

# Downpipe

What is a downpipe? A downpipe is the exhaust connection between the turbocharger and the exhaust system in a car. Aftermarket downpipes are used to replace the stock turbo outlet pipe (the “downpipe”) with a better flowing part. The design and pipe diameter can affect how well a downpipe works.

There are several types of downpipes. The most common from Mazda is a cast pipe which connects the outlet of the turbo with the rest of the exhaust.



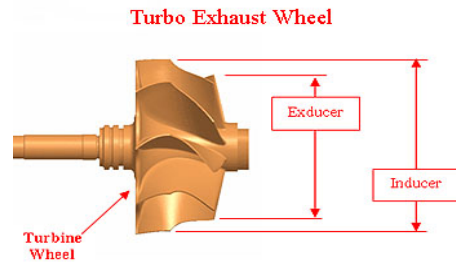
**Stock Downpipe with Cat**

## Design

When manufacturers design downpipes they are setup to perform at a stock level and lose effectiveness when you turn the boost up. Most front wheel drive turbo vehicles have the exhaust flow exiting the turbocharger and hitting an abrupt 90 degree turn. The picture above is an example of this. The design causes an excessive restriction and excess heat when higher than stock boost levels are run. Some vehicles have a catalytic converter as part of the stock downpipe. This is done for startup vehicle emissions. The catalyst, being that it is close to the engine, heats up quickly and aids in burning off emissions when the vehicle first starts up. This is great for emissions but it puts a restriction in exhaust flow which negatively affects the turbocharger spool up time. Keep in mind, most downpipes in newer model cars have a catalytic converter built into them. Removing any catalyst from a street or highway use vehicle is illegal. A downpipe which removes any emissions control devices are intended for race use only.

## Bigger is Better

Using larger diameter pipe in the construction of a downpipe helps ease exhaust gas flow away from the turbocharger.



**Turbine Outlet**

Ideally you want to use a pipe which is close to the same size as the exducer (outlet of the exhaust turbine wheel) to help the exhaust build up velocity to help scavenge exhaust gas. Having a transition to a larger diameter further down the downpipe gives you better maximum flow once the exhaust has picked up speed. [See CorkSport's exhaust tech article for more information on scavenging.](#)



**Pipe Size Transition**

An example of this is the CorkSport Mazdaspeed 6 downpipe. The beginning diameter of the exhaust pipe is 2.25 and it transitions to a 3 inch pipe 8 inches after the connection point at the turbo.



**Bell Mouth Downpipe**

One of the most common styles of downpipe is the bell mouth. These work well for exhaust flow and are a more common type available on the market due to their relative ease of design and manufacture.

## Downpipe



**Divorced Wastegate Downpipe**

Divorced downpipes are not as common and are a little more difficult to build since they use two separate pipes. One pipe is for the main exhaust flow and the other is for the wastegate exhaust flow.



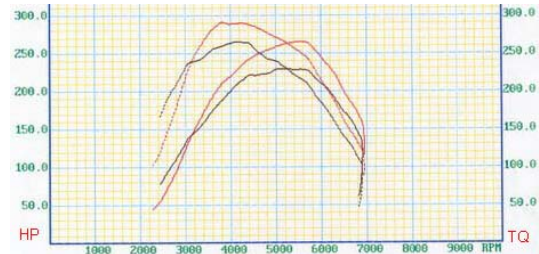
**Divorced Downpipe Inlet**

At the turbo outlet there is a divider which keeps the exducer exhaust flow going down the main exhaust pipe. This divider keeps the turbulence down at the exducer to aid the exhaust in picking up speed. The wastegate pipe is joined into the main exhaust pipe 15-18 inches after the turbocharger. This is done to have the main exhaust flow help pull the wastegate exhaust gas out of the pipe.

### **Purpose**

Why install a downpipe? When installing a downpipe several things that happen. First, the turbocharger requires less effort to spin, so boost will happen at a lower RPM. Secondly, with less restriction the turbo will be able to move more exhaust gasses and this will help raise boost. Increasing the boost level is where most power gains are made with a downpipe. A good

example of this increase in power is with a Mazdaspeed 6. Installation of the CorkSport downpipe on a customer's vehicle showed a power gain of 26 horsepower and 32 ft/lbs of torque at the wheels. This was done with an increase of 2 psi of boost, due to the installation of the downpipe.



**Mazdaspeed 6 Downpipe Dyno**

The dyno chart above shows the before (brown line) and after (red line) power gains of the CorkSport downpipe when installed on a Mazdaspeed 6.

An additional benefit of installation is reduction of heat. With the exhaust having less restriction it generates less heat into the engine bay. Vehicles that have a catalyst in the downpipe create an even larger amount of radiant heat. The radiant heat can 'heat soak' the intercooler, intercooler piping, and intake manifold resulting in a loss of power. Over time this heat can make the vacuum lines and wiring harness brittle.



**Turbo under Load**

In summary, if you have a turbocharged vehicle then you need a downpipe if you want to make more power. The benefits of a faster spooling turbo, increased boost, more power, and less heat in the engine bay are all winners.