

Justification:
Safety Instruction
(Maintenance)

**Private Owner
Circular Letter
506 Issue 4**

Title

**Non-Destructive
Testing (NDT) of
Axles by UAT and
MPI**

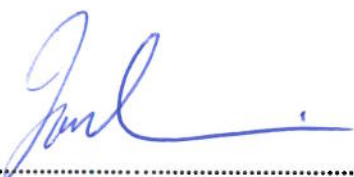
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AUTHORISATION

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I. INTRODUCTION

POCL 506, Issue 4 has been rationalised to clarify to Owners the requirements regarding:

- a). When to carry out UAT
- b). When to carry out MPI of axles.
- c). Which axles require an enhanced MPI regime.
- d). What to do with axles that are rejected for failing NDT.
- e). Axles that operate (or have operated) in a corrosive/reactive environment.
- f). Axle painting.
- g). NDT records.

POCL 506, Issue 4 supersedes POCL 563.

2. ULTRASONIC TESTING OF AXLES (UAT)

- 2.1 Before carrying out UAT it shall be ensured that there is no damage or defects to the axle end faces or axle body that would affect the testing. If any of the following damage or defects are found they shall either be rectified or advice sought from the Supervisor:

- a). Raised edges.
- b). Indentations.
- c). Depressions.
- d). Poor surface texture.
- e). Grooving.
- f). Damage to the axle end threaded holes.

Unless approved otherwise by the Senior PWRA Engineer (and incorporated into the maintenance documentation) axles shall be subject to UAT far end, near end and high angle scans, at the periodicities detailed as follows:

- 2.2 UAT of new axles (and those to be re-used in overhauled wheelsets)

Shall be subject to UAT before being assembled into a wheelset.

Note: When new axles are supplied in the form of complete wheelsets they shall be subject to UAT upon receipt unless this has been carried out by the wheelset supplier and documentary evidence is available.

- 2.3 UAT of axles assembled into wheelsets

To be tested before use (unless tested for any reason within the preceding six months) and subsequent to any of the following events:

- a). Re-wheeling.
- b). Wheel re-profiling.
- c). Replacement of axle-mounted brake discs, or other pressed-on items (e.g. pulleys).
- d). Renewal of axle bearings (repair or overhaul).
- e). Re-machining of axle (overhaul).

2.4 UAT of axles of 40 years (or more) old

At half the previous periodicity, unless advised differently by the Senior PWRA Engineer. Such axles shall be stamped with an 'X' in front of the manufacturer's/assembling contractor's code.

2.5 Absolute backstop periodicity for UAT

The UAT periodicity to ensure that axles remain safe in service may either be time, distance or event based as detailed in this instruction and the maintenance documentation. However, the periodicity shall never exceed 8 years.

3. MAGNETIC PARTICLE INSPECTION (MPI)

3.1 MPI of axles prior to assembly into a wheelset

Prior to being assembled into a wheelset, axles shall be subject to all-over MPI to confirm that no cracks are present.

3.2 MPI of axles in service

At every PPM and VIBT, axles shall be visually inspected for corrosion and damage to the surface coating. Unless there is only light surface corrosion present (that can be completely removed by wire brush or fine emery paper by hand) the axle shall be sent for overhaul or scrapped. When removing light corrosion it shall be ensured that:

- a). The axle surface is not damaged or scratched.
- b). The axle surface coating re-instated.

3.3 MPI of axles at wheelset repair (excluding re-profiling)

When wheelsets are repaired i.e. when no interference fits are broken (other than those for axle bearings) then all those parts of the axle that are exposed shall be subject to MPI to confirm that no cracks are present.

When axle bearings are removed from a wheelset all associated items such as abutment rings shall also be removed and MPI carried out on all the then exposed areas.

3.4 MPI of axles at wheelset overhaul

All axles at wheelset overhaul i.e. when the wheelset is fully disassembled and stripped shall be subject to all-over MPI to confirm that no cracks are present. However, in certain applications and with particular axles MPI is required to be carried out at set mileage periodicities. Details of axles requiring MPI at set mileage periodicities are provided in Section 4.

3.5 MPI when axles are transferred between vehicles

When an axle is transferred between vehicles without MPI being carried out as part of the transfer, then controls shall be in place to ensure that the periodicity of MPI of that axle is not exceeded.

All the mileage figures quoted are absolute limits. Owners (or their agents) shall have auditable systems in place for the recording of mileage and management of their axles to ensure that the mileage limits are not exceeded.

3.6 Absolute backstop periodicity for MPI

The MPI periodicity to ensure that axles remain safe in service may either be time, distance or event based as detailed in this instruction. However, the periodicity shall never exceed 8 years.

3.7 MPI of axles of 40 years (or more) old

At half the previous periodicity, unless advised differently by the Senior PWRA Engineer.

3.8 Alternatives to MPI

The requirements for MPI detailed in this document shall be complied with unless an alternative process (accepted by an Approval Body) is used. All such alternatives shall produce a level of risk reduction at least equivalent to the requirements detailed in this document.

4. 'HIGH RISK' AXLES REQUIRING A REDUCED PERIODICITY OF MPI

4.1 MPI of axles on vehicles fitted with pedestal suspensions

Previous work has shown that there is a need for specific instructions for MPI testing of axles fitted to vehicles equipped with pedestal suspensions as follows:

- 1). Two- axle pedestal suspensions (Gloucester and BSC).
- 2). Bogie pedestal type suspensions (Gloucester GPS, BSC Axle Motion).

4.2 Axles fitted to two-axle wagons with pedestal suspensions

Axles manufactured from BR109 Grade 2 steel, or from steel with a UTS of <u>greater than or equal to</u> 656 N/mm ²	
Axles in general traffic	Axles in a corrosive environment
MPI at 35,500 laden miles	MPI at 25,500 laden miles

Axles manufactured from BR109 Grade 2 steel with a UTS of <u>less than</u> 656 N/mm ²	
Axles in general traffic	Axles in a corrosive environment
MPI at 27,500 laden miles	MPI at 21,500 laden miles

4.3 Axles fitted to four-axle wagons with bogie pedestal suspensions

Axles manufactured from BR109 Grade 2 steel, or from steel with a UTS of <u>greater than or equal to</u> 656 N/mm ²	
Axles in general traffic	Axles in a corrosive environment
MPI at 192,500 laden miles	MPI at 127,500 laden miles

Axles manufactured from BR109 Grade 2 steel with a UTS of <u>less than</u> 656 N/mm ²	
Axles in general traffic	Axles in a corrosive environment
MPI at 140,000 laden miles	MPI at 102,500 laden miles

4.4 Axles to Gloucester Drawing No. 6147/A0 with a mid-span diameter of 162mm

Due to their small axle body diameter and corresponding higher stresses these axles shall not be used in corrosive environments. They shall also have a reduced MPI periodicity as follows:

Axles fitted to vehicles of 90 tonne GLW with Gloucester GPS 22.5t bogies (Note: As supplied for certain 90 tonne bogie hopper wagons and 90 tonne bogie LPG tank wagons)	
Axles in general traffic	Axles in a corrosive environment
MPI at 32,500 laden miles	NOT TO BE USED

Axles fitted to vehicles of 82 tonne GLW with Gloucester GPS 20.5t bogies (Note: As supplied for certain 82 tonne container carrying wagons)	
Axles in general traffic	Axles in a corrosive environment
MPI at 100,000 laden miles	NOT TO BE USED

4.5 Axle to Drawing No. F-A0-7703 (previously F-A0-3639)

Axles fitted in three-piece bogies	Axles in two axle non-pedestal suspensions
MPI at 206,000 laden miles	MPI at 43,000 laden miles

Axles fitted to Alcan PCA fleet wagon numbers BAHS 55531 to 55573 only
MPI at 100,000 laden miles, subject to all of the following conditions being met:
a) Maximum 45 tonnes GLW.
b) Wagons fitted with parabolic springs in UIC double link suspension.
c) UAT periodicity 150,000 miles or 5 years (whichever is the soonest).
d) Operating at 50% tare, 50% laden.
e) Axles remain captive to this particular fleet.

Note: If axles to Drawing No. F-A0-7703 are used in pedestal suspensions then the requirements of Clauses 4.2 and 4.3 shall apply.

4.6 Axle to Drawing No. S-18597 1986

This axle shall only be used in two-axle leaf spring suspensions. MPI at 340,000 laden miles.

4.7 Wheelsets to Drawing No. F-S-1589: 22/23 tonne axle load

Wheelsets to the above drawing (which superseded SW/DE/38211) for Grade 2 axles, are not suitable for use at an axle load of 22/23 tonne on either a pedestal, or other types of wagon suspension. This is because the axle mid-span diameter of 6" (150 mm) is too small for the axle load concerned and results in overstressing of the axle. Such axles shall be replaced by axles with a mid-span diameter of at least 6¾" (171 mm) for acceptable axle stresses.

5. **AXLES REJECTED FOR FAILING NDT**

All axles rejected for failing NDT shall be removed from service. Unless there is a specific (and certificated) procedure for recovering that particular axle type, it shall be scrapped by cutting in two. Axles rejected for failing NDT, but awaiting recovery shall be quarantined and remain clearly marked with a red band around the body with the word 'SUSPECT' adjacent in red paint; they shall not be stamped.

6. **ADDITIONAL REQUIREMENTS FOR AXLES OPERATING (OR THAT HAVE OPERATED) WITHIN A CORROSIVE/REACTIVE ENVIRONMENT**

All axles operating or that have operated within a corrosive/reactive environment shall at every wheel re-profiling be subject to:

- a). An approved process of MPI between the wheelseats.
- b). A near end scan and high angle scan ultrasonic axle test to an approved ultrasonic test procedure.
- c). A far end scan.

This maintenance regime should be continued on axles no longer operating within a corrosive/reactive environment until the axle is overhauled, stripped of its protective coating and subject to MPI or similarly sensitive NDT technique.

As part of the annual review of maintenance documentation the current best industry practice for testing wheelsets subject to this environment shall be considered to ensure that the 'best' approach continues to be adopted on these critical axles. Any change to the test regime shall require certifying by an Approval Body.

7. NDT OF AXLES INVOLVED IN A COLLISION, STRUCK BY AN OBJECT ON THE TRACK OR DERAILED.

Axles shall be subject to NDT if involved in any of the above incidents where:

- a). The speed was greater than 10 mph.

or
- b). The distance run derailed was more than 100 metres.

or
- c). There is visible damage to the wheelset.

8. AXLE PAINTING

All axles shall be protected from corrosion by a paint system that is suitable for the wagon's operating environment. In particular it is essential to ensure that adequate corrosion protection is provided, especially in the area of the axle bearing abutment to wheelseat transition radius, which is known to be at high risk of corrosion cracking. The paint system shall be maintained as required in service to ensure no corrosion of the axle takes place.

9. NDT RECORDS

Records of all NDT (i.e. UAT, MPI or an approved alternative) shall be retained either by the Owner (or wheelset overhaul contractor) for a period of five years beyond the axle's service life. When wheelsets are scrapped, the reason for scrapping shall be recorded.

10. SCOPE

This POCL is applicable to all axles on PWRA registered wagons.

11. IMPLEMENTATION

This document shall be implemented immediately.

In the event of any query arising, or clarification required, please contact:

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