheated steam is invisible and odourless, it presents a danger to operational personnel. Care should be taken if a leak is suspected as this steam has the potential to cause life threatening injuries</li> </ul> </li> </ul>
<p>Q1.2.20</p> <p>Explain what is meant by the term: <b>'Steam lap'</b></p>	<ul style="list-style-type: none"> <li>• <b>Steam lap:</b> 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.</li> </ul>
<p>Q1.2.21</p> <p>Explain what is meant by the term: <b>'Exhaust lap'</b></p>	<ul style="list-style-type: none"> <li>• <b>Exhaust lap:</b> 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 full expansion and brings about an earlier cut-off of the exhaust steam, for compression to cushion the piston.</li> </ul>
<p>Q1.2.22</p> <p>Explain what is meant by the term: <b>'Lead'</b></p>	<ul style="list-style-type: none"> <li>• <b>Lead:</b> -- 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.</li> </ul>
<p>Q1.2.23</p> <p>Explain what is meant by the term: <b>'Angle of advance'</b></p>	<ul style="list-style-type: none"> <li>• <b>Angle of advance:</b> The angle by which the eccentric is fixed to the axle at 90 degrees plus lap and lead angle in the direction of rotation.</li> </ul>

<p>Q1.2.24 Explain the effect of "<b>linking up</b>" an engine with adjustable valve gear?</p>	<ul style="list-style-type: none"> <li>• (Notching up) Allows the use of the steam more expansively – uses less steam, less coal and less water.</li> </ul>
<p>Q1.2.25 Explain what is meant by the terms "<b>inside admission</b>" and "<b>outside admission</b>"?</p>	<ul style="list-style-type: none"> <li>• <b>Inside Admission:</b> -- 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..</li> <li>• <b>Outside Admission:</b> -- 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.</li> </ul>
<p>Q1.2.26 Explain what is meant by "<b>power reverse gear</b>"?</p>	<ul style="list-style-type: none"> <li>• An arrangement whereby the operation of the reversing gear mechanism is operated by a power assisted device using an operating medium such as air, steam, or hydraulics.</li> </ul>
<p>Q1.2.27 Why can <b>knocks</b> occur in the operation of a steam locomotive? What is the procedure when monitoring for knocks and what action should you take if they occur?</p>	<ul style="list-style-type: none"> <li>• 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: <ul style="list-style-type: none"> <li>– Excessive clearance between Axle-box's and horn guides.</li> <li>– Piston Rod loose in crosshead.</li> <li>– Piston striking cylinder heads</li> <li>– Excessive clearance between crosshead and guide bars.</li> <li>– Loose gudgeon pin in crosshead.</li> <li>– Excessive clearance or looseness in Big End bearings and or fastenings</li> <li>– Excessive clearance or looseness in Coupling Rod bushes or fastenings.</li> <li>– Part of the locomotive being struck by reciprocating and or rotating parts.</li> </ul> </li> </ul>
<p>Q1.2.28 <i>Blank for additional question</i></p>	<ul style="list-style-type: none"> <li>•</li> </ul>



### Question Set 1.3 Moving a steam locomotive

QUESTION	SAMPLE RESPONSE
Q1.3.1 Describe the process involved in obtaining <b>authority</b> to move and position a steam locomotive?	<ul style="list-style-type: none"> <li>• Candidate will describe the processes involved in obtaining <b>authority</b> to move and position a steam locomotive as per the standard operating procedures of the railway operator.</li> </ul>
Q1.3.2 How should a steam locomotive's <b>controls</b> be operated?	<ul style="list-style-type: none"> <li>• The candidate will describe the rail operator's standard operating procedures for operating the controls on the type and class of steam locomotive concerned.</li> <li>• The controls must be operated smoothly and carefully.</li> </ul>
Q1.3.3 Why is it important to remain <b>vigilant</b> when moving a steam locomotive in a yard?	<ul style="list-style-type: none"> <li>• To identify any situation that may potentially be unsafe or cause a problem in the safe and efficient running of the locomotive, including:               <ul style="list-style-type: none"> <li>– problems on the ahead of the locomotive in the yard,</li> <li>– problems on the locomotive itself or</li> <li>– problems in the yard environment around the locomotive.</li> </ul> </li> <li>• It is the driver's special duty in conjunction with the fireman to regularly scan the locomotive's operating environment in the yard to check that there are no problems either occurring then, or which may be developing.</li> </ul>
Q1.3.4 Describe the process involved in <b>moving</b> a steam locomotive to its required position in the yard?	<ul style="list-style-type: none"> <li>• Candidate will describe the sequence of processes involved in <b>moving</b> a steam locomotive to its required position in the yard as per the standard operating procedures of the railway operator for the type and class of locomotive concerned.</li> <li>• This includes the operation of the locomotive, stopping it in the right position and securing it when in position.</li> </ul>
Q1.3.5 <i>Blank for additional question</i>	<ul style="list-style-type: none"> <li>•</li> </ul>

## Question Set 1.4 Conducting train operations

QUESTION	SAMPLE RESPONSE
<p>Q1.4.1 How does the fireman <b>assist</b> the steam locomotive driver during a train journey?</p>	<ul style="list-style-type: none"> <li>• The role of the fireman is to: manage the fire and steam generation on the locomotive and to assist the driver to operate and regularly check the performance of the locomotive and its various components and pieces of equipment,</li> <li>• The fireman assists in whatever corrective action may be required. The exact nature of the checks that need to be made will be dependent on the type of steam locomotive concerned and the standard operating procedures of the rail operator,</li> <li>• The fireman must remain attentive to the driver's instructions and respond to them promptly when given,</li> <li>• The fireman must remain vigilant and check the road ahead and look behind to check for any signals, level crossings or abnormal situations and alert the driver as required, and</li> <li>• The fireman will assist the driver during any emergency or abnormal situation that may arise.</li> </ul>
<p>Q1.4.2 What is the role of a train driver concerning <b>fixed trackside signals, point stand indicators and signs and level crossings?</b></p>	<ul style="list-style-type: none"> <li>• The driver and the fireman work in partnership to observe the fixed signals, point stand indicators, check points, track side signs and level crossings and to scrutinise for any abnormal situation that might occur at a level crossing.</li> <li>• The driver calls all signs and signals to the fireman and receives acknowledgement from the fireman (or vice versa)</li> <li>• The train driver must assess the situations at fixed signals, point stand indicators, check points, signs and level crossings with the assistance of the fireman and take all required action as per the railway's safeworking rules and standard operating procedures.</li> <li>• All signs and signals involved in stopping and starting a train at a platform must be observed including the need to follow the guards signals</li> </ul>
<p>Q1.4.3 Describe the processes involved in interpreting and applying <b>'authority'</b> to move a train'</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the processes involved in interpreting and applying 'authority' to move a train as per the safety management system and standard operating procedures of the railway operator concerned.</li> </ul>

<p>Q1.4.4</p> <p>Describe the processes involved in interpreting and applying a '<b>Cancellation of authority to move a train</b>'?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the processes involved in interpreting and applying a 'Cancellation of authority to move a train' as per the safety management system and standard operating procedures of the railway operator concerned.</li> </ul>
<p>Q1.4.5</p> <p>Describe the standard operating procedures and safeworking rules that need to be followed by drivers when <b>operating in the vicinity of worksites on the track</b>?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the describe the standard operating procedures and safeworking rules that need to be followed by drivers when operating in the vicinity of worksites on the track -- as per the safety management system of the railway operator concerned.</li> </ul>
<p>Q1.4.6</p> <p>How do drivers work with firemen, guards and shunters when <b>coupling</b> a locomotive to rollingstock?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the describe the standard operating procedures and safeworking rules that need to be followed by drivers when working with firemen, guards and shunters during the <b>coupling</b> of a locomotive to rollingstock <ul style="list-style-type: none"> <li>– 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.</li> <li>– Before coupling the driver will make sure that the main air reservoir is fully charged. The fireman, guard or 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 buffers are closely compressed and then apply the locomotive's brake.</li> <li>– The fireman, guard or shunter then couples the locomotive to the leading vehicle as per the railway's standard procedures.</li> <li>– After coupling to the train, the driver will lap the brake valve handle until the air hoses have been coupled and the brake cocks opened. The driver will then shift the brake valve handle to the full release position to charge the brake pipe. The brake valve is then returned to the running position in sufficient time to prevent an overcharge of the brake pipe.</li> <li>– It is the responsibility of the fireman, guard or shunter concerned 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.</li> </ul> </li> </ul>

<p>Q1.4.7 Describe the standard operating procedures and safeworking rules that need to be followed by drivers when <b>shunting rollingstock</b> to form a train?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the describe the standard operating procedures and safeworking rules that need to be followed by drivers when shunting rollingstock to form a train -- as per the safety management system of the railway operator concerned.</li> </ul> <p>This includes a description and demonstrated understanding of all shunting signals that may be given by the fireman, guard, shunter or other persons assisting in the shunting operations.</p>
<p>Q1.4.8 How should a driver <b>handle</b> a train?</p>	<ul style="list-style-type: none"> <li>• The handling of the train requires detailed route knowledge including the location of grades, stations, sidings, crossings, fixed lineside signals, curves, speed limits, and other potential hazards 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.</li> <li>• Handling of the train 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 the most economical use of steam.</li> <li>• Candidate will also describe the standard operating procedures for the railway and locomotive concerned for lifting the train on heavy grades, light and heavy steaming as required on the routes concerned.</li> </ul>
<p>Q1.4.9 During a train journey, what is the role of a train driver concerning <b>fixed trackside signals, point stand indicators, check points, track side signs and level crossings?</b></p>	<ul style="list-style-type: none"> <li>• The driver and the fireman work in partnership to observe the signals, indicators and signs and to scrutinise for any abnormal situation that might occur at a level crossing.</li> <li>• The fireman assists the driver by double checking the situations at signals, point stand indicators, check points, track side signs and level crossings and aiding the driver in taking all required action as per safeworking rules and standard operating procedures.</li> <li>• The driver or fireman calls all signs and signals to the other person and receives acknowledgement from that person (or vice versa)</li> </ul>

<p>Q1.4.10</p> <p>Why is it important for the train driver to remain <b>vigilant</b> at all times during a train journey?</p>	<ul style="list-style-type: none"> <li>• During a train journey it is vital that the train driver and the fireman remain vigilant at all times to identify any situation that may potentially be unsafe or cause a problem in the safe and efficient running of the train.</li> <li>• This may include problems on the road ahead, on the locomotive itself or on the train being drawn. In this regard it is the fireman's special duty to regularly look back at the train being drawn to check that there are no problems occurring and to advise the train driver accordingly.</li> </ul>
<p>Q1.4.11.</p> <p>What are the responsibilities of a train driver concerning <b>speed limits</b> along a train's route?</p>	<ul style="list-style-type: none"> <li>• Trains must comply with the prescribed speed limits both within the yard and throughout a train journey.</li> <li>• It is important that the train driver knows all of the prescribed speed limits along a train route and in the yard</li> <li>• He must observe all trackside speed signs and take appropriate action to vary the train's speed to comply with the limits in the current and approaching sections</li> <li>• Maximum speed is the maximum of the line speed or class of rollingstock -- not just track speed. In this regard, the driver needs to know the limits on any rollingstock attached to the train</li> </ul>
<p>Q1.4.12</p> <p>Describe the precautions a train driver should follow when <b>approaching and stopping</b> at stations along a train's route?</p>	<ul style="list-style-type: none"> <li>• The train driver must anticipate a scheduled stop at a station and take appropriate action for a steady deceleration of the train in sufficient time for a gradual stop,</li> <li>• The train driver must approach the stop smoothly and steadily with appropriate deceleration and braking that allows the train to come to a gentle stop on the required stopping position, and</li> <li>• The stop should be achieved without sudden deceleration or jerks arising from sudden braking.</li> </ul>

<p>Q1.4.13</p> <p>What are five examples of <b>abnormal situations</b> that may occur during a train journey and what is the role of the train driver in responding to these abnormal situations?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the action to be taken by a train driver in the event of five different types of abnormal situation as per the rail operator's emergency and standard operating procedures.</li> <li>• This may include: <ul style="list-style-type: none"> <li>– stopping and securing the train in collaboration with the fireman and the guard, and</li> <li>– working collaboratively with the train crew in undertaking the required emergency procedures including conducting emergency communication and assisting passengers and train crew in an orderly evacuation of the train as per the rail operator's emergency procedures. guard</li> <li>– Note that in an emergency, the driver takes directives from guard who is in charge of the train.</li> </ul> </li> <li>• Examples of the types of abnormal situations that could be included are: <ul style="list-style-type: none"> <li>– a track obstruction</li> <li>– trespassers crossing the track</li> <li>– equipment failure</li> <li>– signals in stop mode</li> <li>– incorrect information or failure in communications</li> <li>– a passenger emergency (e.g. illness or injury)</li> <li>– an ill crew member</li> <li>– a passenger initiated alarm</li> <li>– a false alarm</li> <li>– a derailment</li> <li>– a collision</li> <li>– a chemical spill</li> <li>– a fire and explosion on the locomotive or train</li> <li>– a bomb threat</li> <li>– head or marker light failure</li> </ul> </li> </ul>
<p>Q1.4.14</p> <p>What are the symptoms of <b>fusible plug failure</b>?</p>	<ul style="list-style-type: none"> <li>• Steaming difficulty</li> </ul>
<p>Q1.4.15</p> <p>Does the failure of a plug provide a <b>warning</b> that the water level is low?</p>	<ul style="list-style-type: none"> <li>• No, it demonstrates that the water level has already fallen to a dangerous level</li> </ul>
<p>Q1.4.16</p> <p>Will the escaping steam from a failed fusible plug <b>put the fire out</b>?</p>	<ul style="list-style-type: none"> <li>• Not necessarily. It may do in a small boiler, but in a large boiler with multiple fusible plugs, a single failure may not have enough quenching effect to extinguish the fire.</li> </ul>

<p>Q1.4.17      What <b>should be done</b> in the event that a fusible plug melts?</p>	<ul style="list-style-type: none"> <li>• Extinguish the fire, but keep the blower going strongly to keep steam from entering the cab. In the case of oil, turn it off. In the case of a solid fuel, if there is a drop grate arrangement, drop the fuel into the ash pan, with the ash wetter turned on.</li> <li>• 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, as this may flash to steam on the overheated plates of the boiler, causing greater volumes of steam and/or water to pass through the fusible plug.</li> <li>• In all cases, steam is to be vented from the boiler by whatever auxiliary devices that are available. An example could be a non-lifting injector, with the water turned off.</li> <li>• The failure of a fusible plug indicates a very serious situation. It is extremely important to know the emergency procedures of <u>the railway</u> concerned in the event of the failure of a fusible plug.</li> </ul>
<p>Q1.4.18      Why is it important that a train driver can give and interpret <b>hand signals</b>?</p>	<ul style="list-style-type: none"> <li>• Drivers work closely with other members of the train crew and other qualified railway personnel in the safe and effective operation of locomotives and trains. A key skill required of all the railway personnel concerned is being able to give and interpret the standard railway hand signals.</li> <li>• In various circumstances, these hand signals may be complemented by the use of flags and lights and radio equipment (e.g. where night work is involved).</li> <li>• Drivers must be proficient in giving these signals and using the equipment as per the railway's standard procedures. They must also be able to recognise and correctly interpret signals given by others.</li> <li>• Candidate will describe the signals used on the railway concerned.</li> </ul>
<p>Q1.4.19      <u>Describe the method of safe working on your railway and what actions you as steam locomotive driver need to take in relation to the authority to enter a section</u></p>	<ul style="list-style-type: none"> <li>• The candidate will describe the method of safe working on the railway concerned and will specifically describe the action a <u>steam locomotive driver</u> must take <u>in relation to the authority to enter a section</u>.(for that railway).</li> </ul>
<p>Q1.4.20      <i>Blank for additional question</i></p>	

## Question Set 1.5 Shutting down and stabling a steam locomotive

QUESTION	SAMPLE RESPONSE
<p>Q1.5.1 Describe the procedures for moving a locomotive to its <b>stabling position</b> in the yard?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the processes involved in uncoupling a locomotive and moving it to its stabling position in the yard as per the standard operating procedures of the railway operator concerned.</li> </ul>
<p>Q1.5.2 Describe the <b>post-operational checks</b> you must conduct for the locomotive(s) after service.</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the all of the required post-operational checks that need to be undertaken in conjunction with the fireman as per the railway operator's checklist and standard operating procedures for the type of steam locomotive concerned.</li> </ul>
<p>Q1.5.3 What <b>action</b> should be taken if faults or defects are identified during post-operational checks of the locomotive and its equipment?</p>	<ul style="list-style-type: none"> <li>• The standard operating procedures for taking action on identified defects and deficiencies may vary from one railway operator to another. The candidate will describe the standard operating procedures for the railway operator concerned.</li> <li>• At the least, the defects and deficiencies must be recorded and reported.</li> <li>• Depending on the railway operator's policies and procedures, the driver may <u>also</u> be required to .... <ul style="list-style-type: none"> <li>– rectify the defects and deficiencies, if possible,</li> <li>– isolate them, and/or</li> <li>– tag them.</li> </ul> </li> </ul>
<p>Q1.5.4 How is the locomotive <b>secured</b> in its stabling position?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the standard operating procedures of the railway operator for securing the type of steam locomotive concerned.</li> </ul>
<p>Q1.5.5 What <b>other tasks</b> might a locomotive driver undertake after securing the steam locomotive?</p>	<ul style="list-style-type: none"> <li>• Check that the locomotive driver's equipment kit (e.g. tools and other locomotive equipment) is complete and in good operational condition,</li> <li>• If there are any defective or broken components or if some parts of the kit or its equipment are missing, take appropriate action to report and rectify the problem, and</li> <li>• Make sure that the equipment kit is properly stowed and/or returned to store and is ready for use when the locomotive is next prepared for service</li> </ul>



<p>Q3.5.6      What <b>paperwork</b> must be completed after the locomotive is stabled and secured?</p>	<ul style="list-style-type: none"> <li>• Candidate will describe the all of the paperwork that must be completed as per the railway operator's checklist and standard operating procedures. This may typically include: <ul style="list-style-type: none"> <li>– time sheet</li> <li>– log or record of locomotive operations</li> <li>– reports of operational problems with the locomotive and/or any defective equipment identified and details of any action taken or required</li> <li>– reports of any safety incidents as per standard procedures and regulatory requirements</li> <li>– paperwork related to the return of equipment to store.</li> </ul> </li> </ul>
<p>Q3.5.7      <i>Blank for additional question</i></p>	<ul style="list-style-type: none"> <li>•</li> </ul>