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HAA 'Merry-go-round' Coal Hoppers

Build Details: 1964-1977 BR Darlington, Shildon & Ashford
Numbering: 350000-359571, 365000-366129, 368000-368459
Bogies / Suspension: Single link
Dimensions: 9041mm LOB, 5561mm Wheelbase
Published Drawings: BRW
Areas of operation: South Wales, East Midlands & Yorkshire, North East and Scotland
Main liveries: Unpainted bodywork, frames in brown, then red, then yellow, then maroon.

Summary:

The HAA wagon (and its derivatives) was part of a drive to improve the efficiency of the movement of coal to power stations. They became the most numerous air-braked wagon type, and quietly went about their business until they were eventually displaced by the closure of many collieries and the introduction of new wagon designs. Although large quantites were scrapped, many lived on, having been rebuilt as box wagons for carrying ballast.

Photos

For more pictures see the Links section at the bottom

HAA 365653 at Healey Mills 12th May 2001.
Paul Bartlett

History:

NB: This is a brief profile. It will eventually be upgraded to the standard of later profiles, with more detailed information.

The largest fleet of air-braked wagons built for BR comprised over 11,000 32-ton Coal Hoppers introduced under the 'Merry-go-round' concept. The basis of this was that the wagons could operate in a non-stop loop from collieries to power stations, both loading and unloading being undertaken while travelling at low speed. The track layout at the terminals was designed so that the operations could be performed without stopping or shunting.

Two prototype wagons were built at Darlington works in 1964, following which several large batches were constructed at the nearby Shildon works. Ashford also built one small batch of 160 wagons in 1965. Most of the early wagons (up to 355396) were originally lettered with B prefix numbers but these were later removed.

Operation was in block trains of up to 35 wagons, hauled generally by class 47 diesels fitted with the neccessary slow-speed controls. The class 56 diesels were designed with these services in mind and took over most services from 1976 onwards, later being joined by class 58s and 60s. The only time the wagons would be seen in other trains or singly was when they were in transit for repairs.

While the majority of the wagons were built as HAAs, the final batch (built in 1982 as 368000-368459) were coded as HDA to indicate their ability to operate at up to 60mph when empty instead of the standard 45mph. This was achieved through modifcations to the design of the brakes. Another variation, which did not initially result in a change of TOPS code, was the fitting of top canopies to increase the load volume. Many of the early wagons had these but then lost them and for some years canopied hoppers were only common in Scotland.

From the early 1990s further TOPS codes were introduced to show detail differences such as canopies and modified brakes. Many HAAs became HFAs, while all of the HDAs became HBAs, this code now being available since all the original HBA hoppers had been rebuilt as HEAs. Later codes used were HCA, HMA and HNA. 15 HAAs were rebuilt as china clay hoppers with a canvas roof (CDA), all but one of which were renumbered in the 375124-375137 range.

The livery of these wagons was of unpainted metal hoppers and black underframes. The hopper support framework was originally brown, then red with the introduction of the new Railfreight image in the late 1970s. When Railfreight re-invented itself in 1987, a new livery with yellow framework and a large coal sector logo on the hopper side was introduced. Under EWS the framework is now painted maroon. Merry-go-round hoppers were worked hard however, and the typical livery included a coating of coal dust. Some of the terminals served used stationery shunters to move the wagons forward at low speed. These often featured tyred wheels that gripped the wagon sides, resulting in horizontal streaks on the hopper sides.

The decline in the UK mining industry from the 1980s onwards made many of these wagons redundant. More of the type were replaced when EWS introduced a new batch of 1144 high-capacity bogie coal hoppers (HTA) from 2001. Although many HAAs were scrapped as being worn out, over 1000 have donated their underframes to be rebuilt as MHA low-sided box spoil wagons for infrastructure and general use. Conversions have been undertaken since 1997 and the new vehicles have been numbered in the 394001-394999 and 396000-396101 ranges. At least 10 other HAAs were modified as MSA Scrap Hoppers in 2004 and renumbered in the 397000-397013 range.

Queries:

References:

Links:

Photos of HAA wagons pre-1980 on Paul Bartlett's website

Photos of HDA wagons on Paul Bartlett's website

Photos of HAA wagons and variants from 1980 onwards on Paul Bartlett's website

Photos of HAA wagons with top canopies on Paul Bartlett's website

Photos of HAA wagons on Martyn Read's website

Photos of HBA wagons on Martyn Read's website

Photos of HCA wagons on Martyn Read's website

Photos of HDA wagons on Martyn Read's website

Photos of HFA wagons on Martyn Read's website

Photos of HMA wagons on Martyn Read's website

Photos of HNA wagons on Martyn Read's website

Photos of HAA wagons on Andy Jupe's website

Photos of HBA wagons on Andy Jupe's website

Photos of HCA wagons on Andy Jupe's website

Photos of HDA wagons on Andy Jupe's website

Photos of HFA wagons on Andy Jupe's website

Photos of HMA wagons on Andy Jupe's website

Photos of HNA wagons on Andy Jupe's website

Updates: *15/03/2013:* Photo links (finally) updated.

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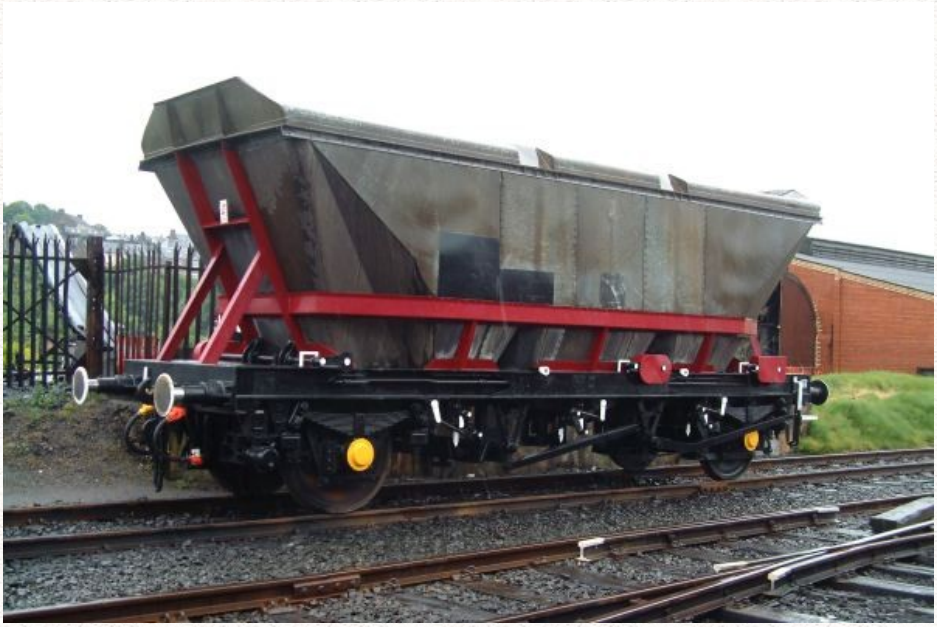
32.5 tonnes Merry-Go-Round (MGR) HCA hopper wagon, EWS no.350001



Built 1964, BR Darlington, Diagram 1/156. Roller bearings, air brake.
SRPS Core Collection, EWS livery.

This is the prototype MGR wagon type HOP 32AB, in which description "HOP" refers to the hopper design, "32" indicates the capacity in tons (achieved by utilising the volume of the top canopy) and "AB" refers to the air brake. The later TOPS designation of this variant of the MGR wagon is HCA - signifying that the wagon has a canopy and can run at 45mph loaded and 60mph empty in block formation.

The Merry-Go-Round system was introduced in 1964, as an innovative way of supplying coal from collieries to power stations using permanently coupled sets of high capacity, air braked wagons, automatically loaded and unloaded in a non-stop operation. Locomotives are provided with slow speed control, so that as trains pass through the handling plant they can be automatically loaded, discharged and weighed. Whereas previously wagons had to be individually shunted for unloading by tippling, in principle, merry-go-round trains require no shunting at collieries or power station.

The Merry-Go-Round system represented a considerable investment by British Railways and by the National Coal Board. However, it was estimated that each MGR wagon replaced about 14 older wagons. Fewer locomotives, sidings, train crews, shunters and wagon examiners were needed, and train speeds were faster, so making more effective use of the working railway.

Over 10,000 of these wagons were built, and they became the most common wagon type in service in Britain. A steel underframe and support frame support the galvanised hopper body. The hopper is steeply sloped to assist the rapid discharge of coal through three sets of bottom double doors (though discharge of wet coal can be difficult in freezing conditions). The air brake operates on discs on two wheels at opposite corners of the wagon. Single link suspension, Timken roller bearings and Oleo hydraulic buffers complete the modern specification.

Wagons built without a top canopy had a capacity of 26 tons. Those provided with a top canopy (or "top skip") could carry 32 tons, to which the wagon weight of 13 tons adds to 45 tons gross weight, which was the maximum load that could be carried on two axles when these wagons were designed.

Canopied wagons found extensive use in Scotland, where collieries such as Seafield at Kirkcaldy were equipped with modern loading facilities which could accommodate the extra height. Wagons delivering coal to Cockenzie Power Station, where no continuous loop line is provided, require to be shunted. However Longannet Power Station achieves optimum working by use of a loop line facility, and two trains can be unloaded simultaneously, subject to the capacity of the receiving bunker.

This wagon was generously donated to SRPS by EWS. It was overhauled, cleaned up and repainted at EWS Worksop MGR Depot before being delivered to Bo'ness on 30th June 2008.

More details from *HAA - The Wagon That Powered The Nation...*

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HAA - The Wagon That Powered The Nation...

The Merry-Go-Round Concept

Merry-Go-Round trains began operation in the mid 1960s and were an innovative way of supplying coal from collieries to power stations using permanently coupled sets of high capacity, air braked wagons automatically loaded and unloaded in a non-stop operation. It is from this continuous coming and going that the term Merry-Go-Round (MGR) was derived. Rather than each wagon being shunted under the colliery storage hopper or emptied into the power station's receiving hopper by a shunting locomotive the MGR train is drawn through at slow speed (typically ½ mph) by the train loco. At many power stations unloading took place on a continuous loop, thus avoiding the need to uncouple the locomotive. These included Longannet, Drax, Cottam, Didcot, Willington and Ferrybridge power stations. These loops are fully signalled to allow trains to be unloaded in succession.

Due to the requirement in the early 1960s to transport increased tonnages of coal (e.g. 34,000 tons was required by West Burton power station each week) to the new generation of power stations BR, Central Electricity Generating Board (CEGB) and the National Coal Board (NCB) needed to find a more efficient means of moving the coal. In response to this the MGR principle was unveiled by Gerard Fiennes in January 1963 and the High Capacity Wagon Design Committee was formed developing a new wagon coded HOP 32 AB (32 tonne payload, air braked) mineral hopper to be used in the MGR trains. The first prototype was ready in April 1964 and tests began at High Marnam power station although it has to be said that the NCB needed some convincing. One must bear in mind that investment was needed not only in new wagons but in permanent way, signalling, maintenance depots and high capacity bunkers able to load trains in quick succession. In the meantime Brush Traction also modified a Class 47 with Slow Speed Control (SSC) allowing it to run at a constant ½ mph.

The first use of MGR trains was in September 1965 at West Burton power station in Nottinghamshire where there was also a circular loop for unloading. The next power station to use the MGR system was Eggborough with the principle being extended to other power stations, cement and steel works and ultimately to the shipment of other raw materials such as iron ore and limestone

For unloading each wagon was fitted with automatic bottom discharge doors in the hopper controlled by fixed lineside equipment – cams automatically opened and closed the doors by means of safety catches and levers. However, not all MGR trains were loaded by rapid loading bunkers or unloaded as trains hauled by SSC fitted locomotives, particularly where collieries might be due for early closure and so outmoded handling methods remained in force. In some cases wagon moving devices were used such as where wagons were propelled by rubber tyred wheels leaving distinctive tyre tracks on the sides of the wagon hoppers.

As far as I am aware the first loco to be constructed with SSC was D1758 (later Stratford Union Jack celebrity 47164 and now 57305) allocated new to Tinsley on 23 May 1964. Apart from Class 33/2s, 50s and some Scottish based Class 20s and 26/0s the 200 SSC fitted Class 47/0s and 47/3s provided the backbone of the MGR fleet until the introduction of Class 56s from 1976. Thereafter all locomotives of classes 58, 60, 66 and 67 were fitted with SSC as well as some refurbished Class 37s. Interestingly the seven Class 26/0 D5300-D5306 converted in 1967 to work Cockenzie power station trains were the only Pilot Scheme locomotives to have been fitted with SSC – those Class 20s fitted with SSC were predominantly built in 1967/68. The SSC equipment fitted to Class 50s was removed when the locomotives were refurbished at Doncaster Works. As would be expected train set sizes vary depending not only on the locomotive but also on line and terminal restrictions and are typically between 28 and 45 wagons.

There are many advantages to the high capacity air-braked wagons of the MGR system compared with unfitted or vacuum braked 16T mineral and 21T hopper wagons, the design of which did not lend itself to automatic unloading. These include the fast loading and discharge of coal, automatic weighing, the requirement for fewer locomotives, wagons and sidings, better utilisation of rolling stock and train crew, less need for shunters and shunting, and greater speed and safety. Even over short distances coal carried this way was competitive. In short, MGR trains were a far more efficient, economical and speedy way of transporting coal from pit to power station not least because the new generation of power stations built from the 1960s were much larger. Indeed by 1975 60% of coal carried on the Eastern region of BR was in HAA MGR wagons.

The HAA Wagon and Derivatives

The two wagon prototypes, numbers B350000 (HOP AB, later TOPS code HAA) and B350001 (HOP 32 AB with canopy later TOPS code HBA) were built at Darlington Works in 1964. Whereas Darlington works was closed in 1966 nearby Shildon Works was modernised and continued building and repairing wagons until closure in 1985 and with the exception of 160 wagons built at Ashford built all 10702 HAA and 460 HDA (see below) wagons. Somewhat appropriately 350000 remains in County Durham and is preserved at the National Railway Museum's Locomotion at

Shildon. With the exception of continental stock these wagons represented the first series production of air-braked wagons for BR and were ultimately to become the most common single type of wagon in the modern fleet.

Apart from the exceptions mentioned later (and see table 2) the HAA design remained pretty much standard throughout its production run. Dimensions are given in table 1 below. Construction consisted of a steel underframe and framework supporting the galvanised hopper body. The body was made up of three steep sided chambers to assist the rapid release of coal through the double doors at the bottom of each chamber. The train brake operated on discs on two wheels on opposite corners of the wagon with the clasp handbrake operating on the other two wheels. Each wagon was fitted with Timken roller bearings, Oleo hydraulic buffers and single link suspension. The initial livery was black for the underframe and running gear, bauxite for the hopper framework and unpainted galvanised steel for the hopper itself.

As per the initial design, HOP 32 AB, some wagons were built or fitted with a canopy and this top extension allowed a greater payload of 32 tonnes thus utilising the maximum axle weight of 22.5 tonnes per wagon. However these canopies were only of use where the height of the colliery screens permitted their operation and were largely confined to Scotland.

In use it was found that the four cross struts on top of the body and intended to stiffen the sides were being damaged by the weight of coal dropping on to them and thus potentially causing distortion to the bodysides. The solution to this problem was to rivet a stiffening plate along the length of the body and dispense with the cross struts. From 1977 all new build or rebodied wagons were treated this way and the extra row of rivets distinguishes these wagons.

Table 1: dimensions

	HAA	HAA with canopy	HEA
Length (mm)	8001	8001	7420
Wheelbase (mm)	5563	5563	4572
Width (mm)	2692	2692	2700
Height (mm)	3200	3645	3250
Wheel diameter (mm)	1092	1092	1092
Tare weight (tonnes)*	12.5	13.25	13.2

*These are approximate weights and if anyone can confirm exact tare weights I would be grateful. Rebodied wagons are about 1 tonne heavier due to the thicker steel used.

The final batch of 460 MGR wagons was introduced in 1982 and being allowed to travel at a higher loaded top speed of 60mph were given the TOPS code HDA rather than HAA which were restricted to 45 mph loaded or 55 or 60 mph empty. This higher top speed was achieved by uprated braking and suspension which meant that the HDA wagons were better suited to long haul or Speedlink services.

With the elimination of unfitted and vacuum braked coal wagons HAA wagons dominated coal traffic prior to the introduction of high capacity bogie wagons, e.g. EWS HTA and Freightliner HHA. Such was the domination of coal transport to power stations that in the severe winter of 1978/79 widespread freezing of wet coal in wagons seriously threatened generating capacity. This was quite literally due to coal, which is washed, freezing in the bottom of wagons or sticking to the doors preventing closure and effective trials were carried out using an anti- freeze type chemical to treat wagon bottoms.

Today all surviving wagons are part of the EWS fleet and although the majority of the fleet has been withdrawn over 2000 remain in service. This reduction of the HAA fleet is not just due to new bogie wagons but to the shift to gas fired power stations in recent years. However, the increasing demand for coal due to surging gas prices may be the saviour for some HAA wagons in the short term. There remains the requirement for HAAs because of line restriction, for example, to Longannet due to the axle loading of HTAs precluding their use over the Forth Bridge.

The last remaining working using canopy fitted wagons is on the Hardendale – Redcar limestone service making use of a mixture of wagons with TOPS codes HBA, HCA, HFA and HNA.

Although out of the scope of this article mention must be made of the CDA China Clay hopper based on the HAA design (built in 1987) or converted from HAA hoppers most of which are still in service as well as the PFA limestone hoppers (built in 1969) and those wagons using redundant HAA and HEA chassis (see table 2).

The HEA Domestic Hopper Wagon

Apart from coal to power stations much coal was also transported for domestic and other industrial use where it was uneconomic to install specialised MGR unloading equipment. In 1976 the HBA hopper wagon was introduced to work these services and 1998 wagons had been built at Shildon by 1979. They are of a somewhat different design from the HAA wagon in that the hopper is made of steel and consists of two rather than three chambers with a simplified door operating mechanism. They had a payload of 32.5 tonnes and a maximum speed of 60 mph. In order that the wagons could travel at 75 mph they were modified with Bruninghaus springs and those built with or later fitted with Bruninghaus suspension were re-classified as HEA.

Amongst other things, HEA wagons have been used to carry coke, scrap metal (coded HSA) and the covered CEA version was even used to carry calcified seaweed. In August 2006 the only freight flows utilizing HEAs are coke trains from Port Talbot and Redcar to Scunthorpe Steelworks.

Conclusion

It is fair to say that like the High Speed Train, the Merry-Go-Round is one of the defining icons of the modern British railway industry. However, unlike the HST, all our lives have been affected over the last 40 years by MGR trains continually and reliably shifting coal from colliery to power station to supply us with our electricity needs. Railways were invented to carry coal. This is what they do best and the HAA wagon has carried on this tradition albeit as a radical departure from the way coal was previously hauled. For these reasons alone it would be fitting that a complete set of HAA be preserved as a lasting tribute.

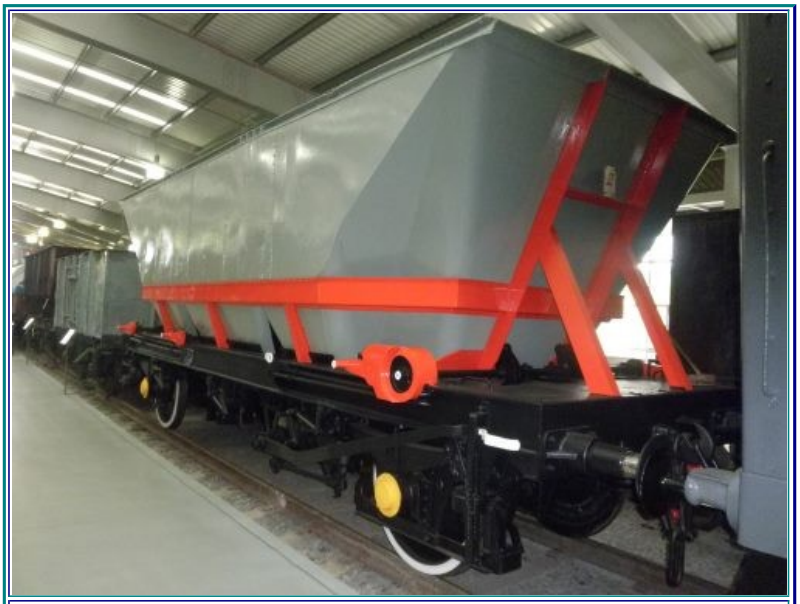
Table 2: TOPS Codes
N.B. this is not a definitive list and many wagons carry erroneous wagon codes
CBA 2-axle Covered Limestone Hopper [COVHOP 32 AB]
CDA 2-axle Covered China Clay Hopper for English China Clays
CEA 2-axle Covered Hopper (ex HEA)
HAA 2-axle MGR Coal Hopper [HOP AB]
HBA Initial designation of 2-axle Domestic Coal Hopper
HBA 2-axle MGR Coal Hopper fitted with canopy [HOP 32 AB]
HCA 2-axle MGR Coal Hopper fitted with canopy
HDA 2-axle MGR Coal Hopper, maximum speed 60 mph
HEA 2-axle Domestic Coal Hopper fitted with Bruninghaus suspension
HFA 2-axle MGR Coal Hopper fitted with aerodynamic canopy
HMA 2-axle MGR Coal Hopper fitted with modified brake
HNA 2-axle MGR Coal Hopper fitted modified brake and canopy
HSA 2-axle Scrap Steel Hopper (ex HEA)
MAA 2-axle Box Open Wagon (ex HAA)
MEA 2-axle Box Open Wagon (ex HEA)
MFA 2-axle Low Sided Box Open Wagon (ex MEA)
MHA 2-axle 'Coalfish' Low Sided Box Open Wagon (ex HAA)
RBA 2-axle MGR Coal Hopper fitted with pneumatic doors (only 359571)
RMA 2-axle Brake Force Vehicle (ex HAA)
RNA 2-axle Barrier Wagon (ex HEA)

Jonathan Makepeace
My thanks go to Paul Bartlett, Paul Fuller, Lee Davies

References:

- Middleton, R.G., *Problems of Discharging Coal from MGR Wagons in Winter,* BR Research Report Ref: TM-DON-8, September 1981
- Monk-Steel, D., Bartlett, P.W. & Mann, T., *BR Air-braked Coal Hopper wagons*, Model Railway Constructor Annual 1987,pp 20-36 edited by Leigh, C., 1987

BR 350000 MGR Coal Hopper built 1964



BR 350000 MGR Coal Hopper built 1964

Present Location	NRM Shildon
Designed For	BR
Built by	BR
Where built	Faverdale
General type	4w Light Alloy Hopper
Specific type	Hop AB
First Number	350000
Present Number	350000
TOPS code	HAA
Owner	National Railway Museum
Diagram number	1/156
Lot number	3495
Status	Restored
Condition	Excellent
Capacity (tons)	32
Operating	No
Stored	In the open
Number of Wheels	4
Wheelbase	18 ft 3 in
Rarity	Many
Notes	Prototype.
Inspected by	Alan Moore
Date of Inspection	02/02/2010
Photo by	Philip Walton
Photo Date	12/07/2011
Date Record Last Updated	29/07/2011

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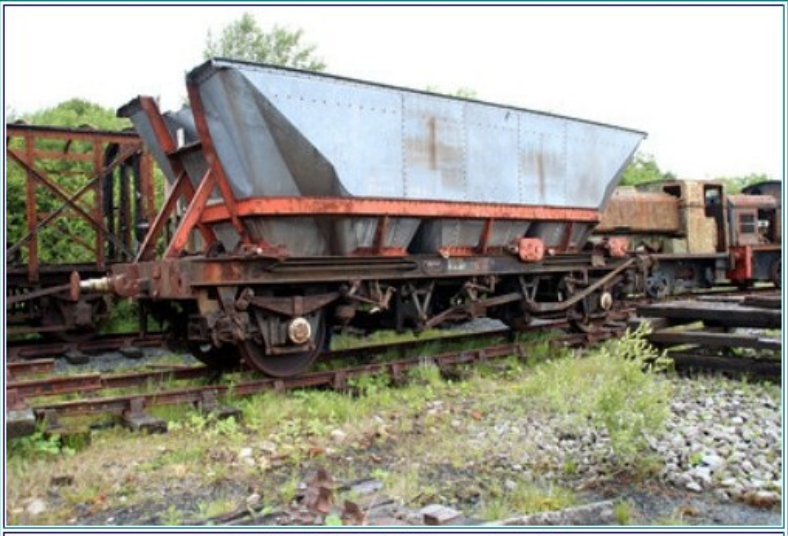
BR 354456 MGR Coal Hopper built 1968



BR 354456 MGR Coal Hopper built 1968

Present Location	Scottish Industrial Railway Centre
Designed For	BR
Built by	BR
Where built	Shildon
General type	4w Light Alloy Hopper
Specific type	Hop AB
First Number	354456
Present Number	354456
TOPS code	HAA
Owner	Ayrshire Railway Preservation Group
Diagram number	1/156
Lot number	3670
Capacity (tons)	32
Number of Wheels	4
Gauge	4ft 8 1/2in
Wheelbase	18 ft 3 in
Rarity	Many
Inspected by	Allan Jenkins
Date of Inspection	23/06/2013
Photo by	Allan Jenkins
Photo Date	23/06/2013
Date Record Last Updated	07/11/2013

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