

# CLASS 317



“STEP ABOARD  
YOUR NEW TRAIN”

Rail People  
Real Expertise

## FOREWORD

There has never been a greater need to provide increased capacity and the highest levels of quality in a cost effective manner.

Angel Trains has invested over £7 million in developing a package of comprehensive improvements to our Class 317 trains that gives passengers not only that new train quality and comfort, but can also

deliver improved reliability, speed and energy efficiency.

The bright, modern interior increases seating capacity ensuring that passengers can travel in comfort and get on and off the train with ease.

Please contact us so that we can introduce our demonstrator unit and see what we are talking about.



MALCOLM BROWN

# ALL THE BENEFITS...



## ROOM TO GROW

Optimised seating arrangements to accommodate increased passenger numbers.



## ENHANCED INTERIOR

Passenger environment upgraded to meet the expectations of a modern train in the modern world.



## EASY ACCESS

Improved layout to make it easier for passengers to get on and off the train.



## PERFORMANCE

High maximum speed, with good acceleration and deceleration to meet timetable requirements.



## MAINTENANCE

Reduced maintenance activities and costs compared to an old train.



## COST

Reduced maintenance and operating costs and more cost effective than a new train.



## RELIABILITY

Improvement in reliability through a modern traction system found on new trains.



## ENVIRONMENTAL

Reduced power consumption through a more effective traction system with regenerative braking as fitted to new trains.

# ...OF A NEW TRAIN.





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# STEP ABOARD YOUR NEW TRAIN



Angel Trains recognise the importance of identifying what the target passenger market is and what their specific requirements are when travelling, as well as what the current and future ridership demands of the routes will be.

There must be the right balance between capacity, comfort, facilities and ambience.

In most cases, trains are serving the demands of different markets and therefore compromises often have to be made. The key to an

efficient layout is to make these work together most effectively.

Angel Trains has proactively undertaken concept studies to look at various different interior layouts and seating configurations.

The high capacity seating layout is aimed at commuter railways, where passenger numbers are high and journey times are such that passengers will require a seat as well as a comfortable travelling environment.



# CAPACITY AND COMFORT

The outer suburban style layout is focused on maximising seating capacity where average journey times for passengers are greater.

There is greater emphasis on comfort in terms of seating configuration, spacing and carpet rather than vinyl floor coverings.

Interior layouts also need to give due consideration for the provision of toilets, luggage storage facilities,

lighting, flooring and provision of spaces for passengers with reduced mobility, including those in wheelchairs.

Any changes to the vehicle interiors will always be undertaken to ensure compliance with the accessibility legislation.

Class 317 3+2 seating style layouts are illustrated here.





# FULL SPEED AHEAD

## TRACTION IMPROVEMENTS

Angel Trains has replaced the existing DC traction equipment on a Class 317 unit with a modern AC traction system.

Unit 317722 has been fitted with the new traction system and has successfully passed its testing and trial period in passenger service.

The current configuration of the Class 317 is a four-car unit, consisting of one motor car and three trailer cars, with the motor car housing all of the traction and high voltage equipment. The roof-mounted pantograph and high voltage circuit breaker are connected to the underframe mounted main transformer via the HT cable.

The wheelsets are powered by four axle-hung DC traction motors which are electronically controlled by solid-state thyristors, which vary the voltage supply to the traction motors and simultaneously convert the current from AC to DC.

The units are re-tractioned by removing the DC motors and replacing them with new AC traction motors fitted to the existing gearboxes. The phase controlled converters for the DC motors will be replaced with AC converters feeding the asynchronous AC traction motors. The existing transformer is retained and inductors will be connected between the transformer secondary windings and the line converter.

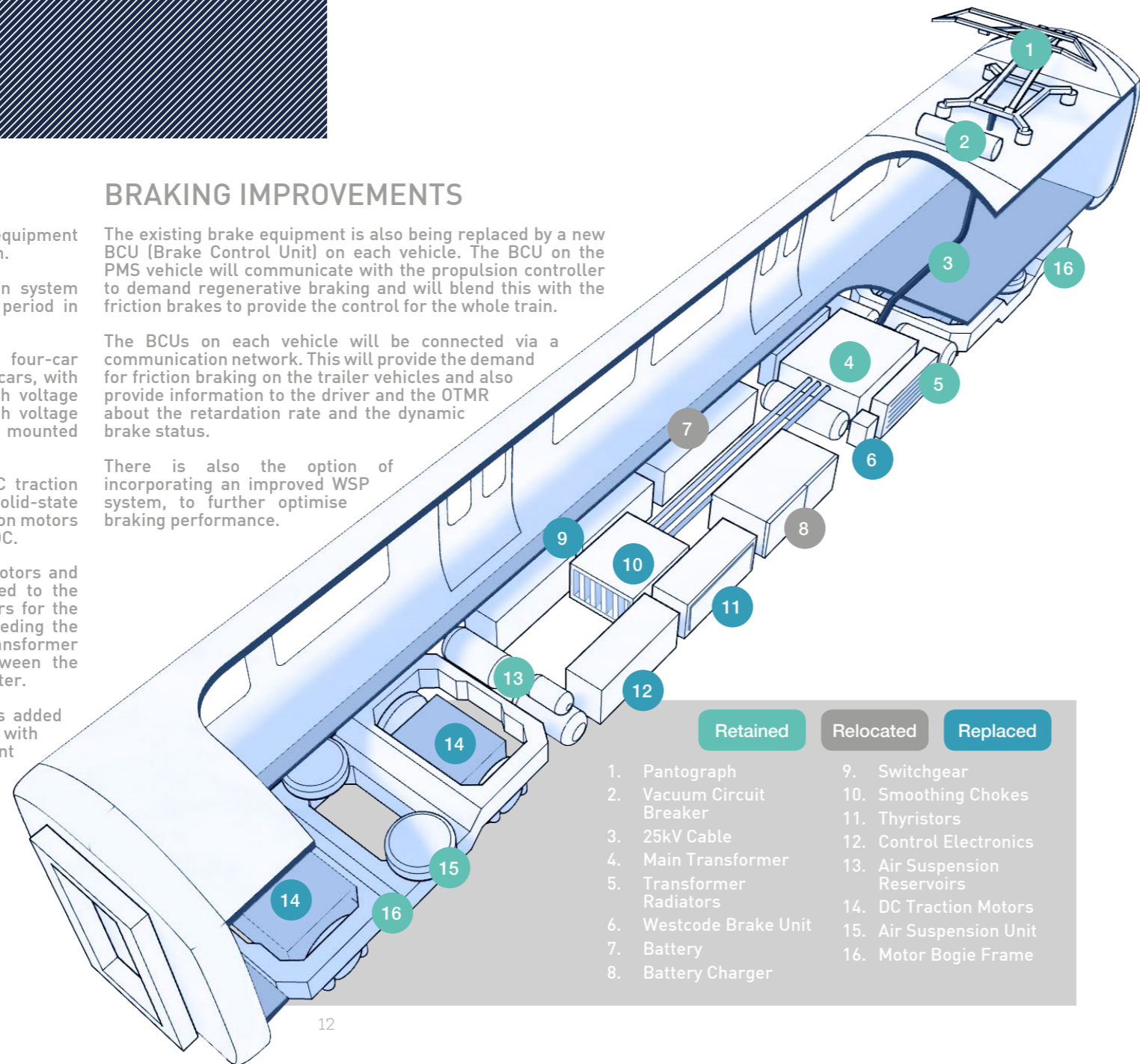
A new Voltage Measurement Transformer (VMT) is added to the roof to provide the propulsion equipment with information about the line voltage and a new Current Measurement Transformer (CMT) will be added to the underframe next to measure the current used.

## BRAKING IMPROVEMENTS

The existing brake equipment is also being replaced by a new BCU (Brake Control Unit) on each vehicle. The BCU on the PMS vehicle will communicate with the propulsion controller to demand regenerative braking and will blend this with the friction brakes to provide the control for the whole train.

The BCUs on each vehicle will be connected via a communication network. This will provide the demand for friction braking on the trailer vehicles and also provide information to the driver and the OTMR about the retardation rate and the dynamic brake status.

There is also the option of incorporating an improved WSP system, to further optimise braking performance.



## PERFORMANCE

The maximum speed of the Class 317 remains unchanged at 100mph; however the new traction system, improves the acceleration of the train allowing faster journey times, and increased power allows the timetable to be maintained even under crush laden conditions.



## MAINTENANCE

AC traction motors require less maintenance, as they do not require brush changes or intrusive commutator work. Diagnostic tools can be used to allow predictive maintenance and to improve the speed and efficiency.

Regenerative braking results in a reduction in brake pad changes enabling the potential for maintenance periodicities to be extended.



## RELIABILITY

The replacement traction system will bring about a step change in the reliability performance of the Class 317 units with the performance of the traction system being more akin to a new train.

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## TRACTION BENEFITS



## ENVIRONMENTAL

It is predicted that with regenerative braking operational, the power consumed by the replacement traction system will be around 60% of that consumed by an existing Class 317 on the same journey. It is also anticipated that the power factor of the unit will be improved and this will help to reduce Network Rail's distribution losses.



## COST

Cost benefit will be realised through reduced maintenance and operating costs.

# FLEXIBLE FORMATION

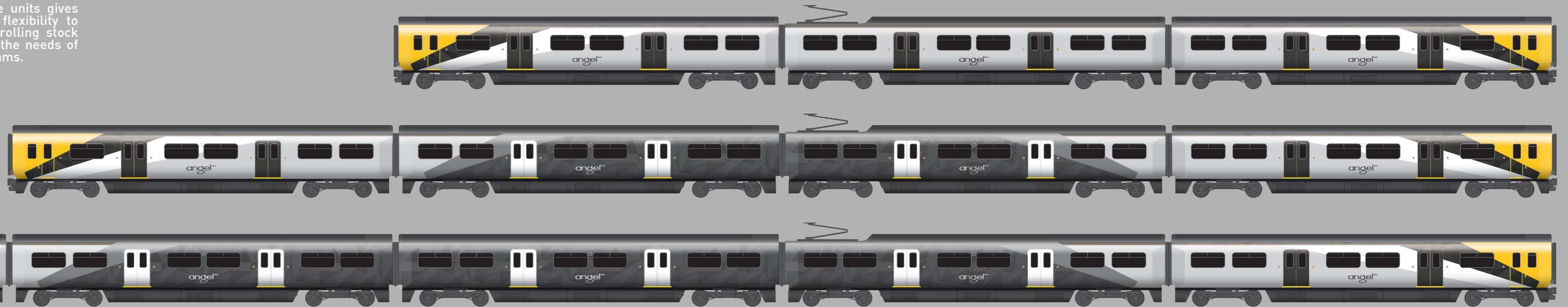
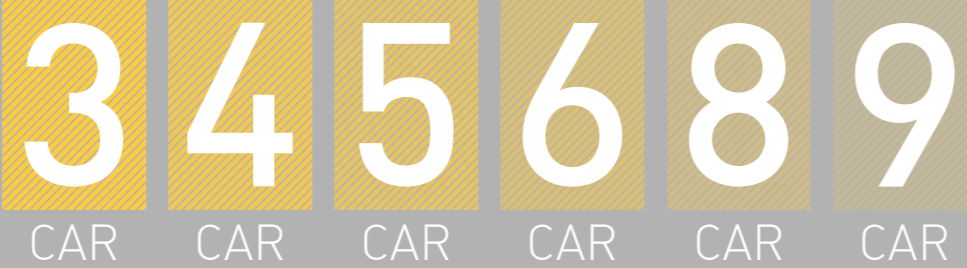
The Class 317 unit comprises four vehicles; two driving trailer vehicles, an intermediate trailer vehicle and an intermediate motor vehicle.

The units can be operated in multiple to give an eight or twelve-car formation. For certain routes with limited platform space, it may be beneficial to run the units in formations of three, five, six or nine vehicles.

In order to achieve this, it is possible to re-form the units into three or five-car units or a mixture of both. A three-car unit can be created by removing the intermediate trailer vehicle from the unit.

There are no main electrical or pneumatic circuits affected by the re-formation of the units into three or five-cars and, by inspection, the maximum draw-gear loads are within the existing range.

The reformation of the units gives franchise bidders the flexibility to be able to match the rolling stock capacity and length to the needs of the route and the diagrams.



Angel Trains has analysed the journey times of a Class 317/5 unit operating in three, four and five-car formations.

Operating as a three-car unit provides significant performance improvements. On a typical outer-suburban route (Liverpool Street to Cambridge) the unit would arrive at the

final destination around five minutes earlier. A five-car unit is slightly slower and would increase the same journey time by approximately two minutes.

When re-formed in to 3-car units, the Class 317 units perform better with reduced journey times.

Reconfiguration can provide benefits in terms of performance and reduced energy consumption, particularly when regenerative braking is used reducing the overall operating costs of a Class 317 unit, whilst also delivering maintenance and environmental benefits.

“CLASS 317 UNITS PERFORM BETTER WITH REDUCED JOURNEY TIMES”





# ENHANCED CUSTOMER ENVIRONMENT

## A COMFORTABLE COMMUTE

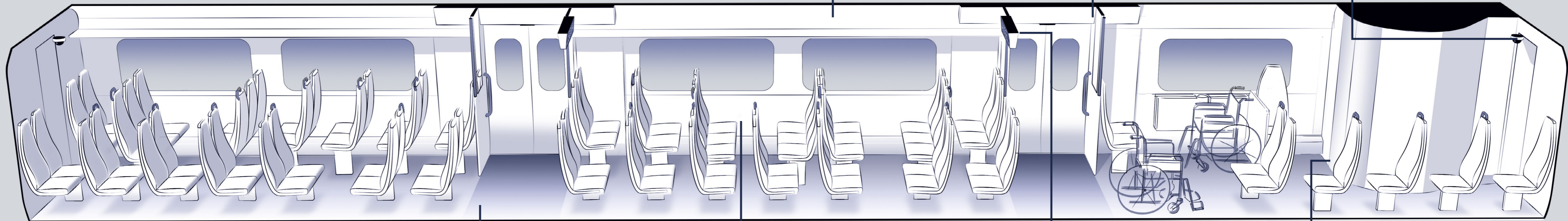
Climate control air conditioning system provides greater passenger comfort.

## PASSENGER DEMAND MANAGEMENT

Passenger counting allows Operators to understand usage patterns and deploy trains accordingly.

## CAUGHT ON CAMERA

Improved passenger security through the provision of CCTV cameras provides a safe environment for passengers and staff.



Keeping passengers connected while on the move through WiFi connectivity.

## WORLDWIDE CONNECTION

Selective door opening enables the train to stop at different platform lengths and open the doors safely.

## OPERATIONAL FLEXIBILITY

Provision of USB plug sockets allow passengers to keep their devices powered.

## KEEPING PASSENGERS SWITCHED ON

Information displays throughout the train give passengers real-time updates on station stops. Additional screens can be provided for advertising or onward journey information.

## INFORMING THE PASSENGER

Environmentally friendly toilet retention tanks allow waste to be collected and disposed of properly.

## IMPROVED HYGIENE





# RELIABILITY IMPROVEMENTS

Fitment of new LED headlights along with combined tail/marker lights provide the benefit of longer life with less energy consumption, whilst providing a more modern aesthetic appearance to the units.

## HEADLIGHTS

## DRUM SWITCH TIP REPLACEMENT

Replace the existing drum switch tips with a new replaceable tip arrangement to allow easier maintenance.

Replace the existing wiring between the auto-connector and drum switch with a plug and socket harness arrangement reducing the maintenance down-time and minimise risks associated with the repeated disconnection and reconnection of individual train wires.

## AUTOCOUPLER TO DRUM SWITCH HARNESS

A multi-point locking mechanism on the cab door to improve security when un-occupied.

## INTERNAL CAB DOORS

Replace the existing brake controllers with a new direct replacement controller to address reliability and obsolescence issues. The replacement controllers include new cams, contacts and relays.

## BRAKE CONTROLLERS

Monitor the door opening and closing times to provide an indication to maintenance staff of any issues before they lead to a door failure in service. Indication can be provided through local LEDs or optional remote download for technical staff.

## DOOR CONDITION MONITORING

New weather seals and nosing rubbers fitted to improve the sealing between adjacent door leaves.

## DOOR SEALS

Fitment of new door leaves to address the issues caused by the swelling of the existing door leaves which has the added benefit of improving the appearance of the doors.

## DOOR LEAVES

Fitment of a new door threshold plate to prevent corrosion and swelling of the underfloor and allow the brush seal to be replaced without further removal of the threshold strip.

## DOOR THRESHOLD STRIP

Fitment of a new full width door header panel gives access to all of the door header gear from one end of the door track to the other which will improve access for maintenance. In addition, larger access hatches at the bottom of the door pocket will allow greater access to clean out the door runner.

## DOOR MAINTENANCE





# LASTING IMPRESSIONS



First and last impressions are always important and trains are no different.

Whether a regular commuter or an occasional traveller, it is the exterior of the train that first catches the eye.

The exterior livery allows the Operator to extend their brand image to the train or can even provide mobile advertising.

Whilst certain aspects of the livery are constrained by industry standards, the majority of the bodysell can be seen as a blank canvas upon which the Operator can express themselves.

Together with Seymourpowell, Angel Trains has developed new designs and colour schemes on our rolling stock to demonstrate the type of livery options that are possible.

# BEFORE AND AFTER

PARAMETER	BEFORE	AFTER	IMPROVEMENT
Acceleration - 0-100mph	223 Seconds	177 Seconds	✓
Maximum Speed	100mph	100mph	
Regenerative Braking	No	Yes	✓
Seating Capacity*	198	323	✓
Total Capacity*	369	467	✓
PRM TSI Targeted Compliance	No	Yes	✓
Air Conditioning	No	Yes	✓
Passenger Information System	Yes	Upgraded	✓
Closed Circuit Television	Yes	Upgraded	✓
WiFi Connectivity	No	Yes	✓
USB Power Sockets	No	Yes	✓
Passenger Counting	20% Fitted	30% Fitted & Upgraded	✓
Selective Door Opening	No	Yes	✓
Toilet Retention Tanks	No	Yes	✓
Ethernet Backbone	No	Yes	✓
External Door Improvements	No	Yes	✓
Train Length	4 Car	3, 4, 5, 6, 8 or 9 Car	✓

\*"Before" based on 317/7 with 0.45 ppm<sup>2</sup>. "After" dependant on exact layout chosen, but based on 4-car 3+2 layout.

Layout drawings, including standing capacity, and additional technical information is available on request.





# STEP ABOARD YOUR NEW TRAIN



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