CHAPTER 4

The Locomotive
Steam until mid 1950’s
- Confine to diesel-electric or straight electric
Two primary factors – Tractive force (effort) and Horsepower

- **Tractive Force** = Weight of Drivers times Coefficient of Adhesion

- **Horsepower** = Rate of Doing Work

Drawbar Horsepower
Tractive Force vs. Tonnage and Grade
Performance Curve of the locomotive
(with train resistance for 420 tons trailing load of passenger stock)
Different Horsepower Ratings

- Gross hp generated by diesel engine
- Locomotive hp available for traction (torque x rpm)
- Electrical power to motors (volts x amps)
- Drawbar hp (drawbar pull x speed)
- Power to move, lift, and accelerate weight of locomotive itself (varies with speed, grade, curvature, loco/train weight ratio)
- Power to haul train (85%)
- 85% Horsepower left for hauling train
Power Required vs. Speed and Grade
Diesel – Electric Locomotive

- Diesel Engine - Prime Mover
- Turbocharger / Electronic Fuel Injection
- Alternator / Generator / Fans / Batteries
- AC/DC Traction Motors
Locomotive Principal Components
Radial Trucks
Locomotive Controls
■ Six Axle

VS.

Four Axle
Multiple Unit Arrangements

- Distributive Power / ECP
Slugs and Mates
- Head-End Power
- Fuel Efficiency
- Electric Locomotive
- Hybrid Locomotive
■ Locomotive Maintenance

■ DC/AC Traction Motors

■ Inspection/Running Repairs/Major Repairs

■ Remote Diagnostics and New Technologies

■ Life