

SD70MAC Locomotive

The Alaska Railroad (ARRC) owns 28 SD70MAC locomotives, which make up more than half of ARRC's 51-unit locomotive fleet. "SD" refers to Special Duty and "MAC" translates to "M" for Modified cab and "AC" for Alternating Current traction motors. ARRC's other 23 locomotives are older General Purpose (GP) locomotives – Eight are GP-38-2 models and 15 are GP-40-2.

Workhorse with Horsepower

The first digit on ARRC's 4-digit locomotive numbers indicate the horsepower (hp). For example GP38 locomotive No. 2003 is a 2000 hp locomotive while SD70MAC locomotive No. 4326 is a 4000 hp locomotive.

Today's modern diesel electric locomotive – including the SD70MAC – is a complex and efficient machine. Through a number of processes it converts diesel fuel to torque on the axles and pulling force on the rear coupler.

A diesel locomotive is essentially an electric locomotive that carries its own power source. Unlike an automobile, the diesel electric locomotive does not use a mechanical drive or a transmission. Rather output from the main drive shaft is used to turn an alternator to generate electricity, which ultimately powers traction motors that are mounted on the axles.



ARRC operates 24/7 year-round. (by Mike Grunwald)



The blue-and-gold locomotives are Alaska Railroad icons.

Purchases and Purposes

The SD70MAC was built between 1993 and 2003 by the Electro Motive Division (EMD) of General Motors. Over 1500 were built for five different railroads and they operate throughout North America.

The Alaska Railroad purchased SD70MACs in three different orders. The first 16 were delivered in 1999 and 2000. These original MACs are 4000 hp units and are equipped for Distributed Power (DP), meaning that one or more locomotives can be positioned in the middle or at the rear of a long train to help push, but an engineer does not need to be in the cab driving these mid- to back-located locomotives. Instead, the engineer driving the front locomotive can also control the other locomotives via radio-controlled computer commands.



SD70MACs pull long gravel trains. (by Dave Blazejewski)

Each 4000-numbered units have a name on the nose:
4001 is *Spirit of Alaska* | 4002 is *Spirit of Seward*
| 4003 is *Spirit of Moose Pass* | 4004 is *Spirit of Whittier*
| 4005 is *Spirit of Girdwood* | 4006 is *Spirit of Anchorage*
| 4007 is *Spirit of Palmer* | 4008 is *Spirit of Wasilla*
| 4009 is *Spirit of Talkeetna* | 4010 is *Spirit of Cantwell*
| 4011 is *Spirit of Denali* | 4012 is *Spirit of Healy*
| 4013 is *Spirit of Nenana* | 4014 is *Spirit of Fairbanks*
| 4015 is *Spirit of North Pole* | 4016 is *Spirit of Delta Junction*.

In 2004, ARRC purchased eight more MACs that are also rated at 4000 horsepower. These are dual mode freight and passenger units equipped with a selector switch. When in passenger mode, half the horsepower is used to pull/push the train, while the other half of the output is used to power a 480-volt head-end power (HEP) generator that supplies electricity to trailing passenger railcars.

The final four SD70MACs, delivered in 2007, were custom ordered because regular production by EMD had ceased in favor of the newer SD70ACE model. These are also dual mode 4000 hp and are the only four capable of DP and HEP operation.

The ARRC's fleet of 12 dual mode SD70MACs is unique in the rail industry. They harken back to the 1960s when EMD built powerful dual mode locomotives for the likes of the Great Northern and Santa Fe railroads during the waning days of private passenger trains. (Note: In 1970, Congress created Amtrak to take over passenger rail service that private freight railroad companies in the U.S. were previously required to operate.)

On the Alaska Railroad, the SD70MACs are used in all types of service, from heavy-haul coal trains (with four up front and three on the rear) to high-speed passenger trains and everything in between. They are the backbone of daily train operations.

Cool Features and Stats

The SD70MACs were the Alaska Railroad's first 6-axle diesel locomotives. Historically 4-axle two-wheel trucked units were favored due to the route's tight curvature, and the rail-and-wheel wear caused by 6-axle trucks. However, SD70MACs feature EMD's pioneering HTC-R radial or "steerable" trucks which are computer controlled and pivot in their frames with the curvature of the rail. This feature reduces the "bite" on the inside of the rail that leads to increased friction, drag and wear.

- Engine:..... 710G3C-ES 16 cylinder
- RPM (Maximum / Minimum):..... 904 /318
- Gear Ratio:..... 70:17
- Speed:..... 70 mph
- Trucks (Wheel Assembly):..... HTC-R11 6-Wheel
- Truck Configuration:..... C-C (two 3-axle trucks)
- Weight:..... 415,000 pounds
- Traction Motors:..... Six GM 1TB2630
- Tractive Effort (starting):..... 175,500 lbs @33%
- Tractive Effort (continuous):. 137,000 lbs @ 12 mph
- Multiple Unit Capability:..... Yes
- Dynamic Braking:..... Yes
- Total Length..... 74 feet
- Wheel Diameter..... 42 inches
- Truck Wheel Base..... 13 feet 7 inches
- Height to Top Engine Hood..... 14 feet 8.5inches
- Height to Top Cab..... 15 feet 7.5 inches
- Cab Width..... 10 feet 5 inches
- Top of Walkway..... 9 feet 4.5inches
- Walkway Width..... 3 feet 8.5 inches
- Engine Hood Width..... 10 feet
- Center Bolster..... 46 feet 7 inches
- Center Front Truck to Front Pilot... 2 feet 3 inches
- Center Rear Truck to Rear Pilot.... 2 feet 3 inches
- Distance between Truck Centers... 50 feet 4 inches
- Minimum Turning Radius..... 29 degrees



SD70MAC locomotives haul coal-filled hoppers from the Healy coal mine to the loading facility in Seward. (photo by Frank Keller)