



Australian Government

BUILDING OUR FUTURE



How we pave a road

Woolgoolga to Ballina Pacific Highway upgrade
October 2018



Concrete slip form paving machine on the Pacific Highway

Roads and Maritime Services, Pacific Complete and its contractor partners are working to deliver the Woolgoolga to Ballina Pacific Highway upgrade.

The 155 kilometre upgrade between Woolgoolga and Ballina is the last highway link between Hexham and the Queensland border to be upgraded to four lanes.

Paving is the last major construction activity before the road can open to traffic. It is one of the more “visible” elements of road construction and directly impacts motorists because it creates a smoother, faster and more reliable journey.

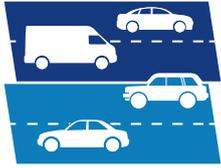
During the project, concrete road paving is expected to create about 325 jobs.



About **180,000** man hours for concrete road pavement

Overview of paving on the upgrade

Historically, about 60 per cent of the pavement between Hexham and the Queensland border has been built using concrete and about 40 per cent has been built using asphalt. Between Woolgoolga and Ballina, 78 per cent of pavement will be built using rigid concrete pavement and the remaining 22 per cent will be constructed using flexible asphalt pavement. Major concrete paving work started in winter 2018 and will continue through to 2020.



22% flexible asphalt pavement
78% rigid concrete pavement

Procurement

On the Woolgoolga to Ballina Pacific Highway upgrade four rigid concrete pavement contracts have been awarded.

Packages	Contractor
Glenugie to McIntyres Lane (Sections 3, 4)	Seymour Whyte Constructions
Iluka Road to Devils Pulpit (Section 6)	BMD Constructions
Devils Pulpit to Richmond River (Sections 7, 8, 9)	CPB Contractors
Richmond River to Coolgardie Road (Section 10)	Lendlease

Three significant sections of the highway will be built using flexible asphalt pavement. In Section 4, BGC is using flexible asphalt pavement between McIntyres Lane and Maclean as part of an integrated package. Section 5, the stretch of road between Maclean and Iluka Road, is still in tender evaluation and will be procured in multiple stages. Section 11, the stretch of road between Coolgardie Road to Ballina Bypass has been awarded to Lendlease as part of an integrated package. Along the alignment, smaller stretches of road will be constructed using asphalt pavement in areas where concrete pavement is not suitable.

Concrete pavements

Concrete pavement traditionally offers a greater life-cycle cost advantage over asphalt pavements. Concrete, as a pavement type, is desirable for highways because it can withstand anticipated traffic volumes and heavy loads. Concrete pavements traditionally require low maintenance and repair.

Raw materials for concrete

About 750,000 cubic metres of concrete will be used for road pavement on the upgrade. The concrete is produced at wet and dry mix batch plants located along the alignment. Raw materials typically used to make the concrete include water, cement, fly ash, sand and gravels. Fly ash is a by-product of coal-fired power stations.

Roads and Maritime has a master supply agreement with local quarries to supply the aggregates needed to make the concrete required for the upgrade. These aggregates are supplied to the paving contractor who then make the concrete at batch plants on site.

Wet and dry mix concrete batch plants

For concrete paving, we will have 5-8 batch plants operating along the alignment at various times. We'll mainly be using wet mix batch plants which usually have a higher capacity than dry mix plants, meaning they produce more concrete per hour.

At the wet mix plant, the concrete ingredients are weighed and transported via a conveyor belt to the mixer where water and admixtures are added. Admixtures are additives that improve the concrete's performance. The concrete is then dumped into open body or agitator delivery trucks.

At the dry mix plant, the concrete ingredients are weighed and sent to a truck-mounted mixer called an agitator. The water and admixtures are added to the mobile truck mixer. The concrete is then transported to the site of the concrete pour.

We try to build our batch plants as close to site as possible to reduce the time that trucks need to travel on the highway.

Deliveries for paving

Trucks will use the Pacific Highway and local roads to deliver the raw materials like gravel and sand from the local quarries to the batch plants and then to deliver the final pavement product to site.

Each quarry has limits imposed on the number of truck movements allowed per day.



Pouring the base concrete layer



Texture curing machine ready for action



Newly paved road at Wells Crossing

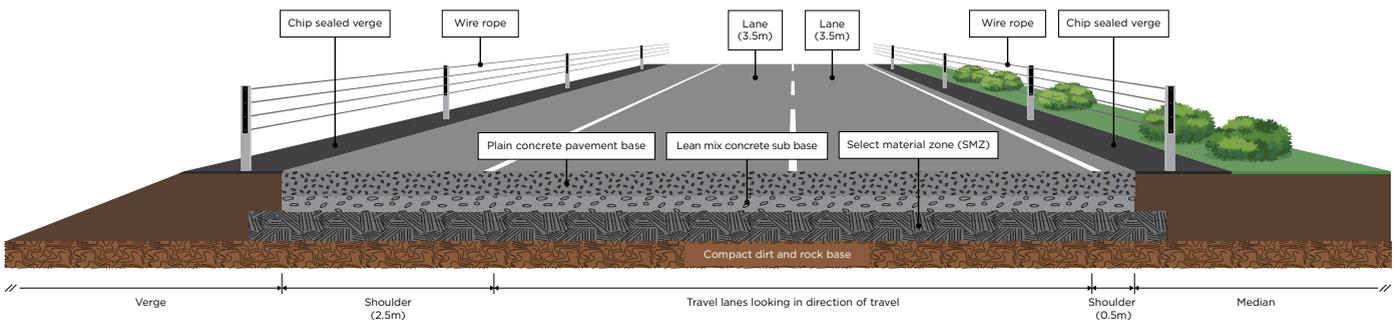
A typical concrete paving operation

A typical highway paving operation includes the delivery, tipping, spreading, compacting and finishing of concrete sub base and concrete base layers. The process to finish the concrete includes texturing the surface and spraying it with a curing compound. Joints are created in the base using a saw cutter. Once cut, joints are cleared of debris and sealed with an appropriate sealant.

Concrete road paving layers:

Layer	Description
Plain concrete pavement (PCP) base	The PCP base layer is made up of higher strength concrete, normally 250mm thick depending on expected traffic loading. The base layer is typically paved in two runs with the lanes paved first and the shoulders typically paved later. Steel tiebars connect each slab together and stop them pulling apart.
Lean mix concrete sub base (LCS)	The LCS is about 150mm thick. To form the LCS, a low-strength (lean mix) concrete is placed on top of the SMZ layer. This layer is topped with a debonding sprayed seal. There is no steel present in this layer.
Select material zone (SMZ)	The SMZ is 300mm thick. The SMZ is made up of compacted gravel and is topped with a bitumen sprayed seal. There is no steel present in this layer.

1.0 Plain concrete pavement



About **750,000m³** of concrete for road pavement



About **240,000** tonnes of asphalt for road pavement



Sub base hand pour



Preparing the base pavement saw cuts for sealing

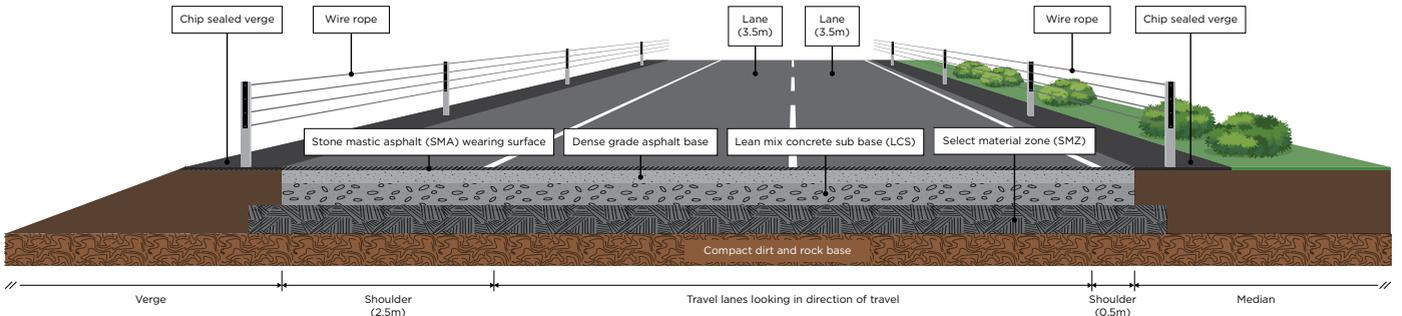
Flexible pavements

Concrete pavements are not suitable in some circumstances. Flexible pavements are preferable in soft-soil floodplains because they can withstand slight movement happening in the ground.

Just like concrete paving, all three types start with the select material zone (SMZ), a layer of compacted gravel. On top of the SMZ, we are using three different sub base options: lean mix concrete (LCS), foamed bitumen and crushed chert gravel. Each type of sub base is topped with a layer of asphalt with a stone mastic wearing surface. This provides skid resistance to the travelling public and would represent the completion of the road.

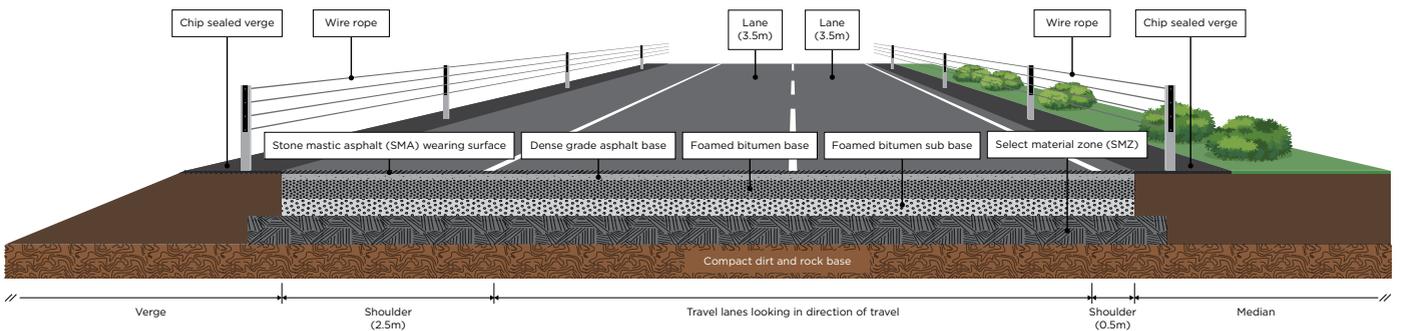
2.0 Stone mastic asphalt wearing course over thick asphalt over lean mix concrete

Used in small sections for its low noise qualities.



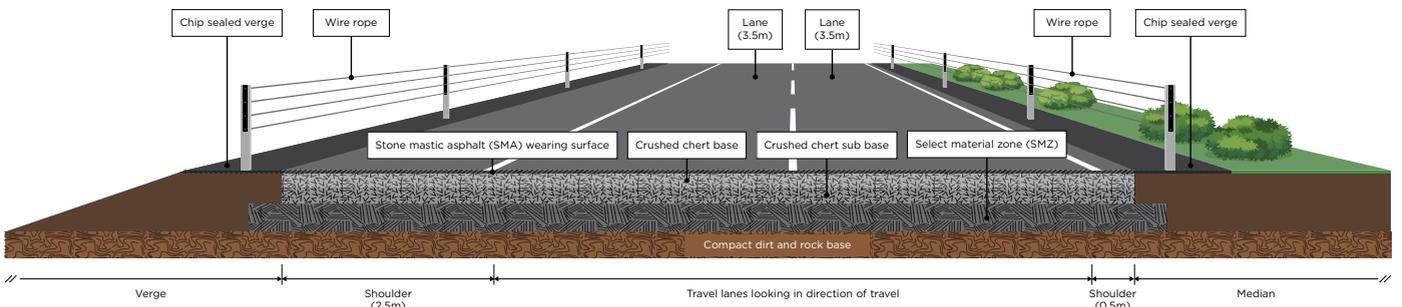
2.1 Asphalt over foamed bitumen material

Used in soft soil areas, particularly around Chatsworth Island.



2.2 Sprayed seal and asphalt over unbound granular material

Used on soft soils and on the northern end of the project to match the materials used on the Ballina Bypass project.





Surveying the new pavement



Paving at Wells Crossing

Typical machinery used for paving

Large road upgrades need a number of machines to complete the concrete paving.

Machinery used for concrete road paving:

Machine	Use
Batch plant	A variety of parts and accessories make up a batch plant, where raw materials are combined to create the concrete or mix.
Concrete trucks	Concrete trucks deliver concrete from the batch plant to the slip form paving machines on site.
Paving machines	The slip form paver spreads the concrete mix with its auger or spreading plough and forms the concrete profile for the highway with its slip form mould. Vibrators inside the slip form machine vibrate the concrete, expel the air entrapped and compact the concrete. The paver may drag a rough material such hessian or artificial turf over the pavement to create friction and skid resistance.
Tining	Metal tynes may also be dragged over the pavement to create friction and skid resistance. The tynes look similar to a large rake.
Curer	Soon after texturing, the paver sprays the surface and slab edges with a curing compound. Curing maintains moisture in the concrete surface so that its strength and surface wear resistance can fully develop. The curing compound must be sprayed on in a continuous, unbroken film and maintained intact for at least seven days.
Saw cutter	During curing, construction joints are sawn by a saw cutter. This causes cracks to form where we want them to. A sealant is installed into the cut joints. Saw cutting usually takes place in the evening, after normal construction hours.

Contact

For enquiries about the project's paving activity and concrete batching facility, please contact the Woolgoolga to Ballina Pacific Highway upgrade community relations team:

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Stay in touch

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