

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 two leading digits 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 4300 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-hp unit features a name on its nose: 4001 – *Spirit of Alaska*; 4002 – *Spirit of Seward*; 4003 – *Spirit of Moose Pass*; 4004 – *Spirit of Whittier*; 4005 – *Spirit of Girdwood*; 4006 – *Spirit of Anchorage*; 4007 – *Spirit of Palmer*; 4008 – *Spirit of Wasilla*; 4009 – *Spirit of Talkeetna*; 4010 – *Spirit of Cantwell*; 4011 – *Spirit of Denali*; 4012 – *Spirit of Healy*; 4013 – *Spirit of Nenana*; 4014 – *Spirit of Fairbanks*; 4015 – *Spirit of North Pole*; and 4016 – *Spirit of Delta Junction*.

In 2004, ARRC purchased eight more MACs that were rated at the higher 4300 horsepower. These are dual mode freight and passenger units equipped with a selector switch. When in passenger mode, half the horsepower (2,150 hp) 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 SD7OMACs, delivered in 2007, were custom ordered because regular production by EMD had ceased in favor of the newer SD7OACE model. These are also dual mode 4300 hp and are the only four capable of DP and HEP operation.

The ARRC's fleet of 12 dual mode SD7OMACs 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 SD7OMACs 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 SD7OMACs 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, SD7OMACs 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 8.5 inches
- Height to Top Cab 15 feet 7.5 inches
- Cab Width 10 feet 3 inches
- Top of Walkway: 9 feet 4.5 inches
- 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: . . . 60 feet 2 inches
- Minimum Turning Radius 29 degrees



SD7OMAC locomotives haul coal-filled hoppers from the Healy coal mine to the loading facility in Seward. (photo by Frank Keller)