Motor Vehicle Systems, Maintenance, Safety Devices, and Performance Capabilities

HED 302s – Driver Task Analysis
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Preventive Vehicle Maintenance – the worksheets in this topic area will help you keep your vehicle in good condition.

- Tires
- Cooling Fluids
- Suspension
- Visibility System
Vehicle Systems

- **Engine/Drive Train**
  - In-line mounting: rear-wheel drive, 4-wheel drive
  - Transverse mounting: front-wheel drive, all-wheel drive
  - Mid-engine mounting: rear-wheel drive
  - Rear-engine mounting: rear-wheel drive
Vehicle Systems

• Fuel system
  – Electronic fuel injection (EFI)
  – Carburetor

• Electrical system
  – Battery/alternator
  – Coil/distributor ignition
  – Electronic ignition
  – Computer vs. current regulator
  – Electronic traction control
Vehicle Systems

- Exhaust system
- Lubricating and cooling systems
- Suspension system
  - Shock and spring
  - McPherson strut
Vehicle Systems – view the vehicle systems review and assignment page to learn more about vehicle systems.

• **Steering**
  – Full power
  – Power assisted
  – Rack and pinion
  – Steering wheel size and response

• **Braking**
  – Drum and shoe
  – Caliper disc
  – Anti-lock
  – Traction control
### Vehicle Maintenance

<table>
<thead>
<tr>
<th>Problem Areas</th>
<th>Vehicles Defective</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tires</td>
<td>57,226</td>
<td>42.5%</td>
</tr>
<tr>
<td>Oil Level</td>
<td>39,991</td>
<td>29.7%</td>
</tr>
<tr>
<td>Drive Belts</td>
<td>39,048</td>
<td>29.0%</td>
</tr>
<tr>
<td>Emissions</td>
<td>33,663</td>
<td>25.0%</td>
</tr>
<tr>
<td>Lights Out</td>
<td>32,450</td>
<td>24.1%</td>
</tr>
<tr>
<td>Battery</td>
<td>27,603</td>
<td>20.5%</td>
</tr>
</tbody>
</table>

Vehicles Tested: 134,650 in the following states: VA, NY, TX, WA, MO, IN, OH, KY, MD, NJ, LA, NE, SC, AL, CO, PA, NH, RI, OK, MN, GA, NC, VT, TN, DC, and WY
Tires

- Selection
- Inflation
- Rotation
- Alignment
- Balance
- Sidewall Information

Review the tire information on the Web site shown on the main Web page for the course.
Lubrication System

• The lubricating system reduces heat by coating the engine parts with oil. Coating engine parts with oil reduces friction, heat, and wear. Oil also helps clean internal engine surfaces and prevent rust and corrosion. Change your oil and oil filter every 3000 miles or every 6 months, whichever comes first.

• An oil pump moves oil from the oil pan to all moving engine parts. The oil filter cleans the oil as it circulates.

• Grease is used to lubricate parts of the car, such as the steering system. Grease reduces friction.
Cooling Systems

• The purpose of the cooling system is to keep your car’s engine from overheating. The cooling system circulates coolant (usually a mixture of water and antifreeze) through the engine by means of a network of pipes, channels, and connecting hoses.

• The coolant is stored in the radiator and radiator overflow tank. A water pump moves the coolant through the radiator and the circulating network. A thermostat works to control the flow of coolant to maintain best operating temperature.
Visibility Systems

- Headlights and turn signals [keep them clean]
- Window glass [keep them clean]
- Wipers and cleaning solutions [have good working wipers, replacing them regularly and keep a good supply of fluid in your window washing container.]
- Defrosters
Maintenance Checklists

Typical Inspections that a driver should do:

– Suspension on Yearly Basis
– Windshield Wipers on Monthly Basis
– Headlights and Other Lights on Weekly Basis
– Tire Pressure and Wear on Weekly Basis
– Fluid Levels on Weekly Basis
– Window Glass on Daily Basis
– Brake Function on Daily Basis
– Steering Function on Daily Basis
– Exhaust System on Daily Basis
Maintenance Checklists

Typical Service Inspections as per Owner’s Manual

- Engine System Tuning
- Cooling System Service
- Oil Change and Lubrication Service
- Transmission/Trans axle Service
- Brake Service
- Air Conditioning Service
- Alignment and Tire Rotation Service

READ YOUR VEHICLE OWNERS’ MANUAL. Be one of the few that does read the manual.
Vehicle Performance

- Acceleration & Speed Holding Capability
- Directional Control and Stability
- Slowing and Braking
- Load Capacity
- Skid Resistance and Recovery
- Visibility-Blind Spots-Mirror Adjustment [do you know the best way to adjust your outside mirrors? If not, ask your instructor. You are providing not maximizing your visibility to the rear]
- Seat Adjustment & Ease of Entry and Exit
Acceleration and Speed Holding Capability

• Acceleration, deceleration, and speed can help you judge time and space.
• Rate of acceleration is the time it takes to accelerate from one speed to another.
• Deceleration rate is the time it takes to go from one speed to another.
• Generally large cars with high horsepower have good acceleration and can maintain speed better than under-powered subcompact cars.
Directional Control and Stability

- Under steer
- Over steer
- Recovery
  - Visual Control
  - Motion Control
  - Steering Control

Do you know what these terms mean? If not do a search on the internet and define them for yourself. Knowing what the meaning of each will help you avoid a crash.
Slowing and Braking

- **Downshifting**
  - Front-wheel drive and Constant Velocity Joints
  - Rear-wheel Drive and Universal Joints

- **Brake Application**
  - Controlled Squeeze
  - Trail
  - Threshold
  - Lock
  - Stab/Jab (ABS)

Review a current driver education textbook or car magazine to learn about the above terminology.
Things to Consider

- Load Capacity
  - Skid Resistance and
  - Recovery
- Visibility – Blind Spots – Mirror Adjustment
- Seat Adjustment
- Ease of entry and Exit

[Do you know what all of the factors mean? If not you might want to read about their meaning.]
Safety Devices

- Passive Restraints
- Active Restraints
- Door Locks
- Side guard door beams
- Daytime Running Lights
- Anti-lock Brakes
- Traction Control Devices
Types of Safety Restraints

• Passive (Automatic)
  – Automatic Belts and Bolsters
  – Airbags and Automatic Safety Belts

• Active (Manual)
  – Lap Belts
  – Shoulder Belts
  – Combination Belts (3 point/Door Mounted)
  – Child Restraints
Occupant Protection

What Are Your State Law Requirements? [review this information at the Illinois Secretary of State Web site]

Safety Restraint Benefits

- Increased Vehicle Control
- Occupant Death Reduction
- Disabling Injury Reduction
- Minor Injury Reduction
- Reduce Child Related Distractions
Occupant Protection

Facts and Myths

• Ejection
• Fire and Immersion
• Child on Lap
• Point of Impact
• Movement
## Movement of Belted Occupant

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Movement in 30 mph Crash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>1.9 feet</td>
</tr>
<tr>
<td>Chest</td>
<td>1.3 feet</td>
</tr>
<tr>
<td>Pelvis</td>
<td>1.2 feet</td>
</tr>
</tbody>
</table>

Based on 150-180 lb. male data
Belt Loading and Fit

Car Loaded Locking Systems

Belt Loaded Locking Systems

Proper Adjustment
Safety Devices

- Emergency Flashers
- High Mount Brake Lights
- Tempered Glass
- Cruise Control
- Heating, Ventilation, and Air Conditioning (HVAC)
Reduced or Enhanced Performance

• Heavy Trucks and Buses
• Compact & Sub-compact Vehicles
• High Performance Sport Sedans
• Recreational Vehicles
• Motorcycles & Motor-driven Cycles
• Bicycles
• Farm & Heavy Construction Equipment
Purchasing Checklist – review some Web sites to assist you with considering the below items

- Seating in Front and Rear
- Visibility
- Controls
- Instrumentation
- Interior Amenities
- Transmission/Trans axle
Purchasing Checklist – review some Web sites to assist you with considering the below items

- Ride and Handling
- Braking Capability
- Engine Type and Location
- Noise and Road Feedback
- Cargo Capacity
Assignment for Motor Vehicle Systems, Maintenance, Safety Devices, and Performance Capabilities Unit

- Review your Vehicle Owners Manual or that of another person to determine the maximum load capacity, recommended tire pressures for routine and sustained highway driving, safety devices and recommended maintenance schedule for the vehicle you drive. In writing compare the handling characteristics of the vehicle you drive with the tires inflated to pressure four pounds over and below that recommended for routine driving.