

No.3 Standard Vacuum Brake Ejectors

Designed by BBI Engineering Ltd. for PNP Railways Ltd.

Instructions for Fitting and General Notes

Introduction

The No.3 ejector has been evolved following considerable experimentation to provide a reliable and efficient means of creating vacuum on steam locomotives for powering brake systems fitted to larger 7¼" and 10¼" gauge rolling stock.

The ejector performance has been optimised to achieve the following:-

- Create 21" Hg. vacuum over a working range of approximately 50 p.s.i. using reasonably dry saturated steam.
- The ejector to maintain this level of vacuum up to 120/150 p.s.i. as applicable.
- The rate of air ejection to be capable of exhausting a brake system appropriate to the size of the locomotive (approximately 20 in³ Sec⁻¹)
- Low steam consumption. The demand for steam to be as low as practicable and in proportion to the locomotive's grate area.
- The air clack to remain tight over long periods without maintenance.

The No.3 ejector will typically work trains of ten or more coaches depending on the reservoir sizes fitted and appropriate for a range of fire grate areas from 120 to 200 in²

The number 3 ejector features a renewable air cone and running nut for ease of positioning the exhaust connection.

Fitting Instructions

The ejector is supplied with male steam and train pipe couplings screwed 3/8" x 32 t.p.i. and 7/16" x 26 t.p.i. respectively. The couplings have flat faces, union nuts and nipples. The exhaust end is supplied with a running nut collar drilled 3/8" for soft soldering to the exhaust pipe. The ejector mass is kept to a minimum to avoid condensation losses. Do not use any jointing compound when assembling although a smear of 'copaslip' on the threads is acceptable.

It is necessary to fit a 5/32" bore (minimum) screw operated steam valve taking steam from the driest source available (preferably the dome but should work satisfactorily from the turret). Mount the valve in an easily accessible location in the cab with the body horizontal and the air clack vertically downwards. The serial number must be on the top. It is not desirable to bolt the ejector to the cab structure; it should be supported by the pipework.

Pipe the steam valve using 3/16" o.d. copper tube to the ejector and silver solder the pipe to the nipple provided. Keep the pipe length as short as reasonably possible or lag it with suitable insulation material.

The train pipe nipple is drilled ¼" diameter for ¼" pipe, although it is better to use 5/16" o.d. preferably brass tube for the brake pipe. This can be silver soldered to an adapter to the nipple provided. Run this pipe to the system Brake Pipe via the brake control valve. Ensure that the vacuum pipe system is thoroughly cleaned-through prior to assembly. Failure to complete this may render the non return valve inoperative.

The exhaust pipe may be of thin wall 3/8" o.d. copper or brass tube. It is recommended to keep the length as short as possible to limit back pressure, however, if it is desired to run the exhaust pipe to the smokebox, it will be found that the steam tends to condense and water droplets will be ejected from the chimney particularly when opening the steam valve. The pipe can be connected to an elbow and directed by another pipe upwards to the inside of the petticoat. Ensure that there is no constriction of the bore. It is possible to run the exhaust into the ash pan pointing towards the front of the grate. In this case, scarf the end of the pipe at 30° to diffuse the exhaust. Soft solder the end of the pipe to the ejector collar taking care to align the ejector as specified.

General Notes

1. There are 3 variants of ejector:

Type 3a will attain 21" Hg from a boiler pressure of around 40 psi up to 120 psi. At low boiler pressures (40 to 50 psi) the steam valve will need to be fully open. As the steam pressure rises it will be necessary to progressively throttle the steam supply. Between 100 and 120 p.s.i the steam valve will be almost shut.

Type 3b will attain 21" Hg from a boiler pressure of around 70 psi up to 120 psi. The steam valve may be kept fully open at all pressures.

Type 3c will attain 21" Hg from a boiler pressure of around 90 psi up to 150 psi. The steam valve may be kept fully open at all pressures.

Type 3d will attain 21" Hg from a boiler pressure of around 100 psi up to 150 psi. but has enhanced evacuation capacity (approximately 35 cu in per second).

2. The steam valve should be left open prior to setting off and remain open at all times that the train is in motion. It may be shut when stationary or standing at stations.
3. The only maintenance that should be necessary is to clean the air clack (wash through under the hot water tap) should excessive leakage become evident. Periodically, say yearly, the steam and air cones should be cleaned. This can be achieved by submerging the ejector body in a solution of hot kettle de-scaler for ten minutes. Wash thoroughly with clean, cold water after de-scaling and preferably blow out any trapped water using compressed air.

BBI VACUUM EJECTOR MOUNTING DIAGRAM

SIZE—NO.3

