# Diesel Equipment Technology I

8613 36 weeks / 280 hours

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## Acknowledgments

This 2017 edition of the task list for Diesel Equipment Technology was validated by a panel of industry representatives and educators:

- John M. Bishop, Diesel Technology Instructor, Tidewater Community College
- Alan Crouch, Assistant Dean, School of Business, J. Sargeant Reynolds Community College
- Jeffrey Hodges, Teacher, Buchanan County Technical and Career Center
- Steven Patt, Teacher, Bridging Communities Regional Career and Technical Center
- Mitch Platt, Regional Recruiting and Training Manager, Rush Truck Centers, VA, NC, GA
Students receive basic instruction in general maintenance of medium- and heavy-duty diesel trucks and equipment. They learn theory and operation of diesel engines, brakes, suspension and steering systems, and electrical/electronic systems. Students are also instructed in preventive maintenance and inspection procedures.

Legislation enacted in the 2011 Virginia General Assembly (HB 1493) and amended in 2012 (HB 1108) requires where there is a national industry certification for career and technical education instructional personnel or programs for automotive technology, the Board of Education must make such certification mandatory. The provisions of this act shall become effective July 1, 2013. To comply with the requirements, all Career and Technical Education (CTE) automotive programs must be NATEF accredited and the instructors must be certified by the National Institute for Automotive Service Excellence (ASE).

As noted in Superintendent's Memo #058-17 (2-28-2017), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.
Task Essentials List

- Tasks/competencies designated by plus icons (⁺) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (⊙) are optional
- Tasks/competencies designated by minus icons (⁻) are omitted
- Tasks marked with an asterisk (*) are sensitive.

<table>
<thead>
<tr>
<th>Task Number</th>
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<tr>
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<tr>
<td>Practicing Lab/Shop and Personal Safety</td>
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<tr>
<td>39</td>
<td>Identify general lab/shop safety rules and procedures.</td>
</tr>
<tr>
<td>40</td>
<td>Utilize safe procedures for handling of tools and equipment.</td>
</tr>
<tr>
<td>41</td>
<td>Identify and use proper placement of floor jacks and jack stands.</td>
</tr>
<tr>
<td>42</td>
<td>Identify and use proper procedures for safe lift operation.</td>
</tr>
<tr>
<td>43</td>
<td>Utilize proper ventilation procedures for working within the lab/shop area.</td>
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<tr>
<td>44</td>
<td>Identify marked safety areas.</td>
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<tr>
<td>45</td>
<td>Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.</td>
</tr>
<tr>
<td>46</td>
<td>Identify the location and use of eye wash stations.</td>
</tr>
<tr>
<td>47</td>
<td>Identify the location of the posted evacuation routes.</td>
</tr>
<tr>
<td>48</td>
<td>Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.</td>
</tr>
<tr>
<td>49</td>
<td>Identify and wear appropriate clothing for lab/shop activities.</td>
</tr>
<tr>
<td>50</td>
<td>Secure hair and jewelry for lab/shop activities.</td>
</tr>
<tr>
<td>51</td>
<td>Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.</td>
</tr>
<tr>
<td>52</td>
<td>Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge [HID] lamps, ignition systems, injection systems, etc.).</td>
</tr>
<tr>
<td>53</td>
<td>Demonstrate knowledge of safety data sheets' (SDS) location and content.</td>
</tr>
<tr>
<td>Using Tools and Equipment</td>
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<tr>
<td>54</td>
<td>Identify tools and their usage in diesel applications.</td>
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<tr>
<td>55</td>
<td>Identify standard and metric designation.</td>
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<td>56</td>
<td>Demonstrate safe handling and use of appropriate tools.</td>
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<td>57</td>
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**Preparing Vehicle for Service**

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<tbody>
<tr>
<td>59</td>
<td></td>
<td>Identify information needed and the service requested on a repair order.</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>Identify purpose and demonstrate proper use of fender covers, mats.</td>
</tr>
<tr>
<td>61</td>
<td></td>
<td>Demonstrate use of the three Cs (concern, cause, and correction).</td>
</tr>
<tr>
<td>62</td>
<td></td>
<td>Review vehicle service history.</td>
</tr>
<tr>
<td>63</td>
<td></td>
<td>Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.</td>
</tr>
</tbody>
</table>

**Preparing Vehicle for Customer**

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>64</td>
<td></td>
<td>Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)</td>
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</tbody>
</table>

**DIESEL ENGINES**

**Diesel Engines: General**

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<tr>
<th>Task Number</th>
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<tbody>
<tr>
<td>65</td>
<td></td>
<td>Inspect fluid levels.</td>
</tr>
<tr>
<td>66</td>
<td></td>
<td>Identify engine fuel, oil, coolant, air, and other leaks.</td>
</tr>
<tr>
<td>67</td>
<td></td>
<td>Diagnose engine noises.</td>
</tr>
<tr>
<td>68</td>
<td></td>
<td>Observe engine exhaust smoke color and quantity.</td>
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</table>

**Diesel Engines: Servicing Cylinder Head and Valve Train**

<table>
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<th>Task Number</th>
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</thead>
<tbody>
<tr>
<td>69</td>
<td></td>
<td>Inspect cylinder head.</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>Inspect valves, guides, seats, springs, retainers, rotators, locks and seals.</td>
</tr>
<tr>
<td>71</td>
<td></td>
<td>Measure valve head height relative to deck and valve face-to-seat contact.</td>
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<tr>
<td>72</td>
<td></td>
<td>Inspect injector sleeves and seals.</td>
</tr>
<tr>
<td>73</td>
<td></td>
<td>Inspect valve train components.</td>
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<tr>
<td>74</td>
<td></td>
<td>Reassemble cylinder head.</td>
</tr>
<tr>
<td>75</td>
<td></td>
<td>Measure overhead camshaft end play and backlash.</td>
</tr>
<tr>
<td>76</td>
<td></td>
<td>Inspect electronic wiring harness and brackets.</td>
</tr>
<tr>
<td>77</td>
<td></td>
<td>Adjust valve bridges, valve clearances, and injector settings.</td>
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</tbody>
</table>

**Diesel Engines: Servicing the Engine Block**

<table>
<thead>
<tr>
<th>Task Number</th>
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<th>Tasks/Competencies</th>
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<tbody>
<tr>
<td>78</td>
<td></td>
<td>Perform crankcase pressure test.</td>
</tr>
<tr>
<td>79</td>
<td></td>
<td>Service pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td>Inspect engine block, threaded holes, studs, dowel pins, and bolts.</td>
</tr>
<tr>
<td>Task Number</td>
<td>Tasks/Competencies</td>
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<tr>
<td>81</td>
<td>Inspect cylinder sleeve counter bore and lower bore for distortion.</td>
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<tr>
<td>82</td>
<td>Inspect cylinder walls or liners for wear and damage.</td>
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</tr>
<tr>
<td>83</td>
<td>Reinstall cylinder liners and seals.</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Inspect in-block camshaft bearings for wear and damage.</td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>Reinstall in-block camshaft.</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Inspect crankshaft.</td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>Inspect main bearings for wear patterns and damage.</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Service gear train.</td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>Inspect connecting rods and bearings.</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Service pistons.</td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>Assemble pistons and connecting rods.</td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Check the condition of the piston cooling jets (nozzles).</td>
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</tr>
<tr>
<td>93</td>
<td>Inspect crankshaft damper.</td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>Install flywheel housing.</td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear.</td>
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**Diesel Engines: Servicing Lubrication Systems**

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<tr>
<td>96</td>
<td>Test engine oil pressure and temperature.</td>
</tr>
<tr>
<td>97</td>
<td>Check engine oil level, condition, and consumption.</td>
</tr>
<tr>
<td>98</td>
<td>Inspect oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances.</td>
</tr>
<tr>
<td>99</td>
<td>Inspect oil pressure regulator valve, by-pass and pressure relief valves, oil thermostat, and filters.</td>
</tr>
<tr>
<td>100</td>
<td>Inspect oil cooler and components.</td>
</tr>
<tr>
<td>101</td>
<td>Inspect turbocharger lubrication systems.</td>
</tr>
<tr>
<td>102</td>
<td>Perform oil and filter changes.</td>
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**Diesel Engines: Servicing Cooling Systems**

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<td>103</td>
<td>Check engine coolant type, level, condition, and consumption.</td>
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<td>Test coolant temperature and check operation of temperature and level sensors, gauges, and sending units.</td>
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<td>105</td>
<td>Inspect pulleys, tensioners, and drive belts.</td>
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<td>106</td>
<td>Inspect thermostats, by-passes, housings, and seals.</td>
</tr>
<tr>
<td>107</td>
<td>Refill thermostats, by-passes, housings, and filters.</td>
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<td>108</td>
<td>Inspect coolant conditioner/filter assembly for leaks.</td>
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<td>109</td>
<td>Inspect water pump and hoses.</td>
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<tr>
<td>Task Number</td>
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<tr>
<td>110</td>
<td>Inspect radiator.</td>
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<tr>
<td>111</td>
<td>Inspect thermostatic cooling fan system and fan shroud.</td>
</tr>
<tr>
<td>112</td>
<td>Inspect turbo charger cooling systems.</td>
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<tr>
<td>113</td>
<td>Perform air intake system restriction and leakage tests.</td>
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<td>114</td>
<td>Perform intake manifold pressure (boost) test.</td>
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<td>115</td>
<td>Check exhaust back pressure.</td>
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<td>116</td>
<td>Inspect turbocharger, wastegate, and piping systems.</td>
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<tr>
<td>117</td>
<td>Inspect variable geometry turbocharger (VGT), pneumatic, hydraulic, and electronic controls and actuators.</td>
</tr>
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<td>118</td>
<td>Check air induction system.</td>
</tr>
<tr>
<td>119</td>
<td>Reinstall turbocharger/wastegate assembly.</td>
</tr>
<tr>
<td>120</td>
<td>Inspect intake manifold, gaskets, and connections.</td>
</tr>
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<td>121</td>
<td>Inspect air cooler assemblies.</td>
</tr>
<tr>
<td>122</td>
<td>Inspect exhaust manifold, piping, mufflers, and mounting hardware.</td>
</tr>
<tr>
<td>123</td>
<td>Inspect engine compression/exhaust brakes.</td>
</tr>
<tr>
<td>124</td>
<td>Inspect engine compression/exhaust brake control circuits, switches, and solenoids.</td>
</tr>
<tr>
<td>125</td>
<td>Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings.</td>
</tr>
<tr>
<td>126</td>
<td>Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system.</td>
</tr>
<tr>
<td>127</td>
<td>Test master cylinder for internal/external leaks and damage.</td>
</tr>
<tr>
<td>128</td>
<td>Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage.</td>
</tr>
<tr>
<td>129</td>
<td>Test metering (hold-off), load sensing/proportioning, proportioning, and combination valves.</td>
</tr>
<tr>
<td>130</td>
<td>Test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors.</td>
</tr>
<tr>
<td>131</td>
<td>Inspect disc brake caliper assemblies.</td>
</tr>
<tr>
<td>132</td>
<td>Inspect brake fluid.</td>
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<td>126</td>
<td>Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system.</td>
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<td>Inspect disc brake caliper assemblies.</td>
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<td>Inspect brake fluid.</td>
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**Diesel Engines: Servicing Engine Brakes**

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<tbody>
<tr>
<td>123</td>
<td>Inspect engine compression/exhaust brakes.</td>
</tr>
<tr>
<td>124</td>
<td>Inspect engine compression/exhaust brake control circuits, switches, and solenoids.</td>
</tr>
<tr>
<td>125</td>
<td>Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings.</td>
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</tbody>
</table>

**BRAKES**

**Brakes: Servicing Hydraulic Brakes**

<table>
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<tr>
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<tr>
<td>126</td>
<td>Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system.</td>
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<tr>
<td>127</td>
<td>Test master cylinder for internal/external leaks and damage.</td>
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<tr>
<td>128</td>
<td>Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage.</td>
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<td>129</td>
<td>Test metering (hold-off), load sensing/proportioning, proportioning, and combination valves.</td>
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<td>133</td>
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<td><strong>ELECTRICAL/ELECTRONIC SYSTEMS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Electrical/Electronic Systems: General Electrical Systems</strong></td>
<td></td>
</tr>
<tr>
<td>148</td>
<td>✗</td>
</tr>
<tr>
<td>149</td>
<td>✗</td>
</tr>
<tr>
<td>150</td>
<td>✗</td>
</tr>
<tr>
<td>151</td>
<td>✗</td>
</tr>
<tr>
<td>152</td>
<td>✗</td>
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<tr>
<td>153</td>
<td>✗</td>
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<tr>
<td>154</td>
<td>✗</td>
</tr>
<tr>
<td>155</td>
<td>✗</td>
</tr>
<tr>
<td>156</td>
<td>✗</td>
</tr>
<tr>
<td>Task Number</td>
<td>8613</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>157</td>
<td>☑</td>
</tr>
</tbody>
</table>

**Electrical/Electronic Systems: Servicing Battery**

<table>
<thead>
<tr>
<th>Task Number</th>
<th></th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>158</td>
<td>☑</td>
<td>Perform appropriate battery load test.</td>
</tr>
<tr>
<td>159</td>
<td>☑</td>
<td>Determine battery state of charge using an open circuit voltage test.</td>
</tr>
<tr>
<td>160</td>
<td>☑</td>
<td>Service battery.</td>
</tr>
<tr>
<td>161</td>
<td>☑</td>
<td>Clean battery boxes, mounts, and hold downs.</td>
</tr>
<tr>
<td>162</td>
<td>☑</td>
<td>Charge battery using appropriate method for battery type.</td>
</tr>
<tr>
<td>163</td>
<td>☑</td>
<td>Clean battery cables and connectors.</td>
</tr>
<tr>
<td>164</td>
<td>☑</td>
<td>Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.</td>
</tr>
<tr>
<td>165</td>
<td>☑</td>
<td>Perform battery capacitance test.</td>
</tr>
<tr>
<td>166</td>
<td>☑</td>
<td>Test low voltage disconnect (LVD) systems.</td>
</tr>
</tbody>
</table>

**Electrical/Electronic Systems: Servicing Gauges and Warning Devices**

<table>
<thead>
<tr>
<th>Task Number</th>
<th></th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>167</td>
<td>☑</td>
<td>Identify causes of intermittent, high, low, or no gauge readings.</td>
</tr>
<tr>
<td>168</td>
<td>☑</td>
<td>Test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires.</td>
</tr>
</tbody>
</table>

**Preventive Maintenance and Inspection**

**Preventive Maintenance and Inspection: Servicing Engine**

<table>
<thead>
<tr>
<th>Task Number</th>
<th></th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
<td>☑</td>
<td>Check engine starting and operation.</td>
</tr>
<tr>
<td>170</td>
<td>☑</td>
<td>Inspect belts, tensioners, and pulleys.</td>
</tr>
<tr>
<td>171</td>
<td>☑</td>
<td>Inspect vibration damper.</td>
</tr>
<tr>
<td>172</td>
<td>☑</td>
<td>Check engine oil level and condition.</td>
</tr>
<tr>
<td>173</td>
<td>☑</td>
<td>Inspect engine mounts for looseness and deterioration.</td>
</tr>
<tr>
<td>174</td>
<td>☑</td>
<td>Check engine for oil, coolant, air, fuel, and exhaust leaks.</td>
</tr>
<tr>
<td>175</td>
<td>☑</td>
<td>Check engine compartment wiring harness, connectors, and seals for damage and proper routing.</td>
</tr>
</tbody>
</table>

**Preventive Maintenance and Inspection: Servicing Fuel System**

<table>
<thead>
<tr>
<th>Task Number</th>
<th></th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>176</td>
<td>☑</td>
<td>Check fuel tanks, mountings, lines, caps, and vents.</td>
</tr>
<tr>
<td>177</td>
<td>☑</td>
<td>Drain water from fuel system.</td>
</tr>
<tr>
<td>178</td>
<td>☑</td>
<td>Service water separator/fuel heater and fuel filter(s).</td>
</tr>
</tbody>
</table>

**Preventive Maintenance and Inspection: Servicing Air Induction and Exhaust System**

<table>
<thead>
<tr>
<th>Task Number</th>
<th></th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>179</td>
<td>☑</td>
<td>Check exhaust system mountings for looseness and damage.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8613</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>180</td>
<td>✗</td>
<td>Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after-treatment devices, if equipped.</td>
</tr>
<tr>
<td>181</td>
<td>✗</td>
<td>Check air induction system for air restrictions and leaks.</td>
</tr>
<tr>
<td>182</td>
<td>✗</td>
<td>Inspect turbocharger for leaks.</td>
</tr>
<tr>
<td>183</td>
<td>✗</td>
<td>Check operation of engine compression/exhaust brake.</td>
</tr>
<tr>
<td>184</td>
<td>✗</td>
<td>Replace air filter as needed.</td>
</tr>
<tr>
<td>185</td>
<td>✗</td>
<td>Service crankcase ventilation system.</td>
</tr>
<tr>
<td>186</td>
<td>✗</td>
<td>Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge pump, and filter.</td>
</tr>
<tr>
<td>187</td>
<td>✗</td>
<td>Inspect selective catalyst reduction (SCR) system.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Cooling System

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>188</td>
<td>✗</td>
<td>Check operation of fan clutch.</td>
</tr>
<tr>
<td>189</td>
<td>✗</td>
<td>Inspect radiator (including air flow restriction, leaks, and damage) and mountings.</td>
</tr>
<tr>
<td>190</td>
<td>✗</td>
<td>Inspect fan assembly and shroud.</td>
</tr>
<tr>
<td>191</td>
<td>✗</td>
<td>Pressure test cooling system and radiator cap.</td>
</tr>
<tr>
<td>192</td>
<td>✗</td>
<td>Inspect coolant hoses and clamps.</td>
</tr>
<tr>
<td>193</td>
<td>✗</td>
<td>Inspect coolant recovery system.</td>
</tr>
<tr>
<td>194</td>
<td>✗</td>
<td>Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).</td>
</tr>
<tr>
<td>195</td>
<td>✗</td>
<td>Service coolant filter.</td>
</tr>
<tr>
<td>196</td>
<td>✗</td>
<td>Inspect water pump.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Lubrication System

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>197</td>
<td>✗</td>
<td>Clean engine oil and filters.</td>
</tr>
<tr>
<td>198</td>
<td>✗</td>
<td>Take an engine oil sample for analysis.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Cab and Hood Instruments and Controls

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>199</td>
<td>✗</td>
<td>Inspect key condition and operation of ignition switch.</td>
</tr>
<tr>
<td>200</td>
<td>✗</td>
<td>Check warning indicators.</td>
</tr>
<tr>
<td>201</td>
<td>✗</td>
<td>Check instruments; record oil pressure and system voltage.</td>
</tr>
<tr>
<td>202</td>
<td>✗</td>
<td>Check operation of electronic power take off (PTO) and engine idle speed controls, if applicable.</td>
</tr>
<tr>
<td>203</td>
<td>✗</td>
<td>Check heating, ventilation, and air conditioning (HVAC) controls.</td>
</tr>
<tr>
<td>204</td>
<td>✗</td>
<td>Check operation of all accessories.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Cab and Hood Safety Equipment
<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>205</td>
<td>+</td>
<td>Check operation of electric/air horns and reverse warning devices.</td>
</tr>
<tr>
<td>206</td>
<td>+</td>
<td>Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.</td>
</tr>
<tr>
<td>207</td>
<td>+</td>
<td>Inspect seat belts and sleeper restraints.</td>
</tr>
<tr>
<td>208</td>
<td>+</td>
<td>Inspect wiper blades and arms.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Cab and Hood Hardware

<table>
<thead>
<tr>
<th>Task Number</th>
<th>209</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>209</td>
<td>+</td>
<td>Check operation of wiper and washer.</td>
</tr>
<tr>
<td>210</td>
<td>+</td>
<td>Inspect windshield glass for cracks or discoloration.</td>
</tr>
<tr>
<td>211</td>
<td>+</td>
<td>Check seat condition, operation, and mounting.</td>
</tr>
<tr>
<td>212</td>
<td>+</td>
<td>Check door glass and window operation.</td>
</tr>
<tr>
<td>213</td>
<td>+</td>
<td>Inspect steps and grab handles.</td>
</tr>
<tr>
<td>214</td>
<td>+</td>
<td>Inspect mirrors, mountings, brackets, and glass.</td>
</tr>
<tr>
<td>215</td>
<td>+</td>
<td>Record all observed physical damage.</td>
</tr>
<tr>
<td>216</td>
<td>+</td>
<td>Lubricate all cab and hood grease fittings.</td>
</tr>
<tr>
<td>217</td>
<td>+</td>
<td>Lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.</td>
</tr>
<tr>
<td>218</td>
<td>+</td>
<td>Inspect cab mountings, hinges, latches, linkages, and ride height.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Cab and Hood HVAC

<table>
<thead>
<tr>
<th>Task Number</th>
<th>219</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>219</td>
<td>+</td>
<td>Inspect A/C condenser and lines for condition and visible leaks.</td>
</tr>
<tr>
<td>220</td>
<td>+</td>
<td>Inspect A/C compressor and lines for condition and visible leaks.</td>
</tr>
<tr>
<td>221</td>
<td>+</td>
<td>Check A/C system condition and operation.</td>
</tr>
<tr>
<td>222</td>
<td>+</td>
<td>Check HVAC air inlet filters and ducts.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Battery and Starting System

<table>
<thead>
<tr>
<th>Task Number</th>
<th>223</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>223</td>
<td>+</td>
<td>Inspect battery box(es), cover(s), and mountings.</td>
</tr>
<tr>
<td>224</td>
<td>+</td>
<td>Inspect battery hold-downs, connections, cables, and cable routing.</td>
</tr>
<tr>
<td>225</td>
<td>+</td>
<td>Record battery state-of-charge (open circuit voltage) and condition.</td>
</tr>
<tr>
<td>226</td>
<td>+</td>
<td>Perform battery test (load and/or capacitance).</td>
</tr>
<tr>
<td>227</td>
<td>+</td>
<td>Inspect starter, mounting, and connections.</td>
</tr>
<tr>
<td>228</td>
<td>+</td>
<td>Check starter for unusual noises, starter drag, and starting difficulty.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Charging System

<table>
<thead>
<tr>
<th>Task Number</th>
<th>229</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>229</td>
<td>+</td>
<td>Inspect alternator, mountings, cable, wiring, and wiring routing.</td>
</tr>
<tr>
<td>230</td>
<td>+</td>
<td>Perform alternator output tests.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Lighting System

<table>
<thead>
<tr>
<th>Task Number</th>
<th>231</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>231</td>
<td>+</td>
<td>Check operation of interior lights.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8613</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>---------------------</td>
</tr>
<tr>
<td>232</td>
<td>+</td>
<td>Check all exterior lights, lenses, reflectors, and conspicuity tape.</td>
</tr>
<tr>
<td>233</td>
<td>+</td>
<td>Test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s).</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Air Brakes

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>234</td>
<td>+</td>
<td>Check operation of parking brake.</td>
</tr>
<tr>
<td>235</td>
<td>+</td>
<td>Record air governor cut-in and cut-out settings.</td>
</tr>
<tr>
<td>236</td>
<td>+</td>
<td>Check operation of air reservoir/tank drain valves.</td>
</tr>
<tr>
<td>237</td>
<td>+</td>
<td>Check air system for leaks (brakes released).</td>
</tr>
<tr>
<td>238</td>
<td>+</td>
<td>Check air system for leaks (brakes applied).</td>
</tr>
<tr>
<td>239</td>
<td>+</td>
<td>Test one-way valves.</td>
</tr>
<tr>
<td>240</td>
<td>+</td>
<td>Check low air pressure warning devices.</td>
</tr>
<tr>
<td>241</td>
<td>+</td>
<td>Check emergency (spring) brake control/modulator valve, if applicable.</td>
</tr>
<tr>
<td>242</td>
<td>+</td>
<td>Check tractor protection valve.</td>
</tr>
<tr>
<td>243</td>
<td>+</td>
<td>Test air pressure build-up time.</td>
</tr>
<tr>
<td>244</td>
<td>+</td>
<td>Inspect coupling air lines, holders, and gladhands.</td>
</tr>
<tr>
<td>245</td>
<td>+</td>
<td>Check brake chambers and air lines for secure mounting and damage.</td>
</tr>
<tr>
<td>246</td>
<td>+</td>
<td>Check operation of air drier.</td>
</tr>
<tr>
<td>247</td>
<td>+</td>
<td>Record brake shoe/pad condition, thickness, and contamination.</td>
</tr>
<tr>
<td>248</td>
<td>+</td>
<td>Record condition of brake drums/rotors.</td>
</tr>
<tr>
<td>249</td>
<td>+</td>
<td>Check antilock brake system (ABS) wiring, connectors, seals, and harnesses for damage and proper routing.</td>
</tr>
<tr>
<td>250</td>
<td>+</td>
<td>Check operation and adjustment of brake automatic slack adjusters (ASA).</td>
</tr>
<tr>
<td>251</td>
<td>+</td>
<td>Lubricate all brake component grease fittings.</td>
</tr>
<tr>
<td>252</td>
<td>+</td>
<td>Check condition and operation of hand brake (trailer) control valve, if applicable.</td>
</tr>
<tr>
<td>253</td>
<td>+</td>
<td>Perform ABS operational system self-test.</td>
</tr>
<tr>
<td>254</td>
<td>+</td>
<td>Drain air tanks.</td>
</tr>
<tr>
<td>255</td>
<td>+</td>
<td>Check condition of pressure relief (safety) valves.</td>
</tr>
</tbody>
</table>

Preventive Maintenance and Inspection: Servicing Hydraulic Brakes

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>256</td>
<td>+</td>
<td>Check master cylinder fluid level and condition.</td>
</tr>
<tr>
<td>257</td>
<td>+</td>
<td>Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.</td>
</tr>
<tr>
<td>258</td>
<td>+</td>
<td>Check parking brake operation.</td>
</tr>
<tr>
<td>259</td>
<td>+</td>
<td>Check operation of hydraulic system.</td>
</tr>
<tr>
<td>260</td>
<td>+</td>
<td>Inspect calipers for leakage, binding, and damage.</td>
</tr>
<tr>
<td>261</td>
<td>+</td>
<td>Inspect brake assist system (booster), hoses, control valves, and reservoir fluid level and condition.</td>
</tr>
<tr>
<td>Task Number</td>
<td>8613</td>
<td>Tasks/Competencies</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>262</td>
<td>☑</td>
<td>Record brake lining/pad condition thickness, and contamination.</td>
</tr>
<tr>
<td>263</td>
<td>☑</td>
<td>Record condition of brake rotors.</td>
</tr>
<tr>
<td>264</td>
<td>☑</td>
<td>Check ABS wiring, connectors, seals, and harnesses for damage and proper routing.</td>
</tr>
</tbody>
</table>

**Preventive Maintenance and Inspection: Servicing Drive Train**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>265</td>
<td>☑</td>
<td>Check operation of clutch, clutch brake, and gearshift.</td>
</tr>
<tr>
<td>266</td>
<td>☑</td>
<td>Check clutch linkage/cable for looseness or binding, if applicable.</td>
</tr>
<tr>
<td>267</td>
<td>☑</td>
<td>Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.</td>
</tr>
<tr>
<td>268</td>
<td>☑</td>
<td>Check clutch adjustment.</td>
</tr>
<tr>
<td>269</td>
<td>☑</td>
<td>Check transmission case, seals, filter, hoses, lines, and cooler for cracks and leaks.</td>
</tr>
<tr>
<td>270</td>
<td>☑</td>
<td>Inspect transmission breather.</td>
</tr>
<tr>
<td>271</td>
<td>☑</td>
<td>Inspect transmission mounts.</td>
</tr>
<tr>
<td>272</td>
<td>☑</td>
<td>Check transmission oil level, type, and condition.</td>
</tr>
<tr>
<td>273</td>
<td>☑</td>
<td>Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.</td>
</tr>
<tr>
<td>274</td>
<td>☑</td>
<td>Inspect axle housing(s) for cracks and leaks.</td>
</tr>
<tr>
<td>275</td>
<td>☑</td>
<td>Inspect axle breather(s).</td>
</tr>
<tr>
<td>276</td>
<td>☑</td>
<td>Lubricate all drive train grease fittings.</td>
</tr>
<tr>
<td>277</td>
<td>☑</td>
<td>Check drive axle(s) oil level, type, and condition.</td>
</tr>
<tr>
<td>278</td>
<td>☑</td>
<td>Change drive axle(s) oil and filter/screen, if applicable.</td>
</tr>
<tr>
<td>279</td>
<td>☑</td>
<td>Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.</td>
</tr>
<tr>
<td>280</td>
<td>☑</td>
<td>Change transmission oil and filter, if applicable.</td>
</tr>
<tr>
<td>281</td>
<td>☑</td>
<td>Check inter-axle differential lock operation.</td>
</tr>
<tr>
<td>282</td>
<td>☑</td>
<td>Check transmission range shift operation.</td>
</tr>
</tbody>
</table>

**Preventive Maintenance and Inspection: Servicing Suspension and Steering System**

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8613</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>283</td>
<td>☑</td>
<td>Check steering wheel operation for free play and binding.</td>
</tr>
<tr>
<td>284</td>
<td>☑</td>
<td>Check power steering pump, mounting, and hoses for leaks, condition, and routing.</td>
</tr>
<tr>
<td>285</td>
<td>☑</td>
<td>Change power steering fluid and filter.</td>
</tr>
<tr>
<td>286</td>
<td>☑</td>
<td>Inspect steering gear for leaks and secure mounting.</td>
</tr>
<tr>
<td>287</td>
<td>☑</td>
<td>Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.</td>
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<tr>
<td>288</td>
<td>☑</td>
<td>Check kingpins for wear.</td>
</tr>
<tr>
<td>Task Number</td>
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<td>Tasks/Competencies</td>
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<td>-------------</td>
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<tr>
<td>289</td>
<td>+</td>
<td>Check wheel bearings for looseness and noise.</td>
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<tr>
<td>290</td>
<td>+</td>
<td>Check oil level and condition in all non-drive hubs.</td>
</tr>
<tr>
<td>291</td>
<td>+</td>
<td>Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.</td>
</tr>
<tr>
<td>292</td>
<td>+</td>
<td>Inspect shock absorbers for leaks and secure mounting.</td>
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<tr>
<td>293</td>
<td>+</td>
<td>Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.</td>
</tr>
<tr>
<td>294</td>
<td>+</td>
<td>Record suspension ride height.</td>
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<tr>
<td>295</td>
<td>+</td>
<td>Lubricate all suspension and steering grease fittings.</td>
</tr>
<tr>
<td>296</td>
<td>+</td>
<td>Check axle locating components.</td>
</tr>
<tr>
<td>297</td>
<td>+</td>
<td>Inspect tires for wear patterns and proper mounting.</td>
</tr>
<tr>
<td>298</td>
<td>+</td>
<td>Inspect tires for cuts, cracks, bulges, and sidewall damage.</td>
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<tr>
<td>299</td>
<td>+</td>
<td>Inspect valve caps and stems.</td>
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<tr>
<td>300</td>
<td>+</td>
<td>Record tread depth.</td>
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<tr>
<td>301</td>
<td>+</td>
<td>Adjust air pressure in accordance with manufacturers' specification.</td>
</tr>
<tr>
<td>302</td>
<td>+</td>
<td>Check wheel mounting hardware condition.</td>
</tr>
<tr>
<td>303</td>
<td>+</td>
<td>Inspect wheels for cracks, damage and proper hand hold alignment.</td>
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<tr>
<td>304</td>
<td>+</td>
<td>Check tire matching (diameter and tread) on single and dual tire applications.</td>
</tr>
<tr>
<td>305</td>
<td>+</td>
<td>Inspect fifth wheel mounting, bolts, airlines, and locks.</td>
</tr>
<tr>
<td>306</td>
<td>+</td>
<td>Test operation of fifth wheel locking device.</td>
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<tr>
<td>307</td>
<td>+</td>
<td>Check quarter fenders, mud flaps, and brackets.</td>
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<tr>
<td>308</td>
<td>+</td>
<td>Check pintle hook assembly and mounting, if applicable.</td>
</tr>
<tr>
<td>309</td>
<td>+</td>
<td>Lubricate all fifth wheel grease fittings and plate, of applicable.</td>
</tr>
<tr>
<td>310</td>
<td>+</td>
<td>Inspect frame and frame members for cracks and damage.</td>
</tr>
</tbody>
</table>

Legend:  ✫ Essential  ○ Non-essential  ❋ Omitted

**Curriculum Framework**

**REQUIRED SUPPLEMENTAL TASKS**
Practicing Lab/Shop and Personal Safety

Task Number 39

Identify general lab/shop safety rules and procedures.

Definition

Identification should include

- wearing correct protective eyewear and clothing
- following all Occupational Safety and Health Administration (OSHA) standards for the task performed
- following the lab/shop rules set by the local school board.

Process/Skill Questions

- Why is eye protection important in the diesel lab/shop?
- Why should you follow OSHA guidelines when performing service on a diesel vehicle?

Task Number 40

Utilize safe procedures for handling of tools and equipment.

Definition

Utilization should include always reading the manufacturer procedures for the safe use of hand tools, power tools, and equipment.

Process/Skill Questions

Why should you always read manufacturer procedures for the proper use of the tool?

Task Number 41

Identify and use proper placement of floor jacks and jack stands.
Definition

Identification should include

- following manufacturer recommendations for jack placement
- ensuring the vehicle is on level ground before jacking
- using jacks and jack stands that are rated for the capacity for the vehicle on which the service is to be performed.

Process/Skill Questions

- Why should you check for proper jack placement?
- Why should you use jack stands to support a vehicle?

Task Number 42

Identify and use proper procedures for safe lift operation.

Definition

Procedure should include

- reviewing all lift-safety information
- identifying the correct placement of lift arms on vehicle
- lowering vehicle on safety locks before performing under-carriage service.

Process/Skill Questions

- Why is it important to read all lift-safety material supplied by the lift manufacturer?
- Why is it important to lower the vehicle onto the safety locks?

Task Number 43

Utilize proper ventilation procedures for working within the lab/shop area.

Definition

Utilization should include
• keeping bay doors open when possible
• operating lab/shop exhaust fans
• using an exhaust ventilation hose on running vehicles.

Process/Skill Questions

• What are the gases emitted by a running vehicle?
• Why is proper ventilation so important?
• What are the dangers of a running vehicle in a confined space?

Task Number 44

Identify marked safety areas.

Definition

Identification should include describing and translating signage and special markings (e.g., floor paint) that identify work and caution areas.

Process/Skill Questions

• What are the different types of work zones?
• How do you know if additional safety equipment or clothing is needed to enter a safety area?
• How are walkways identified in the lab/shop area?

Task Number 45

Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.

Definition

Identification should include
• the different types of fires encountered in the diesel technology field (Classes A, B, C, D, and E) and the hazards and the precautions associated with each type of fire
• the locations and types fire safety equipment including the appropriate type of extinguishers and their use and identification of relevant signage and labels
• fire emergency procedures in accordance with government regulations, building specifications, and instructor's guidelines.

Process/Skill Questions

• How are fire extinguishers locations marked?
• What types of extinguishers are used in the diesel lab/shop?
• What other fire safety equipment might be found in a diesel lab/shop?

Task Number 46

Identify the location and use of eye wash stations.

Definition

Identification should include describing the signage and operating procedures for the unit.

Process/Skill Questions

• What is the color of the sign that signifies an eye wash station?
• When should you use an eye wash station?
• What safety equipment provides additional eye protection?

Task Number 47

Identify the location of the posted evacuation routes.

Definition

Identification should include

• events that could trigger an evacuation
• the location and interpretation of the posted evacuation route
• the destination and procedures for evacuation.

Process/Skill Questions
• What route should be followed in the event of an evacuation?
• Where is the evacuation route posted?
• Why is it important to establish a meeting place in the case of an evacuation?

---

Task Number 48

Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.

Definition

Compliance should include

• wearing safety glasses at all times in the diesel lab/shop area
• wearing additional personal safety equipment, when necessary
• adhering to governmental and classroom safety policies.

Process/Skill Questions

• Why are safety glasses in the diesel lab/shop required at all times?
• What kinds of shoes are appropriate in the lab/shop area?
• Why might you need to wear ear protection in the diesel lab/shop?

---

Task Number 49

Identify and wear appropriate clothing for lab/shop activities.

Definition

Identification should include

• clothing that will not hinder operations or be a danger to self or others
• school or lab/shop policy
• professional dress requirements and professional expectations.

Process/Skill Questions

• What can result from wearing loose clothing around moving objects in the lab/shop?
• What is the school dress code?
• What are the benefits of following standard workplace policies for apparel in the lab/shop?

Task Number 50

Secure hair and jewelry for lab/shop activities.

Definition

Compliance should include

• restraining hair to keep it from inadvertently getting caught in moving parts
• restraining or not wearing jewelry that can short circuit electrical components, cause electrical burns, or get caught in moving parts
• adhering to lab/shop safety policies.

Process/Skill Questions

• What is your lab/shop’s policy concerning hair safety?
• Why should long hair be tied up?
• What is the best way to secure your hair so that it does not cause serious injury?

Task Number 51

Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.

Definition

Demonstration should include following manufacturer guidelines when working with supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits. When working with hybrid vehicles, workers should be able to identify

• location of the battery
• physical appearance of the disconnects (small, plastic pieces that fit into the side of a hybrid battery)
• location of high voltage circuits, according to service materials and manufacturer guidelines
• specific protective gear and clothing that technicians should wear when working with the service plug (i.e., type 00 insulating/voltage gloves).

Process/Skill Questions

• Why is it important to follow manufacturer guidelines when disabling an SRS?
• What could happen if the airbag deploys at the wrong time?
• What precautions should be taken when handling removed airbags?
• What are the components of electronic brake control systems?
• What are the types of electronic brake control systems?
• How does the wheel speed sensor operate?
• What color are the high voltage circuits?
• What are the shock dangers involving electric/hybrid vehicles?
• What is the electrocution threshold for humans?

Task Number 52

Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge [HID] lamps, ignition systems, injection systems, etc.).

Definition

Demonstration should include identifying the manufacturer’s warning and guidelines regarding shock hazard.

Process/Skill Questions

• What is the typical system voltage of an HID headlight?
• What gas is used in most HID bulbs?
• What do HID bulbs use in place of filaments?

Task Number 53

Demonstrate knowledge of safety data sheets' (SDS) location and content.
Definition

Demonstration should include identifying

- the location of the sheets within the lab/shop and the purpose they serve
- the administration’s (ownership’s) responsibility for workers’ health and safety
- laws/regulations and practices affecting workers’ health and safety
- health and safety hazards
- health and safety programs
- the responsibility for environmental stewardship
- environmental laws, regulations, and practices
- sustainability initiatives.

Process/Skill Questions

- What environmental concerns should an industry address?
- What environmentally-friendly practices and resources are available to an industry?
- What methods can be used to motivate employees to become involved in effective health, safety, and environmental practices?

Using Tools and Equipment

Task Number 54

Identify tools and their usage in diesel applications.

Definition

Identification should include

- the National Automotive Technician's Education Foundation (NATEF) Medium/Heavy Truck tools and equipment list
- common end wrenches
- various socket set components
- various wrenches
- various screwdrivers
- various styles of pliers
- various hammers
- various punches and chisels
- specialty cutting tools (hack saw, tubing cutter, hand reamer, and file)
- specialty electrical system tools (volt/ohmmeter, dwell/tachometer, continuity light, timing light, and remote starter switch)
- battery specialty tools (cable puller, terminal and post cleaner, and battery lifting or carrying strap)
• lubrication specialty tools (transmission funnel, oil filter-removing tool, and grease gun)
• other miscellaneous specialty tools (air nozzles, C-clamp, puller set, pressure gauge, and screw extractor)
• fasteners (tapes, dies, nuts, bolts, and studs).

Process/Skill Questions

• What is the difference between an impact socket and a regular socket?
• Why is using a quality tool important?
• Where can you buy quality tools?

Task Number 55

Identify standard and metric designation.

Definition

Identification should include

• the function and application of each system
• the relationship among measurements, tools, and systems used.

Process/Skill Questions

• Why is it important not to mix the systems?
• What determines the measurement system to be used?
• How do you convert fractions to decimals, and why would you want/need to make these conversions?

Task Number 56

Demonstrate safe handling and use of appropriate tools.

Definition

Demonstration should include

• wearing associated protective gear and adhering to clothing guidelines and additional lab/shop policies
• identifying the associated governmental policies and enforcement procedures
• describing manufacturer, lab/shop, and governmental guidelines and policies
• selecting the right tool for the job and describing each tool’s intended application.

Process/Skill Questions

• Why is maintenance of tools important?
• Why is it important to use the right tool for the right job?
• What are some habits of good tool usage?

Task Number 57

Demonstrate proper cleaning, storage, and maintenance of tools and equipment.

Definition

Demonstration should include safety and maintenance procedures for pneumatic, electric, and hydraulic tools and equipment.

Process/Skill Questions

• Why is it important to lubricate air tools?
• How is a drop light used?
• How do impact sockets differ from conventional sockets?

Task Number 58

Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Definition

Demonstration should include using and reading

• outside and inside micrometers
• plastigage
• dial indicator tool
• feeler gauge
• vernier caliper
• depth micrometer.

Process/Skill Questions

• When are precision measuring tools required?
• What factors can influence precision measurement devices? In what ways?
• How do you know if the measuring equipment is functioning properly?

Preparing Vehicle for Service

Task Number 59

Identify information needed and the service requested on a repair order.

Definition

Identification should include

• owner and vehicle information
• description of complaint and the technician's diagnosis
• name/description/price of needed parts
• hourly/total charges for labor and outside work, sales tax, and total cost.

Process/Skill Questions

• What should the work order contain?
• Why is a work order important?
• Why should the customer sign the work order?

Task Number 60

Identify purpose and demonstrate proper use of fender covers, mats.

Definition

Identification should include

• keeping the customer’s property clean (or as it was brought in)
• using a fender cover whenever the hood is opened
• using mats whenever the car door is opened (interior work) and covering everything
• using latex gloves for interior work.

Process/Skill Questions

• Why is customer satisfaction so important?
• How do you avoid soiling the customer’s property?
• Why are protective supplies (e.g., covers, mats, gloves) intended for single-use?

Task Number 61

Demonstrate use of the three Cs (concern, cause, and correction).

Definition

Demonstration should include

• concern—paying attention and following the work order
• cause—listening to the customer complaint
• correction—troubleshooting and repairing.

Process/Skill Questions

• What is the purpose of knowing and following the three Cs?
• Why is it important to listen to the customer?
• What is the problem-solving process?

Task Number 62

Review vehicle service history.

Definition

Review should include

• accessing and interpreting information for repairs and modifications made to the vehicle, based on the vehicle identification number (VIN)
• sharing data with the customer.

Process/Skill Questions

• Why is service history important?
• Where is the VIN located on vehicles?
• What tools allow you to access the service history?

Task Number 63

Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

Definition

Completion should include

• following task, based on employer requirements
• appropriate customer-service etiquette.

Process/Skill Questions

• Why is it crucial to be polite when interacting with the customer?
• Why is a vehicle pre-inspection (walk-around) necessary when completing or agreeing to a new work order?
• What are the most important elements of the customer’s contact information?

Preparing Vehicle for Customer

Task Number 64

Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)

Definition

Preparation of vehicle should include
• ensuring gloves are worn and that floor mats, steering wheel cover, fender covers, and other protective materials are in place (also before any service begins)
• adjusting the seat position for the customer
• ensuring audio/electronics are off or otherwise have not been changed.

Process/Skill Questions

• Why is self-representation and professional dress important when dealing with customers?
• How should you properly address the customer?
• How should you deal with customer complaints?

DIESEL ENGINES

Diesel Engines: General

Task Number 65

Inspect fluid levels.

Definition

Inspection should include visually checking the levels and condition of

• fuel
• oil
• diesel exhaust fluid (DEF)
• coolant

and determining necessary action.

Process/Skill Questions

• What should the proper ratio of water and antifreeze be?
• How do you take a proper oil or coolant sample?

Task Number 66

Identify engine fuel, oil, coolant, air, and other leaks.
Definition

Identification should include

- placing the vehicle on a level surface
- conducting a visual inspection
- using dye with an ultraviolet light or smoke emitter, if necessary
- determining necessary action.

Process/Skill Questions

- Why are fluids different colors? What are the colors of the various fluids?
- How does the use of a dye and light save time in locating leaks? How does a smoke machine save time?
- What are the safety and environmental considerations when repairing a leak?

Task Number 67

Diagnose engine noises.

Definition

Diagnosis should include

- listening for engine noises
- conducting visual inspection for loose or damaged components
- determining whether the noise is external or internal to the engine
- operating engine at various revolutions per minute (RPM) to help isolate the noise
- determining necessary action.

Process/Skill Questions

- Why might the noise change at different RPM?
- What tools should be used to measure noise level?

Task Number 68

Observe engine exhaust smoke color and quantity.

Definition
Observation should include

- conducting a visual inspection of the smoke
- recording the various colors of smoke being emitted
- running the engine under various RPM and load to verify change in smoke color and volume
- determining needed action

Process/Skill Questions

- What do the different shades of smoke signify?
- What is the difference between white smoke and steam?
- What performance issues may be indicated by the presence of smoke?

Diesel Engines: Servicing Cylinder Head and Valve Train

Task Number 69

Inspect cylinder head.

Definition

Inspection should include checking

- cylinder head for cracks or other damage
- mating surfaces for warpage
- condition of passages
- core/expansion and gallery plugs

and determining necessary action.

The inspection procedure may include

- cleaning with hot or cold tank
- cleaning with sand blasting or sonic cleaning
- conducting a visual inspection with a magnetic particle testing system (e.g., Magnaflux)
- using dye penetrant
- using a straightedge with a feeler gauge.

Process/Skill Questions

- What is "Magnafluxing"? Why is it done?
• What precautions should be taken when sandblasting a cylinder head?
• What precautions should be taken when storing a straightedge?

Task Number 70

Inspect valves, guides, seats, springs, retainers, rotators, locks and seals.

Definition

Inspection should include

• follow manufacturer’s guidelines for the disassembly of the cylinder head
• using tools suggested by the manufacturer for disassembly
• following manufacture’s guidelines for the reusability guidelines of each part
• determining necessary action.

Process/Skill Questions

• What precision measuring tools would you expect to use when inspecting the parts for potential reuse?
• What are possible consequences of failure to follow the manufacturer's guidelines?

Task Number 71

Measure valve head height relative to deck and valve face-to-seat contact.

Definition

Measurement should include

• following manufacture’s procedure for measuring valve height and valve face dimensions
• locating the manufacturer’s specifications for the valve height and face dimensions
• determining the valve condition
• determining necessary action.

Process/Skill Questions
• What engine performance problem might be encountered if the valves are not seating properly?
• What is the major cause of excessive valve wear?
• Which valves are larger, intake or exhaust? Why?

---

**Task Number 72**

**Inspect injector sleeves and seals.**

**Definition**

Inspection should include

- performing a visual inspection of sleeves, seals, and injectors for damage or wear
- following manufacturer’s procedure for measuring tip or nozzle protrusion
- using precision measuring tools to verify sleeve/injector condition
- determining necessary action.

**Process/Skill Questions**

- What could be the effect of an injector or nozzle either recessed or protruded from the sleeve or chamber out of specification?
- How frequently should an inspection of injector sleeves and seals take place?

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**Task Number 73**

**Inspect valve train components.**

**Definition**

Inspection should include conducting a visual inspection of all components and determining necessary action.

**Process/Skill Questions**

- How do you inspect for bent or worn valve train components?
- What is the function of rocker arm assembly?
- How are the valve springs tested for reuse?
Task Number 74

Reassemble cylinder head.

Definition
Reassembly should include following manufacturer’s guidelines for rebuilding a cylinder head.

Process/Skill Questions
- What special tools are needed to reassemble the cylinder head?
- Once the cylinder head is reassembled, what care needs to be taken to prevent damage?

Task Number 75

Measure overhead camshaft end play and backlash.

Definition
Measurement should include
- inspecting the parts
- using precision tools to measure camshaft for excess wear per manufacturer's specifications
- using a dial indicator to measure camshaft end play and backlash
- making adjustments as necessary
- replacing or reinstalling parts.

Process/Skill Questions
- What is the primary advantage of an overhead camshaft versus a pushrod valve train?

Task Number 76

Inspect electronic wiring harness and brackets.

Definition
Inspection should be made for wear, bending, cracks, and looseness and requires
performing a visual inspection of wires, connectors, and clamps
• checking harness with a digital multimeter (DMM) if harness and connectors look worn
• securing all harnesses in proper location and with necessary clamps
• determining necessary action.

Process/Skill Questions

• Why are braided wires used in a harness instead of a solid wire?
• What are three different types of electrical connectors? What are the pros and cons of each?

Task Number 77

Adjust valve bridges, valve clearances, and injector settings.

Definition

Adjustments should include referring to service materials and following manufacturer’s guidelines.

Process/Skill Questions

• How does valve adjustment affect valve timing?
• What problems can result from incorrect valve adjustment?
• What is the purpose of a valve bridge?

Diesel Engines: Servicing the Engine Block

Task Number 78

Perform crankcase pressure test.

Definition

Performance should follow manufacturer’s procedures based upon engine model and age.

Process/Skill Questions

• What are allowable limits (pounds per square inch [PSI] or volume)? How are they determined?
• How is the source of excessive crankcase pressure determined?
Task Number 79

Service pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.

Definition

Servicing should follow industry standards and include

- removing components
- cleaning components
- inspecting components
- installing components
- comparing aerobic and anaerobic sealers.

Process/Skill Questions

- What are the consequences of using improper cleaning procedures?
- How can excessive use of silicone sealant cause damage to the engine?

Task Number 80

Inspect engine block, threaded holes, studs, dowel pins, and bolts.

Definition

Inspection should look for damage, warpage, and serviceability and may include

- visually inspecting the engine block
- using dye to check for potential cracks
- following industry standards for reuse
- determining necessary action.

Process/Skill Questions

- What would an uneven top deck of an engine block cause?
- How are all of the engine oil galleys cleaned?
- How are bent dowel pins and studs identified?
Task Number 81

Inspect cylinder sleeve counter bore and lower bore for distortion.

Definition

Inspection should include use of precision measuring tools to

- verify bore dimensions versus manufacturer’s specifications
- determine necessary action.

Process/Skill Questions

- What would cause a cylinder sleeve to wear the bore of an engine block?
- If the bores are out of specification, how can they be corrected?

Task Number 82

Inspect cylinder walls or liners for wear and damage.

Definition

Inspection should include use of precision measuring tools to

- cleaning the walls or liners
- verifying bore dimensions according to manufacturer’s specifications
- honing the block or cylinder liner
- determining necessary action.

Process/Skill Questions

- Which precision measuring tools would you select to measure bore diameters?
- What is the purpose of a crossed-hatched honing pattern in the bore?

Task Number 83
Reinstall cylinder liners and seals.

Definition

Reinstallation should include

- installing proper seals on liner with approved lubricant
- verifying liner projection with precision measuring tools
- measuring individual liner projection
- comparing projection across all cylinders against manufacturer’s specification.

Process/Skill Questions

- What problems can low liner projection cause?
- How can low liner projection be corrected?

Task Number 84

Inspect in-block camshaft bearings for wear and damage.

Definition

Inspection should include

- performing a visual inspection of cam bearings for any apparent damage
- determining necessary action.

Process/Skill Questions

- What would cause one bearing to fail while all others were in good condition?
- What type of lubricant is used on new camshaft bearings?

Task Number 85

Reinstall in-block camshaft.

Definition

Reinstallation should include
• visually inspecting the in-block camshaft
• using specialized measurement tools
• following service literature specifications to adjust end play
• determining necessary action.

Process/Skill Questions

• What problem would excessive end play on a camshaft cause?
• Does a camshaft have to be timed to any other component in the engine? Why?

Task Number 86

Inspect crankshaft.

Definition

Inspection should include

• cleaning crankshaft components, including oil passages
• checking for cracks
• checking condition of oil passages
• checking passage plugs
• using precision measuring tools to measure journal diameter
• polishing journals, if necessary
• determining other necessary action.

Process/Skill Questions

• What would cause one bearing to seize and fail when all other bearings are OK?
• How does the Magnaflux process work?
• What can be done to a crankshaft journal that is slightly worn?

Task Number 87

Inspect main bearings for wear patterns and damage.

Definition

Inspection should include
• performing a visual inspection of the bearings
• installing bearings and checking with plastigage
• using a dial indicator to check end play
• correcting end play, if necessary.

Process/Skill Questions

• Why is there a multi-step torquing sequence for crankshaft bearings?
• How is excessive crankshaft end play corrected?

Task Number 88

Service gear train.

Definition

Servicing may include

• performing a visual inspection of gears for excessive wear and fractures
• installing gear train
• aligning and timing all required components
• measuring gear backlash according to manufacturer's specification
• determining necessary action.

Process/Skill Questions

• What components in the drive train need to be timed?
• What problems does excessive gear backlash cause?
• What problems does minimal or no backlash cause?

Task Number 89

Inspect connecting rods and bearings.

Definition

Inspection should include

• performing a visual inspection of all components
• using precision measuring tools to measure pistons, pins, retainers, and bushings
- comparing component measurements with manufacturer's specifications
- determining necessary action.

Process/Skill Questions

- Are pistons perfectly round? If not why?
- What would cause a connecting rod to “twist”?

Task Number 90

Service pistons.

Definition

Servicing should include

- checking ring end gap and piston-to-cylinder wall clearance in liner per manufacturer’s specification
- using of precision measuring tools
- installing piston rings using appropriate tooling.

Process/Skill Questions

- How should the rings of a piston be spaced? Explain.
- Are the compression rings marked or numbered for any reason? Explain.

Task Number 91

Assemble pistons and connecting rods.

Definition

Assembly should include

- following manufacturer's guidelines
- using ring compressor for piston installation
- installing rod bearings
- checking for proper clearances with pastigage and feeler guage.

Process/Skill Questions
• Why is the connecting rod torque sequence a multi-step process?
• What can be done if the bearing clearance is too large? Too small?

Task Number 92

Check the condition of the piston cooling jets (nozzles).

Definition

Checking should include

• visual inspection of the cooling jets for blockage or misalignment
• determination of necessary action.

Process/Skill Questions

• What is the purpose of the cooling jet?
• What are the consequences of a misaligned or blocked cooling jet?

Task Number 93

Inspect crankshaft damper.

Definition

Inspection should include

• conducting a visual inspection
• using required puller and installation tools
• determining whether you have a viscous or rubber mounted damper
• following manufacturer’s specification
• determining necessary action.

Process/Skill Questions

• What tools are needed to remove and install a vibration damper?
• What safety precautions should be taken?
• What would cause a rubber mounted damper to be separated? Can the damper be reused?
Task Number 94

Install flywheel housing.

Definition

Installation should include

- following manufacturer's instructions and specifications
- visually inspecting housing to transmission housing
- using dial indicator to measure flywheel housing face and boar runout
- determining necessary action.

Process/Skill Questions

- What problems will a misaligned flywheel housing cause?

Task Number 95

Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear.

Definition

Inspection should include

- inspecting flywheel gear teeth for damage or misalignment
- using dial indicator to measure runout.

Process/Skill Questions

- What is the process of engagement between the starter and flywheel?
- What problem will broken teeth on the flywheel cause?

Diesel Engines: Servicing Lubrication Systems

Task Number 96
Test engine oil pressure and temperature.

Definition

Testing should include

- locating manufacturer’s specifications for oil pressure and temperature
- checking manual gauge at pounds-per-square-inch (PSI) sensor to validate oil pressure
- checking temperature probe to verify oil temperature
- following manufacturer’s guidelines for troubleshooting oil pressure or temperature problems
- determining necessary action.

Process/Skill Questions

- What are five potential causes of low oil pressure in the engine?
- What are five potential causes for high oil temperature in the engine?

Task Number 97

Check engine oil level, condition, and consumption.

Definition

Checking should include

- using dip stick to measure oil level
- taking an oil sample
- verifying proper viscosity of the recommended oil
- record oil consumption versus gallons of fuel burned
- determining necessary action.

Process/Skill Questions

- What problems can be caused by overfilling an engine with oil?
- Why is using the proper viscosity of oil important?
- What information is shown in an oil sample report?

Task Number 98
Inspect oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances.

Definition

Inspection should include

- performing a visual inspection
- cleaning of the oil pump
- measuring gear clearances per manufacturer’s specification
- verifying condition and operation of relief valve and spring
- determining necessary action.

Process/Skill Questions

- What could cause high oil pressure?

Task Number 99

Inspect oil pressure regulator valve, by-pass and pressure relief valves, oil thermostat, and filters.

Definition

Inspection should include

- removing, cleaning, and inspecting oil filter by-pass valve
- removing, cleaning, and inspecting oil cooler by-pass valve
- determining necessary action.

Process/Skill Questions

- What is the purpose of the oil filter by-pass valve?
- What is the purpose of the oil cooler by-pass valve?

Task Number 100

Inspect oil cooler and components.
**Definition**

Inspection should include

- performing a visual inspection of oil cooler
- pressure checking the oil cooler
- determining necessary action.

**Process/Skill Questions**

- Does the engine oil go through the cooling tubes or does it flow outside the tubes?
- If an engine has failed and caused metal debris to go through the lubrication system, can the cooler be cleaned and reused?

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**Task Number 101**

**Inspect turbocharger lubrication systems.**

**Definition**

Inspection should include

- performing a visual inspection of oil supply and drain line from turbocharger
- verifying that there are no leaks or blockage in oil supply or return line
- determining necessary action.

**Process/Skill Questions**

- What will happen to the turbocharger if the oil supply system fails?
- When installing a turbocharger, what are the pre-lubrication procedures?

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**Task Number 102**

**Perform oil and filter changes.**

**Definition**

Performance should include
• consulting manufacturer’s lubrication and maintenance guide for proper oil specifications and capacities
• cutting oil filter open and inspecting for debris
• taking oil sample
• following environmental guidelines for disposal of waste oil and filter.

Process/Skill Questions

• Will the oil specification change between summer and winter temperatures? Explain.
• Should an oil filter be installed empty or should it be filled with oil?
• What vehicle information should be submitted when sending in an oil sample?

Diesel Engines: Servicing Cooling Systems

Task Number 103

Check engine coolant type, level, condition, and consumption.

Definition

Checking should include

• following all safety guidelines when checking coolant level and sample
• submitting coolant sample to laboratory for analysis or using coolant test strips
• checking cooling system for any signs of leaks
• filling coolant to proper level
• determining necessary action.

Process/Skill Questions

• What should the proper mixture of water and antifreeze be in the engine?
• Name two instruments that could be used to check the freeze protection of the coolant?
• What safety precautions need to be followed when checking the condition of the coolant?
• What environmental considerations need to be followed when servicing the cooling system?

Task Number 104
Test coolant temperature and check operation of temperature and level sensors, gauges, and sending units.

Definition

Testing should include

- locating the manufacturer’s specification for the proper operating range of the coolant
- installing mechanical temperature gauge and comparing it to the electronic gauge
- using a DMM to verify the operation of the sensors and sending units.

Process/Skill Questions

- Will a diesel engine reach operating temperature when idling? Explain.
- What problems can an overheating cooling system cause? Explain.
- What problems can an overcooling system cause? Explain.

Task Number 105

Inspect pulleys, tensioners, and drive belts.

Definition

Inspection should include

- checking the specification for proper belt tension and alignment
- measuring the pulley grooves for excessive wear
- checking against specification
- verifying the proper operation of the belt tensioner
- making adjustments as needed.

Process/Skill Questions

- Why should multiple belts be changed as a set versus replacing individual belts?
- What tool should be used to verify proper belt tension?
- Does the manufacturer recommend the use of commercial “belt dressing” products? Explain.

Task Number 106
Inspect thermostats, by-passes, housings, and seals.

Definition

Inspection should include

- verifying the operating temperature of the thermostat
- testing the opening temperature and maximum movement of the thermostat per manufacture’s procedure
- checking the thermostat housing for chemical build up or cracks
- examining cooling system hoses and clamps
- replacing parts as needed.

Process/Skill Questions

- What are the results if a thermostat fails to open? If it remains open all the time?
- What is the purpose of the coolant by-pass line or passage?
- What causes the chemical deposits found in a cooling system?

Task Number 107

Refill coolant/additive package.

Definition

Refilling should include

- draining and disposing of coolant per local Environmental Protection Agency (EPA) regulations
- performing cooling system flushing procedures per manufacturer’s instructions
- filling the cooling system with a proper mixture of water/antifreeze and additives per manufacturer’s specifications
- following manufacturer’s instructions for refilling coolant and the bleeding process, if necessary.

Process/Skill Questions

- What material is the flushing process intended to remove?
- What is the purpose of the additive package in a cooling system?
- What can happen to an engine if air bubbles remain in the cooling system?
Task Number 108

Inspect coolant conditioner/filter assembly for leaks.

Definition

Inspection should include

- performing a visual inspection of coolant conditioner assembly and lines
- verifying operation of coolant valves
- checking lines and fittings for leaks
- making any required repairs.

Process/Skill Questions

- What is the difference between the “initial fill” and “maintenance” coolant conditioner element?
- What can happen to the coolant if it has too high a concentration of additives?

Task Number 109

Inspect water pump and hoses.

Definition

Inspection should include

- visually inspecting the water pump and hose
- clearing the "weep hole" of debris, if applicable
- replacing as needed.

Process/Skill Questions

- How should you inspect a water pump? How often?
- What is the purpose of a "weep hole"?
- What safety precautions should be taken when replacing a water pump?
- What are the procedures to replace a water pump?

Task Number 110
Inspect radiator.

Definition

Inspection should include

- pressure washing the exterior of the radiator
- performing a visual inspection
- recommending that radiator be sent to a specialty shop for pressure testing and repairs, if required
- using a radiator hand pump to verify the operation of the pressure cap
- performing a visual inspection of the recovery tank for leaks
- determining additional needed action.

Process/Skill Questions

- What safety precautions should be taken when pressure washing a radiator?
- Why is a cooling system pressurized?
- What is the purpose of the recovery tank?

Task Number 111

Inspect thermostatic cooling fan system and fan shroud.

Definition

Inspection should include

- recording the temperature at which the fan starts operating and comparing to specifications
- recording the temperature at which the fan shuts down and comparing to specifications
- inspecting shroud for missing pieces, cracks, or loose hardware
- replacing as needed.

Process/Skill Questions

- What is the purpose of the thermostatic fan?
- What can happen if the fan clutch fails?
- What are the two main purposes of the fan shroud?
Task Number 112

Inspect turbo charger cooling systems.

Definition

Inspection should include

- performing a visual inspection of the water supply line and return line for leaks
- removing and replacing any heat shields that surround the turbocharger
- determining additional needed action.

Process/Skill Questions

- Why do some turbochargers have coolant lines while others do not?

Diesel Engines: Servicing Air Induction and Exhaust Systems

Task Number 113

Perform air intake system restriction and leakage tests.

Definition

Performance should include

- verifying operation of the filter restriction gauge
- checking for air leaks per manufacturer’s instructions
- determining needed action.

Process/Skill Questions

- What are the symptoms of an air leak on the pressure side of the intake system?
- What will an air leak on the suction side of an intake system cause?

Task Number 114

Perform intake manifold pressure (boost) test.

Definition
Performance should include

- checking boost per manufacturer’s procedure
- using both a PSI gauge and a manifold pressure gauge
- determining needed action.

Process/Skill Questions

- What safety precautions must be followed when checking an engine’s boost in a lab/shop environment?
- Why are manifold pressure gauges measured in inches of mercury vacuum (inHg)?

Task Number 115

Check exhaust back pressure.

Definition

Checking should include

- following manufacture’s instruction
- performing visual inspection of exhaust manifolds, exhaust piping, and mufflers
- determining needed action.

Process/Skill Questions

- What problems will high back pressure cause?
- What is the most common cause of excessive back pressure?

Task Number 116

Inspect turbocharger, wastegate, and piping systems.

Definition

Inspection should include

- performing an operational bench test for wastegate performance
- performing a visual inspection of intake system piping
- determining needed action.
Process/Skill Questions

- What is the purpose of the wastegate?
- What will the complaint be if the wastegate opens early?
- What will happen if the wastegate never opens?

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Task Number 117

Inspect variable geometry turbocharger (VGT), pneumatic, hydraulic, and electronic controls and actuators.

Definition

Inspection should include

- performing a visual inspection of the VGT along with its controls
- performing an operational test of the VGT with the use of Electronic Technician (ET) software
- determining needed action.

Process/Skill Questions

- What is the purpose of VGT?
- What are the results if the VGT does not operate correctly?

Task Number 118

Check air induction system.

Definition

Checking should address piping, hoses, clamps, and mounting, and should include

- using the scan tool and comparing results to service materials and manufacturer’s guidelines
- using the air filter indicator to determine filter replacement needs
- determining needed action.

Process/Skill Questions

- What kinds of problems can unfiltered air cause?
• What kind of complaint might an air leak after the turbocharger cause?

Task Number 119

Reinstall turbocharger/wastegate assembly.

Definition

Re-installation should include

• removing the turbocharger while following safety guidelines
• replacing all mounting hardware and gaskets when reinstalling turbocharger
• re-lubing the turbocharger before connecting the oil supply line.

Process/Skill Questions

• What is the purpose of pre-lubing the turbocharger?

Task Number 120

Inspect intake manifold, gaskets, and connections.

Definition

Inspection should include

• performing a visual inspection of all lines and connections
• tightening and/or double clamping all connections
• making replacements as needed.

Process/Skill Questions

• What issues would a defective manifold cause on a naturally aspirated (N/A) engine versus a turbocharger (T) engine?

Task Number 121
Inspect air cooler assemblies.

Definition

Inspection should include

- cleaning cooler assembly per manufacturer’s directions
- pressure testing the cooler assembly with air pressure per manufacturer
- repairing any loose connections
- replacing parts as needed.

Process/Skill Questions

- What is the purpose of the charge air assembly?
- What other names may the charge air assembly be called?
- What will be the operational complaint if the cooler assembly is not working properly?

Task Number 122

Inspect exhaust manifold, piping, mufflers, and mounting hardware.

Definition

Inspection should include

- performing a visual inspection of the manifold, the muffler, and all connections
- replacing hardware as required.

Process/Skill Questions

- What are the signs of an exhaust manifold leak?
- On a turbocharged engine, why is an exhaust manifold leak a serious problem?

Diesel Engines: Servicing Engine Brakes

Task Number 123

Inspect engine compression/exhaust brakes.
Definition

Follow manufacturer’s guidelines for the inspection and adjustment of the engine’s compression brake.

Process/Skill Questions

- What is the purpose of the compression/exhaust brake?
- When is the compression brake activated?
- What are the maintenance requirements of the compression brake system?

Task Number 124

Inspect engine compression/exhaust brake control circuits, switches, and solenoids.

Definition

Inspection should include

- following service instructions for the testing and adjusting the compression brake
- using a DMM to verify the condition of all electrical switches and solenoids
- determining needed action.

Process/Skill Questions

- What problem would a failed solenoid cause with a compression brake system?
- Could a compression brake cause a low power complaint? How?

Task Number 125

Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings.

Definition

Inspection should include

- following guidelines for the inspection of the valve seals and fittings
• inspecting the entire compression brake assembly per guidelines
• determining needed action.

Process/Skill Questions

• Which components of the brake system usually wear out the fastest? Why?

BRAKES

Brakes: Servicing Hydraulic Brakes

Task Number 126

Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system.

Definition

Identification should include checking for out-of-round, scored, hot spots, heat checks, cracks, or damaged brake hardware.

Process/Skill Questions

• What is pedal pulsation?
• What are possible causes of pulling while braking?
• What are possible causes of dragging brakes?

Task Number 127

Test master cylinder for internal/external leaks and damage.

Definition

Testing should include visually inspecting master cylinder for external leaks and testing pedal for internal leaks.

Process/Skill Questions
How do you check a master cylinder for internal leaks? For external leaks?
What is pedal fade?
What are causes of pedal fade?

Task Number 128

Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage.

Definition

Inspection should include checking the components for damage or wear.

Process/Skill Questions

- Where do you find flexible hoses on a vehicle?
- What are the typical failures of brake hoses?
- Why is it important to route brake lines properly?

Task Number 129

Test metering (hold-off), load sensing/proportioning, proportioning, and combination valves.

Definition

Testing should include checking the brake-apply pressure at each wheel and comparing with manufacturer specifications.

Process/Skill Questions

- What braking action will occur if the metering valve is not operational?

Task Number 130
Test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors.

Definition

Inspection should include assessing whether the brake light circuit works as designed.

Process/Skill Questions

• If the warning light does not operate as designed, what is the diagnosis procedure?

Task Number 131

Inspect disc brake caliper assemblies.

Definition

Procedures should include

• checking for binding components
• identifying the problem(s) in caliper operation.

Process/Skill Questions

• What lubricant is used for floating calipers?
• What indicates abnormal wear of brake pads?
• How do you check caliper clearance?

Task Number 132

Inspect brake fluid.

Definition

Inspection should include demonstrating proper methods of storing and handling brake fluid.

Process/Skill Questions
• What is hydrosopic fluid?
• Why is it important to put the lid on the brake fluid when you are finished using it?
• What agency establishes the standards/laws for the handling and storage of brake fluid?

**Brakes: Servicing Mechanical/Foundation Brakes**

**Task Number 133**

**Identify poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components.**

**Definition**

Identification should include

- determining proper function of any brake system component
- comparing component and function to a similar vehicle, if needed
- verifying customer complaint.

**Process/Skill Questions**

- What tools are used in brake repair?
- What concerns are associated with a brake system?
- What is the first step in dealing with a brake system concern?

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**Task Number 134**

**Inspect rotors.**

**Definition**

Inspection should include using proper measuring tools to determine the condition of the rotor.

**Process/Skill Questions**

- What tool is used to check lateral run-out? To check thickness variation?
- What evidence should require you to discard rather than try to repair the rotor?
At how many points do you measure rotor for thickness variation?

Task Number 135

Inspect disc brake pads and mounting hardware.

Definition

Inspection should include

- removing caliper assembly
- replacing pads, according to manufacturer guidelines.

Process/Skill Questions

- What are the procedures to remove pads?
- How often should the pads be checked and replaced?
- How do you determine pad composition? Why is this information important?

Task Number 136

Inspect parking brake application and holding devices.

Definition

Inspection should include visually inspecting cable operation and replacing or adjusting as needed.

Process/Skill Questions

- What are some possible failures of a parking brake system?
- How do you properly lubricate the cables?
- What lubricant is used on the cables?

Brakes: Servicing Power Assist Units

Task Number 137
Identify stopping problems caused by the brake assist (booster) system.

Definition

Identification should include

- hard brake pedal application
- brake pedal movement.

Process/Skill Questions

- What is the operation of a hydroboost system?
- What might cause a hard brake pedal?

Task Number 138

Repair or replace hydraulic brake assist (booster), hoses, and control valves.

Definition

Repair or replacement should include inspecting power steering system, hoses, and hydroboost for proper operation.

Process/Skill Questions

- What is the operation of a hydroboost system?
- What part of the hydroboost unit acts as a reserve?
- What might cause a hard brake pedal?

Task Number 139

Check emergency (back-up, reserve) brake assist system.

Definition

Check should include
• understanding that an emergency brake backup system uses compressed air in the air spring reservoirs as an energy source to supply the pressurized air required for brake function
• making minor modification to existing tractor and trailer brake systems that employ air suspension assemblies, if needed.

Process/Skill Questions

• Why is it important to check the emergency brake assist system?

**Brakes: Servicing Wheel Bearings**

**Task Number 140**

**Replace wheel bearings and races/cups.**

**Definition**

Replacement should include

- removing hub and bearing assembly
- cleaning, inspecting, and repacking wheel bearings
- replacing with new seals
- installing and tightening bearings, according to manufacturer guidelines.

**Process/Skill Questions**

- What are the procedures for removing a hub and bearing assembly?
- What lubricant is used when replacing hub?
- What are the proper procedures for adjusting wheel bearings?

---

**Task Number 141**

**Replace unitized/preset hub bearing assemblies.**

**Definition**

Replacement should include

- removing hub and bearing assembly
- cleaning, inspecting, and repacking wheel bearings
• replacing with new seals
• installing and tightening bearings, according to manufacturer guidelines.

Process/Skill Questions

• What are the procedures for removing a hub and bearing assembly?
• What lubricant is used when replacing hub?
• What are the proper procedures for adjusting wheel bearings?

SUSPENSION AND STEERING

Suspension and Steering: Wheels and Tires

Task Number 142

Identify tire wear patterns.

Definition

Identification should include

• checking tread depth and pressure
• determining needed action.

Process/Skill Questions

• What tread depth is considered unacceptable?
• What problems can low tire pressure cause?

Task Number 143

Identify wheel/tire vibrations.

Definition

Identification should include

• noting shimmy, pounding, and hop (tramp) problems
• determining needed action.
Process/Skill Questions

- What are some common causes for shimmy?
- How can hop (tramp) problems be addressed?

Task Number 144

Install steering and drive axle wheel/tire assemblies.

Definition

Installation should include

- removing assemblies
- reinstalling assemblies according to manufacturer's specifications
- torquing the mounting hardware to specifications using a torque wrench.

Process/Skill Questions

- Where can specifications be found?
- Can the mounting hardware be torqued without a torque wrench? Explain.

Task Number 145

Inspect tire for proper application.

Definition

Inspection should include

- determining the use of the vehicle
- checking the size, load range, position, and tread design of the tire
- determining needed action.

Process/Skill Questions

- What are possible consequences of having tires that don't suit the use of the vehicle?
- How does tread design vary for different vehicle uses?
Task Number 146

Inspect wheel/rims for proper application.

Definition

Inspection should include

- checking for hand-hold alignment, load range, size, and design
- determining needed action.

Process/Skill Questions

- What is hand-hold alignment?
- How do you ensure that a tire is suitable for given wheels/rims?

Task Number 147

Check operation of tire pressure monitoring system (TPMS).

Definition

Check should include

- testing the TPMS to ensure proper operation
- determining needed action.

Process/Skill Questions

- What are the best methods for testing the TPMS?
- What might happen if the TMPS is not tested regularly?

ELECTRICAL/ELECTRONIC SYSTEMS

Electrical/Electronic Systems: General

Electrical Systems

Task Number 148
Interpret electrical/electronic circuits, using wiring diagrams.

Definition

Interpretation should include

- locating appropriate diagram based on concern
- using legends/keys
- applying system knowledge and troubleshooting methods.

Process/Skill Questions

- What does the ground symbol look like?
- What does the acronym "AWG" mean, and how is it applied?
- What does a fuse symbol look like?

Task Number 149

Check continuity in electrical/electronic circuits using appropriate test equipment.

Definition

Demonstration should include using the DMM as a(n)

- voltmeter
- ohmmeter.

Technician should demonstrate an applied understanding of voltage drop principles and be able to measure voltage drop.

Process/Skill Questions

- How should a voltmeter be connected?
- What does this a high voltage drop mean? A low voltage drop?
- What needs to happen to a circuit in order to measure resistance?

Task Number 150
Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.

**Definition**

Demonstration should include

- using the DMM as a voltmeter
- testing light to check for power, ground, and test fuses.

Technician should demonstrate an applied understanding of voltage drop principles and be able to measure voltage drop.

**Process/Skill Questions**

- How should a voltmeter be connected?
- What does this a high voltage drop mean? A low voltage drop?
- What does a test light tell you about a circuit?
- Where should you avoid using a test light?
- What does a dim light indicate?
- What is the difference between a self-powered and a conventional test light?

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**Task Number 151**

Check current flow in electrical/electronic circuits and components using appropriate test equipment.

**Definition**

Demonstration should include using the DMM as an ammeter. Technician should demonstrate an applied understanding of amperage principles and be able to amperage in a circuit.

**Process/Skill Questions**

- How should an ammeter be connected?
- What is the maximum amperage on most handheld DMMs? What does this mean?
Task Number 152

Check resistance in electrical/electronic circuits and components using appropriate test equipment.

Definition

Demonstration should include using the DMM as an ohmmeter. Technician should demonstrate an applied understanding of Ohm's Law and be able to resistance in components and circuits.

Process/Skill Questions

• How should an ohmmeter be connected?
• What does this high of a resistance mean in a circuit? What does low resistance mean in a circuit?
• What needs to happen to a circuit in order to measure resistance?

Task Number 153

Locate shorts, grounds, and opens in electrical/electronic circuits.

Definition

Location should include

• checking electrical circuits with a testing light and determining needed repairs
• checking electrical circuits, using jumper wires, and determining needed repairs
• finding shorts, grounds, opens, and resistance problems in electrical/electronic circuits and determining needed repairs
• measuring and diagnosing the causes of abnormal key-off battery drain and determining needed repairs.

Process/Skill Questions

• What tools are used to locate a short to ground?
• How might a burned bulb affect a fuse?
• What are the types of resistance issues?
Task Number 154

Identify parasitic (key-off) battery drain problems.

Definition

Identification should include

- measuring draw, according to manufacturer standards, using an ammeter
- diagnosing the cause by isolating the excessively drawing circuit by disabling/disconnecting portions of the circuits or components (methodically from maxifuses to minifuses).

Process/Skill Questions

- What is the typical allowable range for a parasitic draw?
- What is key-off load?
- How would you perform a parasitic draw test? Why is this test conducted?

Task Number 155

Test fusible links, circuit breakers, relays, solenoids, and fuses.

Definition

Testing should include conducting a visual inspection or using appropriate test equipment.

Process/Skill Questions

- How would you describe a fusible link?
- How do circuit breakers function?
- How would you recognize an open fuse?

Task Number 156

Test spike suppression devices.

Definition
Testing should include conducting a visual inspection or using appropriate test equipment.

Process/Skill Questions

- How would you describe a spike suppression device?
- How do spike suppression devices function?
- How do you test whether a spike suppression device is working properly?

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Task Number 157

Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.

Definition

Procedure should include conducting a visual inspection or using appropriate test equipment.

Process/Skill Questions

- How would you describe a frequency or pulse width signal?
- What test equipment is used to verify a proper frequency or pulse width signal?
- Why do manufacturers use a frequency or pulse width signal?

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Electrical/Electronic Systems: Servicing Battery

Task Number 158

Perform appropriate battery load test.

Definition

Performance should include

- exploring load and high-rate discharge
- referring to service materials and manufacturer guidelines.

Process/Skill Questions
• Where would you find a cold cranking amperage (CCA) rating?
• Should a frozen battery be tested? Why, or why not?
• What tools are used to perform the battery capacity test?

Task Number 159

Determine battery state of charge using an open circuit voltage test.

Definition

Determination should include referencing service materials and following manufacturer guidelines.

Process/Skill Questions

• When should a battery state-of-charge test be performed? How often?
• What type of acid is in a lead/acid battery?
• What types of batteries are available?

Task Number 160

Service battery.

Definition

Service should include

• cleaning battery case and terminals
• filling battery with distilled water and topping off electrolyte, if appropriate
• replacing battery by disconnecting and reconnecting specified battery size (group number), with respect to polarity
• replacing cables by using the same or larger gauge than manufacturer specifications
• replacing connectors, clamps/terminals, and hold-downs by using same as original equipment.

Process/Skill Questions

• Of what materials are most battery clamps made?
• What precautions should be taken when servicing a battery?
• What product(s) can neutralize battery acid?

Task Number 161

Clean battery boxes, mounts, and hold downs.

Definition

Cleaning should include

• battery case and terminals
• battery hold downs and trays.

Process/Skill Questions

• What precautions should be taken when servicing a battery?
• What product(s) can neutralize battery acid?

Task Number 162

Charge battery using appropriate method for battery type.

Definition

Procedure should include

• maintaining or restoring electronic memory functions
• inspecting, cleaning, filling, and replacing battery
• performing slow/fast battery charge.

Process/Skill Questions

• Why is slow charging preferred?
• How do you charge an absorbed glass mat (AGM) battery?
• What gas is produced when charging a battery?
Task Number 163

Clean battery cables and connectors.

Definition

Procedure should include

- cleaning battery case and terminals
- replacing cables by using the same or larger gauge than manufacturer specifications
- replacing connectors, clamps/terminals, and hold-downs by using same as original equipment.

Process/Skill Questions

- Of what materials are most battery clamps made?
- What precautions should be taken when servicing a battery?
- What product(s) can neutralize battery acid?

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Task Number 164

Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.

Definition

Jump start should include using jumper cables and a battery or auxiliary power supply to start a vehicle.

Process/Skill Questions

- What are the steps to performing a jump start?
- Why is the last connection made away from the battery?
- What personal protective equipment (PPE) should be worn when performing a jump start?

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Task Number 165
Perform battery capacitance test.

Definition

Performance should include

- maintaining or restoring electronic memory functions
- performing capacitance test.

Process/Skill Questions

- What information do you need to know to perform a capacitance test?
- What is the next step if a battery fails a capacitance test?

Task Number 166

Test low voltage disconnect (LVD) systems.

Definition

Procedure should include

- inspecting and testing, based on manufacturer guidelines
- interpretation of appropriate wiring diagrams.

Process/Skill Questions

- What is the purpose of a LVD system?
- What is the repair procedure for a LVD system?

Electrical/Electronic Systems: Servicing Gauges and Warning Devices

Task Number 167

Identify causes of intermittent, high, low, or no gauge readings.

Definition
Identification should include

- inspecting and testing gauges and gauge sending units and replacing as needed
- inspecting and testing connectors, wires, and printed circuit boards of gauge circuits and repairing or replacing, as needed
- diagnosing incorrect operation of warning devices and other driver information systems
- diagnosing intermittent, high, low, or no readings on electronic instrument clusters
- inspecting and testing sensors, sending units, connectors, and wires of electronic instrument circuits and repairing or replacing, as needed.

Process/Skill Questions

- How can you verify a gauge reading? How do you know the electric gauge is accurate?
- How would you test a gauge sending unit?

Task Number 168

Test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires.

Definition

Testing should include

- inspecting, testing, and replacing oil temperature and pressure switches and sensors
- checking operation of parking brake indicator light system
- checking operation of brake stop light system and adjusting and servicing, as needed
- diagnosing intermittent, high, low, or no gauge readings
- testing gauge circuit voltage regulators (limiters) and replacing, as needed
- inspecting and testing gauges and gauge sending units and replacing, as needed
- inspecting and testing connectors, wires, and printed circuit boards of gauge circuits and repairing or replacing, as needed
- diagnosing incorrect operation of warning devices and other driver information systems
- diagnosing intermittent, high, low, or no readings on electronic instrument clusters
- inspecting and testing sensors, sending units, connectors, and wires of electronic instrument circuits and repairing or replacing, as needed.

Process/Skill Questions

- How would you describe a balancing-coil gauge system?
- How would you test a gauge sending unit?
- What is the purpose of the instrument voltage regulator (IVR)?
PREVENTIVE MAINTENANCE AND INSPECTION

Preventive Maintenance and Inspection: Servicing Engine

Task Number 169

Check engine starting and operation.

Definition

Checking should include

- checking oil and coolant levels before starting the engine
- following manufacturer's starting procedure (glow plugs/ether aid)
- recording RPM, oil PSI, and voltage
- noting unusual noises, color of smoke, and vibrations.

Process/Skill Questions

- What is the difference between white exhaust smoke and steam?
- After engine starts, what might you look for in a walk-around inspection?

Task Number 170

Inspect belts, tensioners, and pulleys.

Definition

Inspection should include

- visually checking belts for cracks, tears, or uneven wear
- visually checking pulleys for physical damage or cracks, excessive groove wear, and mounting bolts torqued
- ensuring belt tensioner is moving freely
- checking belt tension with a belt tension gauge.
Process/Skill Questions

- What is the number one reason belts fail prematurely?
- How does the belt tensioner work?
- If a belt tension gauge is not available, how would you set proper belt tension?

Task Number 171

Inspect vibration damper.

Definition

Inspection should include

- performing a visual inspection of damper to ensure bolts are tight and there is no visual damage
- checking the rubber damping ring for cracks or aging and hardening or separation
- ensuring that the damper is “running true” and not wobbling.

Process/Skill Questions

- What is the purpose of the vibration damper?
- What is another name for a vibration damper?
- What kind of vibration is the damper trying to cancel?

Task Number 172

Check engine oil level and condition.

Definition

Checking should include

- parking vehicle on level ground
- checking oil before starting; level should be between add and full marks on dipstick
- inspecting oil condition (gritty, burnt smell, discolored, milky)
- taking oil sample if scheduled
- inspecting seal or O-ring at top of dipstick.

Process/Skill Questions
• What problems would over-filling a crankcase with oil cause?
• What is the notable sign of a worn or missing dipstick seal?

Task Number 173

Inspect engine mounts for looseness and deterioration.

Definition

Inspection should include visually checking that

• mounts are secured
• bolts are tightened
• rubber blocks are not damaged (e.g., cracked, dry rotted).

Process/Skill Questions

• Why are the engine mounts cushioned with rubber?

Task Number 174

Check engine for oil, coolant, air, fuel, and exhaust leaks.

Definition

Checking should include

• walk-around inspection prior to starting the engine to check oil and coolant levels and to look for oil, coolant, air, fuel, and visible signs of exhaust leaks
• another walk-around inspection after the engine starts to look for dynamic leaks.

Process/Skill Questions

• Why should inspections be performed both prior to start-up and after start-up?

Task Number 175
Check engine compartment wiring harness, connectors, and seals for damage and proper routing.

Definition

Checking should include a visual and physical inspection of wiring harness for chaffing, loose connections and proper hold-down clips.

Process/Skill Questions

- What different types of connectors are used in vehicle wiring harnesses?
- What are the pros and cons of each connector?

Preventive Maintenance and Inspection: Servicing Fuel System

Task Number 176

Check fuel tanks, mountings, lines, caps, and vents.

Definition

Checking should include a daily, walk-around, visual inspection to lo

- look for damage to tanks
- check for leaks from tank or lines
- ensure mounting straps and hardware are secure
- determine whether fuel cap and vents need to be cleaned.

Process/Skill Questions

- Why are fuel tanks usually vented?

Task Number 177

Drain water from fuel system.

Definition
Draining should include following manufacturer's guidelines in draining water from the fuel tank (if equipped).

**Process/Skill Questions**

- What is the source for most water found in diesel fuel?

**Task Number 178**

**Service water separator/fuel heater and fuel filter(s).**

**Definition**

Service should be performed daily and should include

- checking fuel heater for coolant leaks at line or fittings
- replacing fuel filters per manufacturer schedule
- using manual or electric priming pump to fill filter
- removing air from system per stated procedure.

**Process/Skill Questions**

- What may happen if the water separator is not drained?
- Why may a fuel heater be needed?
- Why should fuel filters be installed empty?
- Why must air be removed from the fuel system?

**Preventive Maintenance and Inspection:**

**Servicing Air Induction and Exhaust System**

**Task Number 179**

**Check exhaust system mountings for looseness and damage.**

**Definition**

Checking should include a visual inspection of all exhaust system clamps, hangers, and hardware.

**Process/Skill Questions**

- What could happen to an engine if the baffles inside a muffler “break up?”
Task Number 180

Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after-treatment devices, if equipped.

Definition

Checking should include a visual inspection to look for

- exhaust gas leaks
- interference issues between the exhaust system and the cab or chassis
- leaks or loose fittings on the EGR
- problems with wires and fittings on the after-treatment system.

Process/Skill Questions

- What is the purpose of the EGR system?

Task Number 181

Check air induction system for air restrictions and leaks.

Definition

Checking should include

- inspecting piping, charge air cooler, hoses, clamps, and mounting
- inspecting the air filter indicator to determine air filter restriction level.

Process/Skill Questions

- What do the numbers on the side of the air filter indicator denote?

Task Number 182
Inspect turbocharger for leaks.

Definition

Inspection should include

- checking for leaks both on the suction and pressure side
- checking the four mounting bolts securing the turbocharger to the exhaust manifold.

Process/Skill Questions

- What problems could a leak on the suction side of the turbocharger cause? On the exhaust side?

Task Number 183

Check operation of engine compression/exhaust brake.

Definition

Checking should include activating the compression brake solenoids, with the engine running, either by the switch in the cab or with the electronic diagnostic tool.

Process/Skill Questions

- What is the purpose of the compression brake?
- Explain the operation of the engine compression brake.

Task Number 184

Replace air filter as needed.

Definition

Replacement should include

- checking the air filter indicator
- removing the filter cover
- wiping the housing with a clean cloth
• installing a new filter
• securing cover
• resetting air filter indicator.

Process/Skill Questions

• Can air filters be serviced or cleaned?
• What do the numbers on the side of the air filter indicator denote?

Task Number 185
Service crankcase ventilation system.

Definition
Servicing should include

• inspecting the mounting hardware for the filter housing
• following manufacturer guidelines for replacing the filter cartridge and O-ring seals
• inspecting drain lines for leaks or deterioration.

Process/Skill Questions

• What is the purpose of the crankcase ventilation system?
• When should the filter cartridge be changed?

Task Number 186
Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge pump, and filter.

Definition
Inspection should include

• checking DEF level
• checking for leaks
• following manufacturer guidelines for the maintenance servicing of the DEF system.
Process/Skill Questions

- What is the purpose of the DEF fluid?
- What safety and storage concerns are there with DEF?

Task Number 187

Inspect selective catalyst reduction (SCR) system.

Definition

Inspection should include checking the DEF for proper levels, leaks, mounting, and connection.

Process/Skill Questions

- What part does DEF play in the SCR system?

Preventive Maintenance and Inspection: Servicing Cooling System

Task Number 188

Check operation of fan clutch.

Definition

Checking should include

- using the electronic diagnostic tool
- activating the clutch solenoid
- watching for either hydraulic or pneumatic engagement of the clutch.

Process/Skill Questions

- What is the advantage of having a fan clutch versus a straight mechanical fan?
- If the fan clutch fails to engage, what might happen?
- If the fan clutch stays engaged all the time, what might the operator complain about?

Task Number 189
Inspect radiator (including air flow restriction, leaks, and damage) and mountings.

Definition

Inspection should include

- performing a visual inspection of radiator core for debris and leaks
- using an air flow meter following their instruction to check for blocked core
- inspecting top and bottom mounting brackets for the radiator.

Process/Skill Questions

- While using the air flow meter, where will you record the highest volume of air passing through the radiator core?

Task Number 190

Inspect fan assembly and shroud.

Definition

Inspection should include

- checking fan blades for damage (bent or broken)
- checking the condition and mounting of the fan shroud.

Process/Skill Questions

- What effect can broken or bent fan blades have on the operation of the cooling system?
- What are two reasons for having a properly functioning fan shroud?

Task Number 191

Pressure test cooling system and radiator cap.

Definition

Testing should include using a coolant system pressure tester and following instructions
• to verify the integrity of the entire cooling system
• to test the operation of the radiator cap.

Process/Skill Questions

• Why is a cooling system pressurized?

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Task Number 192

Inspect coolant hoses and clamps.

Definition

Inspection should include performing both a visual and physical test on the cooling system hoses and clamps to look for

• cracks in the hose
• rubber deterioration or soft hose
• collapsed hose
• broken or stripped clamps.

Process/Skill Questions

• What are three different styles of hose clamps? What are the pros and cons of each?
• What are preformed hoses?
• Why might you find a spring placed inside a cooling system hose?

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Task Number 193

Inspect coolant recovery system.

Definition

Inspection should include

• checking coolant recovery tank for any leaks
• cleaning the recovery tank if sediment is found
• checking the condition of the hose between the tank and the radiator.

Process/Skill Questions
What is the purpose of the coolant recovery tank?
What causes the coolant to flow into the tank?
What causes the coolant to flow from the tank back into the radiator?

Task Number 194

Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).

Definition

Checking should include

- performing a visual examination of the coolant, looking for solid particles (contaminants)
- submitting a coolant sample to a lab for analysis
- using a hydrometer or refractometer to measure the freeze protection of the coolant.

Process/Skill Questions

- What is the purpose of the various additives found in antifreeze?
- What is the difference between standard antifreeze and extended-life antifreeze?
- At what temperature will a 50/50 mixture of water and antifreeze freeze? Explain.

Task Number 195

Service coolant filter.

Definition

Servicing should include

- changing the coolant additive filter per manufacturer recommendation
- inspecting the filter base, associated valves, and lines for leaks and proper operation.

Process/Skill Questions

- What is the need for the coolant additive filter?
Task Number 196

Inspect water pump.

Definition

Inspection should include

- visually inspecting the water pump and hose
- clearing the "weep hole" of debris, if applicable
- replacing as needed.

Process/Skill Questions

- How should you inspect a water pump? How often?
- What is the purpose of a "weep" hole?
- What safety precautions should be taken when replacing a water pump?
- What are the procedures to replace a water pump?

Preventive Maintenance and Inspection: Servicing Lubrication System

Task Number 197

Clean engine oil and filters.

Definition

Cleaning should include the following steps:

- Drain oil.
- Remove filter and cut open for inspection.
- Compare debris on magnetic plug to what was found in the filter.
- Take oil sample and review analysis report.
- Install new filter empty.
- Add appropriate oil to required level.
- Start vehicle and check for proper pressure and any leaks.
- Repair as necessary.

Process/Skill Questions

- Why should old oil filters be cut open?
• Where would you find the oil specifications and capacity for a particular engine?
• What are four wear metals that could be reported in an oil analysis report?
• What components could the wear metal be coming from?

Task Number 198

Take an engine oil sample for analysis.

Definition

Take oil sample and review analysis report.

Process/Skill Questions

• How is an analysis report completed?

Preventive Maintenance and Inspection: Servicing Cab and Hood Instruments and Controls

Task Number 199

Inspect key condition and operation of ignition switch.

Definition

Inspection should include

• checking the ignition switch, push button, and/or magnetic switch
• checking the neutral safety switch
• checking the clutch safety switch
• checking the starter relay
• conducting a visual inspection of the wiring harness
• checking components, according to service materials, owner manual, and manufacturer guidelines.

Process/Skill Questions

• What components are in a starter control circuit?
Task Number 200

Check warning indicators.

Definition

Check should include:

- coolant temperature
- fuel
- vehicle speed
- odometer
- oil pressure
- tachometer.

Process/Skill Questions

- What is the purpose of warning indicators?

Task Number 201

Check instruments; record oil pressure and system voltage.

Definition

Verification should include:

- checking oil pressure and system voltage on the instrument cluster.

Process/Skill Questions

- What does a low oil pressure or voltage indicate?

Task Number 202
Check operation of electronic power take off (PTO) and engine idle speed controls, if applicable.

Definition

Verification should include operating electronic PTO controls and noting RPM changes.

Process/Skill Questions

- Did the electronic power take off (PTO) operate?
- Did the RPM change (if applicable)?

Task Number 203

Check heating, ventilation, and air conditioning (HVAC) controls.

Definition

Verification should include

- operate HVAC temperature controls and note temperature changes
- operate outlet controls and note how airflow from the vents changes
- operate defroster mode and verify air conditioning (A/C) compressor engages.

Process/Skill Questions

- When the temperature is moved to hot, does hot air come out of the vents?
- When the temperature is moved to cold, does cold air come out of the vents?
- When the outlet controls are operated, does air come out of the vent indicated (foot/vent/defroster)?
- When the defroster mode is selected, did the A/C compressor engage?

Task Number 204

Check operation of all accessories.

Definition
Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation
- identification of accessory systems.

Process/Skill Questions

Briefly describe each accessory and its benefits?

**Preventive Maintenance and Inspection: Servicing Cab and Hood Safety Equipment**

**Task Number 205**

Check operation of electric/air horns and reverse warning devices.

**Definition**

Check should include looking for proper function of

- air horns and reverse warning devices
- horns and warning devices.

**Process/Skill Questions**

- What is the purpose of a warning device horn or buzzer when in reverse?
- What condition might cause an air horn not to operate?

**Task Number 206**

Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.

**Definition**

Check should include
• inspecting the fuse box for spare (unused) fuses
• locating safety triangle and fire extinguisher(s).

Process/Skill Questions

• Are spare fuses identified in the fuse box?
• Remove the safety triangle and fire extinguisher and verify proper decals are applied and legible?

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**Task Number 207**

**Inspect seat belts and sleeper restraints.**

**Definition**

Inspection should include

- Extend the belts and check for tears/cuts in the webbing
- buckle the belts to check for proper latching.

**Process/Skill Questions**

- Do you see any cuts or tears in the seat belts?
- Did the belts latch securely in the buckle?

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**Task Number 208**

**Inspect wiper blades and arms.**

**Definition**

Inspection should include

- checking the wiper blades and arms for proper operation
- referring to service materials
- following manufacturer guidelines.

**Process/Skill Questions**

- Describe how to replace wiper blades?
• What can occur if the wiper arms are bent or in a bind?

**Preventive Maintenance and Inspection:**
**Servicing Cab and Hood Hardware**

**Task Number 209**

**Check operation of wiper and washer.**

**Definition**

Check should include

- inspecting wiper and washer motor for proper operation
- referring to service materials and following manufacturer guidelines.

**Process/Skill Questions**

- How can you test a wiper motor for proper operation?
- What might be the cause of an inoperative washer system?

**Task Number 210**

**Inspect windshield glass for cracks or discoloration.**

**Definition**

Inspection should include visually checking

- windshield for cracks/chips or discoloration
- sun visor location and mounting.

**Process/Skill Questions**

- What is the proper procedure if a crack or chip is found in the windshield?
- What is the proper procedure if the sun visor is found to be loose or broken?

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**Task Number 211**
Check seat condition, operation, and mounting.

Definition

Check should include

- visually inspecting the seat and mounting brackets
- moving the seat to all of its available positions and check for looseness.

Process/Skill Questions

- Is the seat in good working condition?
- Did the seat move through all of its positions without binding?

Task Number 212

Check door glass and window operation.

Definition

Check should include

- visually inspecting door glass and window for cracks/chips or discoloration
- operating the door glass and window in both the fully open and fully closed positions.

Process/Skill Questions

- What is the proper procedure if a crack or chip is found in the door glass or window?
- What are some common reasons for the door glass or window not to operate properly?

Task Number 213

Inspect steps and grab handles.

Definition

Inspection should include visually checking steps and grab handles for

- damage or loose components
• proper mounting.

Process/Skill Questions

• What can occur if steps and grab handles are loose or broken?

Task Number 214

Inspect mirrors, mountings, brackets, and glass.

Definition

Inspection should include

• checking the mirrors, mountings, brackets for broken or looseness mounting
• checking the mirror glass for cracks or discoloration
• moving the mirrors to all of their available positions and checking for proper operation and visibility.

Process/Skill Questions

• Are the mirrors in good working condition?
• Did the mirrors move through all of their positions without binding?

Task Number 215

Record all observed physical damage.

Definition

Record should include

• visual inspection of entire vehicle for physical damage to any component
• reference to manufacturer guidelines
• anything that interferes with normal operation of components.

Process/Skill Questions

• What should be recommended if any physical damage is evident?
Task Number 216

Lubricate all cab and hood grease fittings.

Definition

Procedure should include inspecting and testing, based on manufacturer's guidelines.

Process/Skill Questions

• What can occur if cab and hood grease fittings are not serviced properly?

Task Number 217

Lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.

Definition

Lubrication should include inspecting and testing, based on manufacturer's guidelines.

Process/Skill Questions

• What can occur if door and hood hinges are not serviced properly?
• What can occur if latches, strikers, lock cylinders, safety latches, linkages or cables are not adjusted properly or in good working order?

Task Number 218

Inspect cab mountings, hinges, latches, linkages, and ride height.

Definition

Inspection should include checking and testing, based on manufacturer's guidelines.

Process/Skill Questions
• What can occur if cab mountings, hinges, latches, linkages and ride height specifications are outside manufacturer guidelines?

Preventive Maintenance and Inspection: Servicing Cab and Hood HVAC

Task Number 219

Inspect A/C condenser and lines for condition and visible leaks.

Definition

Inspection should include

• checking A/C condenser and line routing for interference
• checking connections for evidence of possible leaks (oil or dirt residue).

Process/Skill Questions

• What may cause A/C systems to leak?

Task Number 220

Inspect A/C compressor and lines for condition and visible leaks.

Definition

Inspection should include checking

• A/C compressor and line routing for interference
• connections for evidence of possible leaks (oil or dirt residue).

Process/Skill Questions

• What may cause A/C systems to leak?
Task Number 221

Check A/C system condition and operation.

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What may cause A/C systems to not cool properly?

Task Number 222

Check HVAC air inlet filters and ducts.

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What are possible complaints if the HVAC filters and ducts are not clean?

Preventive Maintenance and Inspection: Servicing Battery and Starting System

Task Number 223

Inspect battery box(es), cover(s), and mountings.

Definition
Inspection should include checking and cleaning battery hold-downs and trays.

**Process/Skill Questions**

- What can occur if a battery is loose?

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**Task Number 224**

**Inspect battery hold-downs, connections, cables, and cable routing.**

**Definition**

Inspection should include checking and cleaning battery hold-downs and trays.

**Process/Skill Questions**

- What can occur if a battery is loose?

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**Task Number 225**

**Record battery state-of-charge (open circuit voltage) and condition.**

**Definition**

Procedure should include

- conducting a visual inspection instrument cluster volt meter

**Process/Skill Questions**

- What is an acceptable state of charge (open circuit voltage)?

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**Task Number 226**
Perform battery test (load and/or capacitance).

**Definition**

Performance should include

- capacitance test
- slow/fast battery charge.

**Process/Skill Questions**

- Why is slow charging preferred?
- How do you charge an AGM battery?
- What gas is produced when charging a battery?

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**Task Number 227**

**Inspect starter, mounting, and connections.**

**Definition**

Inspection should include checking the starter, according to service materials and manufacturer guidelines.

**Process/Skill Questions**

- What should be inspected when checking the mounting of a starter motor?

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**Task Number 228**

**Check starter for unusual noises, starter drag, and starting difficulty.**

**Definition**

Check should include

- operating the starter, according to service materials and manufacturer guidelines
- listening for unusual noises, starter drag, and starting difficulties.
Process/Skill Questions

- What could an unusual noise when the starter is engaged indicate?

Preventive Maintenance and Inspection: Servicing Charging System

Task Number 229

Inspect alternator, mountings, cable, wiring, and wiring routing.

Definition

Inspection should be completed according to service materials and manufacturer guidelines.

Process/Skill Questions

- What inspection procedure should you perform on cables and wiring?

Task Number 230

Perform alternator output tests.

Definition

Performance should include

- using appropriate testing equipment
- using appropriate service information
- determining if additional diagnosis is needed (when vehicle is not performing correctly).

Process/Skill Questions

- What is the proper charging voltage with the vehicle running?
- Where should you place the inductive pickup during an output test?
Preventive Maintenance and Inspection: Servicing Lighting System

Task Number 231

Check operation of interior lights.

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation
- interpretation of appropriate wiring diagrams.

Process/Skill Questions

- What are some common reasons for interior lights not operating properly?
- What inputs are necessary for the interior lights to work properly?
- What inputs are necessary for the exterior lights to work properly?

Task Number 232

Check all exterior lights, lenses, reflectors, and conspicuity tape.

Definition

Check should include

- visually inspecting for proper function of stoplights and bulbs including cracked, broken, or hazy lenses, lights that will not hold adjustment, and dull reflectors
- checking for proper function of bulbs, flashers, turn signals, and hazard switches
- visually inspecting for proper aim of the headlights
- referring to service materials and manufacturer guidelines.

Process/Skill Questions

- What are some common reasons for exterior lights not operating properly?
Task Number 233

Test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s).

Definition

Test should include inspecting and assessing, based on

- manufacturer guidelines
- description of normal operation
- interpretation of appropriate wiring diagrams.

Process/Skill Questions

- What is the inspection process of the tractor-to-trailer multi-wire connector?
- What can happen if there is a problem with the connector?

Preventive Maintenance and Inspection: Servicing Air Brakes

Task Number 234

Check operation of parking brake.

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What are some common reasons for the parking brake not to work?
- Should the vehicle be operated if the parking brake does not work properly?
Task Number 235

Record air governor cut-in and cut-out settings.

Definition

Record should include operating the air governor cut-in and cut-out as outlined by the manufacturer.

Process/Skill Questions

- Does the air pressure indicated meet manufacturer guidelines?
- What are some common causes for air pressure not meeting manufacturer guidelines?

Task Number 236

Check operation of air reservoir/tank drain valves.

Definition

Check should include operating the air reservoir/tank drain valves.

Process/Skill Questions

- What are you draining from the system?
- Why should you drain the system at the intervals recommended by the manufacturer?
- What may occur if the reservoir/tanks are not drained?

Task Number 237

Check air system for leaks (brakes released).

Definition

Check should include

- listening for air leakage
• proper brake operation.

Process/Skill Questions

• Where might you find air leaks in the brake system?
• What might happen if there is an air leak in the brake system?

Task Number 238

Check air system for leaks (brakes applied).

Definition

Check should include

• listening for air leakage
• proper brake operation.

Process/Skill Questions

• Where might you find air leaks in the brake system?
• What might happen if there is an air leak in the brake system?

Task Number 239

Test one-way valves.

Definition

Test should include inspecting and assessing, based on

• a check of the air pressure in the brake system
• manufacturer guidelines
• description of normal operation.

Process/Skill Questions

• What may happen if the one-way or double-check valves do not operate correctly?
Task Number 240

Check low air pressure warning devices.

Definition

Check should include

- the low pressure warning light (operate according to manufacturer specifications)
- the low pressure audible warning device, according to manufacturer specifications (if equipped).

Process/Skill Questions

- Did the light work as specified?
- Does the audible warning device (if equipped) work as described?
- What are some reasons for the low pressure warning devices to not work properly?

Task Number 241

Check emergency (spring) brake control/modulator valve, if applicable.

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What are some common reasons for the emergency (spring) brake control/modulator valve not working as designed?

Task Number 242

Check tractor protection valve.
Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What other names may the tractor protection valve be called?
- What is the purpose of the tractor protection valve?

Task Number 243

Test air pressure build-up time.

Definition

Test should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What are some common reasons for taking too much time to build air pressure?

Task Number 244

Inspect coupling air lines, holders, and gladhands.

Definition

Inspection should include

- checking for proper clearance to prevent contact/wear points
- checking connections tightness and for leaks.

Process/Skill Questions
• What may happen if the airlines come loose or disconnected?
• What may occur if the airlines rub against other components?

Task Number 245

Check brake chambers and air lines for secure mounting and damage.

Definition

Check should include

• visually inspecting brake chambers and air lines for cracks or leaks
• grasping and moving brake chambers and air lines to inspect for excessive movement.

Process/Skill Questions

• What should be done if excessive movement/damage is noted on the brake chambers?

Task Number 246

Check operation of air drier.

Definition

Check should include inspecting and testing, based on

• manufacturer guidelines
• description of normal operation.

Process/Skill Questions

• What could rapid loss of air pressure indicate?

Task Number 247
Record brake shoe/pad condition, thickness, and contamination.

Definition

Record should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What are some possible causes for uneven brake shoe/pad wear?
- What may occur if brake shoe/pads are below manufacture thickness specifications?

Task Number 248

Record condition of brake drums/rotors.

Definition

Record should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What are some possible causes for uneven brake drums/rotor wear?
- What may occur if brake drums/rotors are below manufacture specifications?

Task Number 249

Check antilock brake system (ABS) wiring, connectors, seals, and harnesses for damage and proper routing.

Definition
Check should include

- conducting a visual inspection of the wiring harness
- inspecting components, according to service materials, owner manual, and manufacturer guidelines.

Process/Skill Questions

- What inspection procedure should you perform on wiring, connectors, and seals?

Task Number 250

Check operation and adjustment of brake automatic slack adjusters (ASA).

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What may occur if the automatic slack adjusters are out of specification?

Task Number 251

Lubricate all brake component grease fittings.

Definition

Lubrication should include inspecting and testing, based on manufacturer guidelines.

Process/Skill Questions

- What can occur if brake component grease fittings are not serviced properly?
Task Number 252

Check condition and operation of hand brake (trailer) control valve, if applicable.

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What may occur if the hand brake (trailer) control valve does not operate as per manufacturer specifications?

Task Number 253

Perform ABS operational system self-test.

Definition

Performance should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What may cause the ABS to not perform a system self-test?
- If the vehicle fails an operational self-test, what should be done?

Task Number 254

Drain air tanks.

Definition

Draining should include opening the air tank drain valves and inspecting for contamination.

Process/Skill Questions
- What are you draining from the system?
- Why should you drain the system at the intervals recommended by the manufacturer?
- What should be done of contamination is found during draining?

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**Task Number 255**

**Check condition of pressure relief (safety) valves.**

**Definition**

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

**Process/Skill Questions**

- What may occur if the pressure relief safety valves do not operate as per manufacturer specifications?

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**Preventive Maintenance and Inspection: Servicing Hydraulic Brakes**

**Task Number 256**

**Check master cylinder fluid level and condition.**

**Definition**

Check should include a visual inspection of

- brake fluid level
- brake fluid condition.

**Process/Skill Questions**

- What should be done if the brake fluid level is low?
- What service intervals should brake fluid be replaced?
Task Number 257

Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.

Definition

Inspection should include

- checking for cracks/wear points and proper clearance to prevent contact/wear points
- checking connections tightness and for leaks.

Process/Skill Questions

- What may happen if the brake lines come loose or leak?
- What may occur if the brake lines rub against other components?

Task Number 258

Check parking brake operation.

Definition

Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

Process/Skill Questions

- What may cause the parking brake system not work properly?
- How do you adjust the parking brake?

Task Number 259

Check operation of hydraulic system.

Definition
Check should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

**Process/Skill Questions**

- What should be done if there are any concerns in the hydraulic brake pedal system?

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**Task Number 260**

**Inspect calipers for leakage, binding, and damage.**

**Definition**

Inspection should include checking and testing, based on

- manufacturer guidelines
- description of normal operation.

**Process/Skill Questions**

- What do the calipers do?
- What should be done if there are any leaks, binding or damage of the calipers?

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**Task Number 261**

**Inspect brake assist system (booster), hoses, control valves, and reservoir fluid level and condition.**

**Definition**

Inspection should include visually checking

- brake assist (booster), hoses and control valves
- reservoir fluid level and condition.

**Process/Skill Questions**
- What should be done if the reservoir fluid level is low?
- What should be done if the reservoir fluid level is contaminated?
- What should be done if the brake assist system does not operate as per manufacturer specifications?

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**Task Number 262**

**Record brake lining/pad condition thickness, and contamination.**

**Definition**

Recording should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

**Process/Skill Questions**

- What are some possible causes for brake rotor wear or grooves in the rotor?
- What may occur if brake rotors are below manufacture thickness specifications?

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**Task Number 263**

**Record condition of brake rotors.**

**Definition**

Procedure should include inspecting and testing, based on

- manufacturer guidelines
- description of normal operation.

**Process/Skill Questions**

- What are some possible causes for brake rotor wear or grooves in the rotor?
- What may occur if brake rotors are below manufacture thickness specifications?
Task Number 264

Check ABS wiring, connectors, seals, and harnesses for damage and proper routing.

Definition

Check should include

- conducting a visual inspection of the wiring harness
- inspecting components, according to service materials, owner manual, and manufacturer guidelines.

Process/Skill Questions

- What inspection procedure should you perform on wiring, connectors and seals?

Preventive Maintenance and Inspection: Servicing Drive Train

Task Number 265

Check operation of clutch, clutch brake, and gearshift.

Definition

Checking should include

- starting the engine
- depressing the clutch pedal and listening for abnormal noises
- shifting into gear and listening for abnormal noises.

Process/Skill Questions

- Which components could cause abnormal noises?
- What could be the cause of a squealing sound occurring when the clutch pedal is depressed with the engine running?

Task Number 266
Check clutch linkage/cable for looseness or binding, if applicable.

Definition

Checking should include

- activating the clutch
- visually inspecting the linkage/cable, pins, pedals, and pivots.

Process/Skill Questions

- If there is excessive movement in the clutch pedal in any direction other than up and down, what might be the cause? What adjustment should be made?
- If the rubber pad is missing from the clutch pedal, is the vehicle safe to drive? Explain.

Task Number 267

Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.

Definition

Checking should include

- measuring fluid levels
- looking for fluid leaks
- looking at lines, fittings, and connection points to ensure they are free from leaks and chafing.

Process/Skill Questions

- What effect does age have on seals?
- If a clutch slave cylinder is not operating correctly and the fuel level is not low, what might be the problem?
- What are consequences of not using the brake fluid recommended for the vehicle?
Check clutch adjustment.

Definition

Checking should include

- identifying manufacturer’s specifications
- determining whether there is free play in the clutch
- checking internal and external adjustments.

Process/Skill Questions

- Why is it important to follow manufacturer's specifications and instructions?
- Why should a thorough inspection of all linkage components be made prior to making clutch adjustments?
- What problems might arise after a new clutch installation if several slightly worn linkage components are not replaced?

Task Number 269

Check transmission case, seals, filter, hoses, lines, and cooler for cracks and leaks.

Definition

Checking should include

- transmission line for abrasions or improper routing
- transmission tail shaft seal for leaks
- transmission front seal for leaks
- torque converter for leaks
- transmission case for leaks
- transfer case for leaking transmission fluid
- transmission cooler line fitting for leaks
- transmission cooler leaking into the radiator
- transmission mounting bolts
- operation of air valves, if applicable.

Process/Skill Questions

- How significant does a leak or weep need to be before the vehicle is removed from service?
• What effect would a leaking front transmission seal possibly have on a clutch assembly?
• Could poor operation of the high-low range indicate an air problem?

Task Number 270

Inspect transmission breather.

Definition

Inspection should include

• following manufacturer's instructions
• removing breather
• cleaning breather
• checking for proper air flow.

Process/Skill Questions

• If oil is leaking from a wheel seal, why might a stopped up breather vent possibly be the cause?
• A wheel seal was replaced, but there were no signs that anything was wrong with the seal. Why should the breather be removed and cleaned?
• Why should the breather be removed and cleaned more often for vehicles operating in road construction settings?

Task Number 271

Inspect transmission mounts.

Definition

Inspection should be visual and include

• checking for unusual wear
• checking for loose mounting hardware
• checking for worn isolators
• checking torque on mounting bolts.

Process/Skill Questions
• Why is it that shiny parts are often a sign of something being loose?
• How can a broken transmission mount cause u-joints to fail prematurely?
• What effect can a broken transmission mount have on engine mounts?

Task Number 272

Check transmission oil level, type, and condition.

Definition

Checking should include

• following manufacturer's instructions and specifications
• using proper method (e.g., dipstick, fill plug, transmission keypad)
• sending scheduled oil sample to a laboratory.

Process/Skill Questions

• If the vehicle was filled with an oil type not recommended by the manufacturer during the previous change, should the same oil type be used again?
• Why should a transmission oil sample be sent to a laboratory?

Task Number 273

Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.

Definition

Inspection should include looking for

• damaged bearing retainers or stamped straps
• loose bearing retainer bolts or strap bolts
• loose companion flange bolts or nuts
• loose or missing spring tabs or spring tab bolts
• damaged tings on end fittings
• damaged or missing snap rings
• rotating bearing cups.
If any of these situations are evident, replacement of the components is necessary.

**Process/Skill Questions**

- What type of grease should be used? Explain the differences in types of grease.
- Why are carrier bearings installed on long drive shaft locations?
- Why are carrier bearings enclosed in rubber?

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**Task Number 274**

**Inspect axle housing(s) for cracks and leaks.**

**Definition**

Inspection should include

- cleaning and inspecting differential housing
- checking all welded points and mounting points for cracks.

**Process/Skill Questions**

- Why is it important to get proper training on how to make a complete inspection of the axle housing?
- Should a cracked axle housing be cleaned and welded? Explain.
- Components are often welded to axle housings. If an “S cam” bracket weld were cracked what could result?

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**Task Number 275**

**Inspect axle breather(s).**

**Definition**

Inspection should include

- following manufacturer's instructions
- removing breather
- cleaning breather
- checking for proper air flow.
Process/Skill Questions

- Should the breather inspection for a logging truck that is regularly driven in unpaved areas be performed as prescribed by the manufacturer? Explain.
- Is it acceptable to relocate the breather to a higher location on vehicles that regularly drive through standing water? Explain.

Task Number 276

Lubricate all drive train grease fittings.

Definition
Lubrication should include

- adhering to maintenance schedule based on vehicle's type of duty
- following manufacturer's instructions and specifications.

Process/Skill Questions

- How do you locate all the fittings on the front suspension?
- If a fitting is clogged and won't accept any grease, what options do you have?

Task Number 277

Check drive axle(s) oil level, type, and condition.

Definition
Checking should include

- following manufacturer's instructions and specifications
- using proper method (e.g., dipstick, fill plug)
- sending scheduled oil sample to a laboratory.

Process/Skill Questions

- During a vehicle inspection a leaking axle seal is noted. It is important that the vehicle go to work. Should the vehicle be put out of service and the seal replaced or the oil level checked and the vehicle be put back to work?
When inspecting the oil level, the lubricant is found to be ‘milky’ looking. What could have caused this problem? What should be done?

What would cause the lubricant to have a burnt smell?

Task Number 278

Change drive axle(s) oil and filter/screen, if applicable.

Definition

Changing should include

- following manufacturer's instructions and specifications
- adhering to maintenance schedule
- removing filter, cutting it open, and performing a visual inspection
- submitting scheduled oil sample to a laboratory.

Process/Skill Questions

- What should be done if, when the oil is begin drained from a rear differential, a large amount of steel particles are found on the magnetic drain plug?
- What should be done if, when draining oil from a rear differential, a large piece of ring gear is found?
- If the decision is made to drain the housing and fix the broken ring gear should all the components in the axle housing be removed and the housing thoroughly cleaned? Why?

Task Number 279

Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.

Definition

Checking should include a visual inspection to look for

- proper routing
- proper connections
- secure harnesses
- chafed harnesses.
Process/Skill Questions

• While inspecting the area around a transmission, you see a wiring connector wire tied: What should you do?
• While inspecting wire harness routing, you find a harness not secured properly: What should you do?
• An electrical wire has been damaged during a transmission installation. How should it be repaired?
• In the past, someone drilled a hole through the firewall to connect a power wire that was damaged during a recent installation. No grommet was used to protect the wire rubbing against the metal. How should this issue be resolved?

Task Number 280

Change transmission oil and filter, if applicable.

Definition

Changing should include

• following manufacturer's instructions and specifications
• adhering to maintenance schedule.

Process/Skill Questions

• What is “severe duty”? What is “normal duty”? 
• What is the service interval between normal and severe duty?
• What are consequences of failure to change transmission oil?

Task Number 281

Check inter-axle differential lock operation.

Definition

Checking should include the following steps:

• Raise the drive axle following safety precautions.
• Install wheel chocks.
• Release parking brake.
• Manually turn one drive wheel. (The other should remain stationary.)
• Engage differential lock.
• Manually turn one drive wheel. (The other should turn in the same direction.)

Process/Skill Questions

• What damage could be caused by leaving the inter-axle differential lock engaged when highway driving?
• What damage might happen if the inter-axle were disengaged at highway speeds? If it were engaged at high speed?
• What steps should be performed to test whether the inter-axle lock is working properly?

Task Number 282

Check transmission range shift operation.

Definition

Checking should be done according to manufacturer's recommendations.

Process/Skill Questions

• A driver complains that the transmission grinds gears and makes noises when shifting from low side to high side. Could this problem exist because an air vent or filter is obstructed? If so, why?
• How valuable is a wiring schematic when working on today’s modern transmissions?
• How often are shift problems related to poor maintenance or low lubricant?

Preventive Maintenance and Inspection: Servicing Suspension and Steering System

Task Number 283

Check steering wheel operation for free play and binding.

Definition

Check should include conducting a visual inspection and following manufacturer guidelines and specifications.

Process/Skill Questions
• How can collision damage cause looseness in the steering column?
• How might you distinguish between steering column binding and steering gear binding?
• How might you distinguish between steering column noises and steering gear noises?

Task Number 284

Check power steering pump, mounting, and hoses for leaks, condition, and routing.

Definition

Check should include conducting a visual inspection and using hand tools.

Process/Skill Questions

• When should a hose be replaced?
• What is the best wrench to use on hydraulic fittings?
• Why is it important to use swedged fittings on power steering lines?

Task Number 285

Change power steering fluid and filter.

Definition

Change should include replacement of the filter, including

• flushing the system
• replacing the fluid according to original equipment manufacturer (OEM) specifications.

Process/Skill Questions

• Why is it important to check if the vehicle equipped with a power steering filter?
• What is the OEM required maintenance schedule for filter replacement?

Task Number 286
Inspect steering gear for leaks and secure mounting.

Definition

Inspection should include conducting a visual inspection according to state inspection standards and following manufacturer guidelines and specifications.

Process/Skill Questions

- What would happen if mounting bushings failed?
- Why is an alignment needed after replacing the steering gear?
- Why would the power steering system need flushing after the replacement of the steering gear?

Task Number 287

Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.

Definition

Inspection should include using front-end puller set impact wrench with impact socket set. Also, inspection should include using hand tools and an alignment machine to align front end to manufacturer specifications.

Process/Skill Questions

- Why should a front-end puller set be used?
- What is the disadvantage of using a pickle fork?
- What is the proper way to install a cotter pin?
- How is the clamp properly aligned to the adjuster sleeve?
- Why is anti-seize important to use?
- What might be the consequences of using heat for straightening steering components?

Task Number 288

Check kingpins for wear.

Definition
Checking can be done one of two ways.

The traditional method of inspection includes the following steps:

1. Install jack stand under the straight axle.
2. Test the movement of the tire and wheel by hand; however, this is often not enough to successfully prove the king pin is not worn.
3. After lifting the tire and wheel off the floor, use a rod to lift the wheel and tire and check for looseness.

The modern and more precise method of inspection includes the following steps:

1. Install a dial indicator so that the base is on the I-beam and the tip is against the side of the top of the knuckle.
2. Set the dial indicator to zero, and move the top of the tire side-to-side after raising vehicle and installing jack stand.
3. Repeat for lower bushing.
4. If dial indicator moves a total of 0.010” for either, replace with a new king pin set.

**Process/Skill Questions**

- What signs might indicate kingpin wear?
- What is the purpose of using a dial indicator?

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**Task Number 289**

**Check wheel bearings for looseness and noise.**

**Definition**

Check should include

- removing the wheel and replacing the bearing, according to the manufacturer guidelines
- removing the wheel and hub, removing the wheel bearing
- inspecting
- replacing as necessary.

Noise is often the first sign of wheel bearing problem. When low speed noise or noise bounded off jersey barriers or nearby buildings is heard an immediate inspection is warranted. A visual inspection of the tire with odd wear could also indicate a damaged wheel bearing. Procedure for removal and replacement of wheel-end components should be followed by manufacturer's recommendations including the use of proper tools.
Process/Skill Questions

- What are the procedures to remove a wheel and hub?
- Why would you need to replace a wheel bearing?
- What are the tools needed for replacing wheel bearings?
- What precautions should be taken when removing a wheel?
- What procedure should be used when replacing wheel bearing?
- If the outer wheel bearing and race is replaced should the inside be replaced at the same time?
- What tools should be used?
- If the front bearings are lubricated by oil should the bearing be paced with grease prior to installation?

NOTE: Bearing should never be dried with high air pressure. Discuss why, and what problems spinning a bearing with high pressure could cause.

Task Number 290

Check oil level and condition in all non-drive hubs.

Definition

Check should include

- front axle assembly for leaks
- seals
- vents
- fluid level
- condition of fluid.

Process/Skill Questions

- If the drive assembly continues to operate with a restricted vent, what are the probable consequences?
- How are the fluid level and the condition of the fluid checked?
- What should be replaced when replacing seals?
- What tools should be used to replace a seal?

Task Number 291
Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.

Definition

Inspection should include

- conducting a visual check according to state inspection procedures
- using specialized tools according to manufacturer guidelines.

Suspension components directly affect how a vehicle responds to changing road conditions. Suspension components are interconnecting and designed to provide a pleasing ride as well as safety.

Process/Skill Questions

- What safety precautions should be taken when handling leaf springs?
- What is the purpose of the center bolt?
- How can it affect alignment?
- What is the purpose of the spring shackle?
- How are insulators removed and replaced?

Task Number 292

Inspect shock absorbers for leaks and secure mounting.

Definition

Inspection should include

- conducting a visual check, according to state inspection criteria
- removing and replacing, using specialized tools according to manufacturer guidelines.

Process/Skill Questions

- What does oil leaking from the shock absorber indicate?
- What is the difference between a low-pressure and a high-pressure shock absorber?
- How might one inspect an air shock and components?
- Why is inspection of shock mounting points important?
- Does knowing which state and type of highways provide information on early replacement of shocks?
Task Number 293

Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.

Definition

Air suspensions are generally found at two locations, on the axle component and on the cab, making for a much better ride. On axles suspensions with air bags the vehicle can be moved at slow speed whereas a tractor or trailer with leaf springs becomes immediately inoperable. Air lines should be inspected to ensure they are not rubbing against anything that might wear a hole in them. Fittings should be inspected for possible cracks or unusual stress. Linkage, valves and any mounted component should be checked for looseness or damage.

Process/Skill Questions

- If the vehicle air compressor recycles often should the air suspension be suspected of a leak?
- What affect would an improperly set height on a cab air suspension have on windshield visibility?

Task Number 294

Record suspension ride height.

Definition

Vehicle and air suspension systems are designed to work together to create both the best possible ride and the proper alignment of the vehicles drive line.

Process/Skill Questions

- Where do you find the proper setting for ride height, the vehicle manufacturer or air suspension manufacturer?
- Why should manufacturer specific parts be used as replacements instead of 3rd party?
- Why does improve ride height affect drive line configuration?

Task Number 295
Lubricate all suspension and steering grease fittings.

Definition

Suspension components are constantly under stress from weight and movement. When a component becomes dry (absence of lubricant), immediate wear begins. Each component in the suspension systems has an effect on other parts of the system. One dry part can cause severe damage to many other parts.

Process/Skill Questions

- Lubricant comes in many different properties. Using the wrong type of lubricant can cause what?
- Why should only the correct amount of lubricate be used at each fitting?
- Vehicles used on different types of terrain require different lubrication schedules. Explain why.
- Why should lubricants that are affected by water not be used on suspension components?

Task Number 296

Check axle locating components.

Definition

Check should be accomplished prior to using a vehicle. Visual inspection should include checking for loose or broken connectors, worn or missing bushings and for cracked or broken items.

Axle components control the up/down and forward/rear movement of the vehicles rear suspension.

Process/Skill Questions

- Why should an inspection be accomplished prior to moving the vehicle?
- Who should make the decision if the vehicle is unsafe to operate?
- What effect would worn bushings on one side have on all tires on that axle?

Preventive Maintenance and Inspection: Servicing Tires and Wheels
Task Number 297

Inspect tires for wear patterns and proper mounting.

Definition

Inspection should include conducting a visual check according to state inspection procedures and using specialized tools according to manufacturer guidelines.

Process/Skill Questions

- How can tire wear patterns indicate under-inflation or over-inflation? Camber problems? Toe problems?
- How can tire wear patterns indicate loose suspension parts? Faulty shocks/struts? Out of balance?
- When conducting a visual inspection using specialized tools (e.g., tire machine) following manufacturer guidelines, what happens if you damage the TPMS sensor?
- What precautions should be taken when dismounting TPMS tires?

Task Number 298

Inspect tires for cuts, cracks, bulges, and sidewall damage.

Definition

Tire damage is a broad description used to describe any kind of problem that could negatively affect the optimal performance of a tire. It can be caused by a variety of factors, ranging from poor storage to improper usage, but perhaps the most common reasons are under-inflation and poor driving habits.

Process/Skill Questions

- Why does a tire pressure need to be checked even if the tire appears to be at full height?
- Does low air pressure cause a tire to overheat when driven?
- Do all cracks and cuts mean the tire needs to be replaced?
- Does the area the vehicle is operated in change inspections?

Task Number 299

Inspect valve caps and stems.
Definition

The valve caps are only there to keep dust, dirt and other debris out. Valve stems rely of a spring-loaded pin as well as the actual pressure within the tire in order to stop air from running out of the tire.

Process/Skill Questions

- Will the same valve stem work on tires with tubes and tubeless tires?
- How important is it to replace the valve cap after testing air pressure or inflating a tire?
- Should a valve stem be replaced using ordinary tool box tools or with a specially designed valve stem replacement tool?

Task Number 300

Record tread depth.

Definition

Record of tread depth should be taken with one or more of these kinds of gauges:

- plastic or metal combination
- with either a gauge or pressure propelled shaft
- reading in English or metric, or both
- manual or digital

Minimum tread depths are often established by federal/state guidelines. Many tires contain a tread wear indicator. Measuring tread depth is not hard with the right tool. While using a coin may let you know if you have the minimum tread depth, it does not give you an accurate reading as can a tread depth gauge.

Process/Skill Questions

- Why should a tire be replaced when the minimum tread depth is obtained?
- Why are there different requirements for steer tires and drive tires on HD tractors?
- Are the same tread depth requirements on both trucks and cars?
- Why is it good to removed embedded material in a truck tire?

Task Number 301
Adjust air pressure in accordance with manufacturers' specification.

Definition

Adjustment should include

- checking air pressure
- recording air pressure
- adjusting air pressure to meet manufacturer's specifications.

Process/Skill Questions

- How often should tire pressures be checked?
- What problem would tires of unequal dimensions side-by-side cause?
- Where do you find air pressure specifications?
- Pressures vary based on tire loads. How do we decide on the correct air pressure?

Task Number 302

Check wheel mounting hardware condition.

Definition

Check should include following manufacturer's specifications for torque. Mounting hardware is designed by the manufacturer to hold and secure wheels to the axle end.

Process/Skill Questions

- What damage could over-torquing the lug nut cause?
- If there are steel wheels and aluminum wheels on a tractor or trailer, should both be torqued to the same torque?
- What does a rust run coming from a lug nut indicate?

Task Number 303

Inspect wheels for cracks, damage and proper hand hold alignment.

Definition
Inspection should follow the procedure written by the manufacturer for inspecting wheels for cracks and damage.

**Process/Skill Questions**

- Why should a wheel be closely inspected on the inside each time it is removed?
- According to the manufacturer's specifications, should a cracked wheel be repaired or replaced?
- Should a wheel with damage to the bead area be replaced or repaired?

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**Task Number 304**

**Check tire matching (diameter and tread) on single and dual tire applications.**

**Definition**

Check should reflect understanding that tires of different dimensions should not be placed side by side. An exact version of the same tire, except new, should not be placed next to a worn tire. It is always better to replace both tires.

**Process/Skill Questions**

- When placing a new tire next to a worn tire, which tire will carry the weight?
- Will mismatched tire sizes cause a danger when emergency stopping is required on a wet road? Why or why not?

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**Preventive Maintenance and Inspection: Servicing Frame and Fifth Wheel**

**Task Number 305**

**Inspect fifth wheel mounting, bolts, airlines, and locks.**

**Definition**

Inspection should adhere to required pre-trip and post-trip commercial motor vehicle (CMV) inspection regulations, to include checking the fifth wheel mounting hardware and inspecting all airlines for leaks, rubbing or chaffing.
Process/Skill Questions

- Where do we find the proper adjustment procedure for the fifth wheel locking mechanism?
- What are the dangers of connecting a dry fifth wheel plate to a trailer?
- A new fifth wheel is installed on a truck and no stop blocks are found. Should the vehicle be allowed to operate? Why or why not?
- When connecting a tractor to a trailer should the airbags be inflated? Why or why not?

Task Number 306

Test operation of fifth wheel locking device.

Definition

Test should adhere to required pre-trip and post-trip CMV inspection regulations and include checking the sliding fifth wheel locking mechanism and locking pins, king pin locking jaws, and fifth wheel release arm safety latch.

Process/Skill Questions

- After the connection of tractor and trailer, doing a tug test is all that is required before operating the equipment on the highway. Is this correct, or must something else be done?
- When performing a visual inspection of the fifth wheel after connection is made, about an inch of airspace is visible between the fifth wheel and trailer mounting plate. What does this indicate, and what should be done?
- Prior to connection, why is it important to inspect the king pin and king pin mounting plate?
- During the driver’s pre-trip inspection, an unusual amount of slack is noted when the connection is made and the tug test is performed. Should the vehicle be driven or inspected for problems by a technician?

Task Number 307

Check quarter fenders, mud flaps, and brackets.

Definition

Check should include
• brackets
• bracket mounting assemblies
• bolts

Mud flaps and fenders prevent excessive water spray or debris picked up by tires from being launched. Currently, there are no federal regulations governing mud flaps or splash/spray suppression devices. However, many states maintain their own requirements that vary considerably from state to state, and several states do not have any such regulations. Companies that operate vehicles over the US highway systems should have mud flaps or fenders to meet state laws.

Process/Skill Questions

• If the trailer has mud flaps. What additional advantage would mud flaps be on the truck?
• Why should mud flaps be flexible?
• What is the minimum width of a mud flap?
• One state requires the mud flap spacing between the mud flap and the road surface be no more than 8 inches and another states requires 12 inches. What distance should the mud flaps on the trucks and trailers you’re maintaining be set to?

Task Number 308

Check pintle hook assembly and mounting, if applicable.

Definition

Check should include inspecting the locking mechanism for missing or broken parts and making sure it locks securely when closed. If present, safety cables or chains must be secure and free of kinks and excessive slack. Check the pintle hook for cracks, breaks, excessive wear, or missing components. Check for recent welded repair(s). Inspect the pintle hook cross member mounting points for cracks or missing fasteners.

Process/Skill Questions

• Why should a pintle hook never be repaired by welding?
• Shiny metal is visible where the pintle hook mounts to the cross member. What does this indicate?
• When doing the inspection, the safety pin is missing. What action should be taken?

Task Number 309
Lubricate all fifth wheel grease fittings and plate, of applicable.

Definition

Lubrication of all grease fittings should be accomplished each 30,000 miles or less for a highway driven unit. Vehicles operated in harsh climates and/or conditions require lubrication more often. Spread grease all over the mating surface of the top plate. Be sure the grease pockets built into the top plates are full of grease.

Process/Skill Questions

- Several companies offer a lube plate made out of high-density polyethylene. Do fifth wheel manufacturers approve of these plates? Why or why not?
- What types of grease should be used to lubricate the top of a fifth wheel?
- How often should a fifth wheel be cleaned of old grease and why?
- A fifth wheel lifted from the rear and released should drop down so the rear is always lower than the front. Why?

Task Number 310

Inspect frame and frame members for cracks and damage.

Definition

Inspection should ensure that frames are not cracked, loose, sagging, or broken. Bolts that secure the cab, suspension attachments, or the body to the frame must not be loose broken or missing. Welding, drilling or modification of the frame or chassis must be in accordance with the vehicle manufacturer’s recommendations.

Process/Skill Questions

- Why is welding not allowed on a frame?
- What is the correct way to repair a sagging or cracked frame?
- How is an elongated bolt hole repaired on a frame?
- What grade of bolt should be used when replacing a spring hanger?

SOL Correlation by Task
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<td>45</td>
<td>Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.</td>
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<td>47</td>
<td>Identify the location of the posted evacuation routes.</td>
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<td>48</td>
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<td>Demonstrate proper cleaning, storage, and maintenance of tools and equipment.</td>
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<td></td>
<td>Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).</td>
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<td>Identify information needed and the service requested on a repair order.</td>
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<td>Identify purpose and demonstrate proper use of fender covers, mats.</td>
<td>History and Social Science: GOVT.16</td>
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<td>Demonstrate use of the three Cs (concern, cause, and correction).</td>
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<td>63</td>
<td>Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.</td>
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<td>64</td>
<td>Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)</td>
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<td>66</td>
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<td>68</td>
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<td>69</td>
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<td>70</td>
<td>Inspect valves, guides, seats, springs, retainers, rotators, locks and seals.</td>
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<td>71</td>
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<td>73</td>
<td>Inspect valve train components.</td>
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<td>Reassemble cylinder head.</td>
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<td>75</td>
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<td>77</td>
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<td>78</td>
<td>Perform crankcase pressure test.</td>
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<td>79</td>
<td>Service pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.</td>
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<td>80</td>
<td>Inspect engine block, threaded holes, studs, dowel pins, and bolts.</td>
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<td>81</td>
<td>Inspect cylinder sleeve counter bore and lower bore for distortion.</td>
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<td>82</td>
<td>Inspect cylinder walls or liners for wear and damage.</td>
<td>English: 10.5, 11.5</td>
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| 83 | Reinstall cylinder liners and seals. | English: 10.5, 11.5  
Mathematics: G.3 |
| 84 | Inspect in-block camshaft bearings for wear and damage. |
| 85 | Reinstall in-block camshaft. | English: 10.5, 11.5  
Mathematics: G.3 |
| 86 | Inspect crankshaft. | Mathematics: G.3 |
| 87 | Inspect main bearings for wear patterns and damage. |
| 88 | Service gear train. | English: 10.5, 11.5  
Mathematics: G.3 |
| 89 | Inspect connecting rods and bearings. | English: 10.5, 11.5  
Mathematics: G.3 |
| 90 | Service pistons. | English: 10.5, 11.5  
Mathematics: G.3 |
| 91 | Assemble pistons and connecting rods. | English: 10.5, 11.5 |
| 92 | Check the condition of the piston cooling jets (nozzles). |
| 93 | Inspect crankshaft damper. | English: 10.5, 11.5 |
| 94 | Install flywheel housing. | English: 10.5, 11.5 |
| 95 | Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear. |
| 96 | Test engine oil pressure and temperature. | English: 10.5, 11.5  
Science: CH.5a |
<p>| 97 | Check engine oil level, condition, and consumption. | Science: CH.5a |
| 98 | Inspect oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances. |
| 99 | Inspect oil pressure regulator valve, by-pass and pressure relief valves, oil thermostat, and filters. | Science: CH.5a |
| 100 | Inspect oil cooler and components. |
| 101 | Inspect turbocharger lubrication systems. |
| 102 | Perform oil and filter changes. | English: 10.5, 11.5 |</p>
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<td>104</td>
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<td>105</td>
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<td>106</td>
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<td>114</td>
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<td>116</td>
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<td>117</td>
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<td>118</td>
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<td>119</td>
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<td>120</td>
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<td>121</td>
<td>Inspect air cooler assemblies.</td>
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<td>122</td>
<td>Inspect exhaust manifold, piping, mufflers, and mounting hardware.</td>
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<td>123</td>
<td>Inspect engine compression/exhaust brakes.</td>
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<td>124</td>
<td>Inspect engine compression/exhaust brake control circuits, switches, and solenoids.</td>
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<td>126</td>
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<td>128</td>
<td>Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage.</td>
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<td>Check operation of tire pressure monitoring system (TPMS).</td>
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| 148 | Interpret electrical/electronic circuits, using wiring diagrams. | English: 10.5  
Science: PH.11b, PH.11c |
| 149 | Check continuity in electrical/electronic circuits using appropriate test equipment. | Science: PH.11a, PH.11b, PH.11c |
| 150 | Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment. | Science: PH.11b, PH.11c |
| 151 | Check current flow in electrical/electronic circuits and components using appropriate test equipment. | Science: PH.11b, PH.11c |
| 152 | Check resistance in electrical/electronic circuits and components using appropriate test equipment. | Science: PH.11a, PH.11b, PH.11c |
| 153 | Locate shorts, grounds, and opens in electrical/electronic circuits. | Science: PH.11b, PH.11c |
| 154 | Identify parasitic (key-off) battery drain problems. | English: 10.5, 11.5 |
| 155 | Test fusible links, circuit breakers, relays, solenoids, and fuses. | Science: PH.11b, PH.11c |
| 156 | Test spike suppression devices. | Science: PH.11c |
| 157 | Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment. | Science: PH.11b, PH.11c |
| 158 | Perform appropriate battery load test. | English: 10.5, 11.5  
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| 159 | Determine battery state of charge using an open circuit voltage test. | English: 10.5, 11.5  
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<p>| 160 | Service battery. | |
| 161 | Clean battery boxes, mounts, and hold downs. | |
| 162 | Charge battery using appropriate method for battery type. | Science: PH.11c |
| 163 | Clean battery cables and connectors. | |</p>
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<td>172</td>
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<td>Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after-treatment devices, if equipped.</td>
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<tr>
<td>187</td>
<td>Inspect selective catalyst reduction (SCR) system.</td>
<td></td>
</tr>
<tr>
<td>188</td>
<td>Check operation of fan clutch.</td>
<td></td>
</tr>
<tr>
<td>189</td>
<td>Inspect radiator (including air flow restriction, leaks, and damage) and mountings.</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>Inspect fan assembly and shroud.</td>
<td></td>
</tr>
<tr>
<td>191</td>
<td>Pressure test cooling system and radiator cap.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science: CH.5a</td>
</tr>
<tr>
<td>192</td>
<td>Inspect coolant hoses and clamps.</td>
<td></td>
</tr>
<tr>
<td>193</td>
<td>Inspect coolant recovery system.</td>
<td></td>
</tr>
<tr>
<td>194</td>
<td>Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).</td>
<td>Science: CH.5a</td>
</tr>
<tr>
<td>195</td>
<td>Service coolant filter.</td>
<td></td>
</tr>
<tr>
<td>196</td>
<td>Inspect water pump.</td>
<td></td>
</tr>
<tr>
<td>197</td>
<td>Clean engine oil and filters.</td>
<td>Science: CH.5a</td>
</tr>
<tr>
<td>198</td>
<td>Take an engine oil sample for analysis.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>199</td>
<td>Inspect key condition and operation of ignition switch.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>200</td>
<td>Check warning indicators.</td>
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</tr>
<tr>
<td>201</td>
<td>Check instruments; record oil pressure and system voltage.</td>
<td>Science: PH.11c</td>
</tr>
<tr>
<td>202</td>
<td>Check operation of electronic power take off (PTO) and engine idle speed controls, if applicable.</td>
<td>Science: PH.11c</td>
</tr>
<tr>
<td>203</td>
<td>Check heating, ventilation, and air conditioning (HVAC) controls.</td>
<td></td>
</tr>
<tr>
<td>204</td>
<td>Check operation of all accessories.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>205</td>
<td>Check operation of electric/air horns and reverse warning devices.</td>
<td></td>
</tr>
<tr>
<td>206</td>
<td>Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.</td>
<td>History and Social Science: GOVT.9, GOVT.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science: PH.11c</td>
</tr>
<tr>
<td>207</td>
<td>Inspect seat belts and sleeper restraints.</td>
<td></td>
</tr>
<tr>
<td>208</td>
<td>Inspect wiper blades and arms.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>209</td>
<td>Check operation of wiper and washer.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>210</td>
<td>Inspect windshield glass for cracks or discoloration.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>211</td>
<td>Check seat condition, operation, and mounting.</td>
<td></td>
</tr>
<tr>
<td>212</td>
<td>Check door glass and window operation.</td>
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<tr>
<td>Step</td>
<td>Task Description</td>
<td>Language(s)</td>
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<tr>
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</tr>
<tr>
<td>213</td>
<td>Inspect steps and grab handles.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>214</td>
<td>Inspect mirrors, mountings, brackets, and glass.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>215</td>
<td>Record all observed physical damage.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>216</td>
<td>Lubricate all cab and hood grease fittings.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>217</td>
<td>Lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>218</td>
<td>Inspect cab mountings, hinges, latches, linkages, and ride height.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>219</td>
<td>Inspect A/C condenser and lines for condition and visible leaks.</td>
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<tr>
<td>220</td>
<td>Inspect A/C compressor and lines for condition and visible leaks.</td>
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<tr>
<td>221</td>
<td>Check A/C system condition and operation.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>222</td>
<td>Check HVAC air inlet filters and ducts.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>223</td>
<td>Inspect battery box(es), cover(s), and mountings.</td>
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<tr>
<td>224</td>
<td>Inspect battery hold-downs, connections, cables, and cable routing.</td>
<td>Science: PH.11b, PH.11c</td>
</tr>
<tr>
<td>225</td>
<td>Record battery state-of-charge (open circuit voltage) and condition.</td>
<td>Science: PH.11b, PH.11c</td>
</tr>
<tr>
<td>226</td>
<td>Perform battery test (load and/or capacitance).</td>
<td>Science: PH.11c</td>
</tr>
<tr>
<td>227</td>
<td>Inspect starter, mounting, and connections.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>228</td>
<td>Check starter for unusual noises, starter drag, and starting difficulty.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>229</td>
<td>Inspect alternator, mountings, cable, wiring, and wiring routing.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>230</td>
<td>Perform alternator output tests.</td>
<td>Science: PH.7a, PH.7b, PH.11c</td>
</tr>
<tr>
<td>231</td>
<td>Check operation of interior lights.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>232</td>
<td>Check all exterior lights, lenses, reflectors, and conspicuity tape.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>233</td>
<td>Test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s).</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>234</td>
<td>Check operation of parking brake.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>235</td>
<td>Record air governor cut-in and cut-out settings.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>Step</td>
<td>Task Description</td>
<td>Language</td>
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<tr>
<td>236</td>
<td>Check operation of air reservoir/tank drain valves.</td>
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<td>237</td>
<td>Check air system for leaks (brakes released).</td>
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<tr>
<td>238</td>
<td>Check air system for leaks (brakes applied).</td>
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<tr>
<td>239</td>
<td>Test one-way valves.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>240</td>
<td>Check low air pressure warning devices.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>241</td>
<td>Check emergency (spring) brake control/modulator valve, if applicable.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>242</td>
<td>Check tractor protection valve.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>243</td>
<td>Test air pressure build-up time.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>244</td>
<td>Inspect coupling air lines, holders, and gladhands.</td>
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<tr>
<td>245</td>
<td>Check brake chambers and air lines for secure mounting and damage.</td>
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<tr>
<td>246</td>
<td>Check operation of air drier.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>247</td>
<td>Record brake shoe/pad condition, thickness, and contamination.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>248</td>
<td>Record condition of brake drums/rotors.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>249</td>
<td>Check antilock brake system (ABS) wiring, connectors, seals, and harnesses for damage and proper routing.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>250</td>
<td>Check operation and adjustment of brake automatic slack adjusters (ASA).</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>251</td>
<td>Lubricate all brake component grease fittings.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>252</td>
<td>Check condition and operation of hand brake (trailer) control valve, if applicable.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>253</td>
<td>Perform ABS operational system self-test.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>254</td>
<td>Drain air tanks.</td>
<td></td>
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<tr>
<td>255</td>
<td>Check condition of pressure relief (safety) valves.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>256</td>
<td>Check master cylinder fluid level and condition.</td>
<td></td>
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<tr>
<td>257</td>
<td>Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.</td>
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<tr>
<td>258</td>
<td>Check parking brake operation.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>259</td>
<td>Check operation of hydraulic system.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>260</td>
<td>Inspect calipers for leakage, binding, and damage.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>261</td>
<td>Inspect brake assist system (booster), hoses, control valves, and reservoir fluid level and condition.</td>
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<tr>
<td>262</td>
<td>Record brake lining/pad condition thickness, and contamination.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>263</td>
<td>Record condition of brake rotors.</td>
<td></td>
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<tr>
<td></td>
<td>Description</td>
<td>Language: 10.5, 11.5</td>
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<tr>
<td>264</td>
<td>Check ABS wiring, connectors, seals, and harnesses for damage and proper routing.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>265</td>
<td>Check operation of clutch, clutch brake, and gearshift.</td>
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<tr>
<td>266</td>
<td>Check clutch linkage/cable for looseness or binding, if applicable.</td>
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<tr>
<td>267</td>
<td>Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.</td>
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<tr>
<td>268</td>
<td>Check clutch adjustment.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>269</td>
<td>Check transmission case, seals, filter, hoses, lines, and cooler for cracks and leaks.</td>
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<tr>
<td>270</td>
<td>Inspect transmission breather.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>271</td>
<td>Inspect transmission mounts.</td>
<td></td>
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<tr>
<td>272</td>
<td>Check transmission oil level, type, and condition.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>273</td>
<td>Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>274</td>
<td>Inspect axle housing(s) for cracks and leaks.</td>
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<tr>
<td>275</td>
<td>Inspect axle breather(s).</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>276</td>
<td>Lubricate all drive train grease fittings.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>277</td>
<td>Check drive axle(s) oil level, type, and condition.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>278</td>
<td>Change drive axle(s) oil and filter/screen, if applicable.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>279</td>
<td>Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.</td>
<td>Science: PH.11b, PH.11c</td>
</tr>
<tr>
<td>280</td>
<td>Change transmission oil and filter, if applicable.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>281</td>
<td>Check inter-axle differential lock operation.</td>
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<tr>
<td>282</td>
<td>Check transmission range shift operation.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>283</td>
<td>Check steering wheel operation for free play and binding.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>284</td>
<td>Check power steering pump, mounting, and hoses for leaks, condition, and routing.</td>
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<tr>
<td>285</td>
<td>Change power steering fluid and filter.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>286</td>
<td>Inspect steering gear for leaks and secure mounting.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>287</td>
<td>Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>288</td>
<td>Check kingpins for wear.</td>
<td></td>
</tr>
<tr>
<td>289</td>
<td>Check wheel bearings for looseness and noise.</td>
<td>English: 10.5, 11.5</td>
</tr>
<tr>
<td>290</td>
<td>Check oil level and condition in all non-drive hubs.</td>
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<tr>
<td>291</td>
<td>Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.</td>
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<tr>
<td>292</td>
<td>Inspect shock absorbers for leaks and secure mounting.</td>
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</tr>
<tr>
<td>293</td>
<td>Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.</td>
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</tr>
<tr>
<td>294</td>
<td>Record suspension ride height.</td>
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<tr>
<td>295</td>
<td>Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.</td>
<td></td>
</tr>
<tr>
<td>296</td>
<td>Inspect shock absorbers for leaks and secure mounting.</td>
<td></td>
</tr>
<tr>
<td>297</td>
<td>Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.</td>
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</tr>
<tr>
<td>298</td>
<td>Inspect suspension ride height.</td>
<td></td>
</tr>
<tr>
<td>299</td>
<td>Lubricate all suspension and steering grease fittings.</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>Check axle locating components.</td>
<td></td>
</tr>
<tr>
<td>301</td>
<td>Inspect tires for wear patterns and proper mounting.</td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>Inspect tires for cuts, cracks, bulges, and sidewall damage.</td>
<td></td>
</tr>
<tr>
<td>303</td>
<td>Inspect valve caps and stems.</td>
<td></td>
</tr>
<tr>
<td>304</td>
<td>Record suspension ride height.</td>
<td></td>
</tr>
<tr>
<td>305</td>
<td>Adjust air pressure in accordance with manufacturers' specification.</td>
<td></td>
</tr>
<tr>
<td>306</td>
<td>Check wheel mounting hardware condition.</td>
<td></td>
</tr>
<tr>
<td>307</td>
<td>Inspect wheels for cracks, damage and proper hand hold alignment.</td>
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</tr>
<tr>
<td>308</td>
<td>Inspect tires for cuts, cracks, bulges, and sidewall damage.</td>
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</tr>
<tr>
<td>309</td>
<td>Check tire matching (diameter and tread) on single and dual tire applications.</td>
<td></td>
</tr>
<tr>
<td>310</td>
<td>Inspect fifth wheel mounting, bolts, airlines, and locks.</td>
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</tr>
<tr>
<td>311</td>
<td>Test operation of fifth wheel locking device.</td>
<td></td>
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<tr>
<td>312</td>
<td>Check quarter fenders, mud flaps, and brackets.</td>
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</tr>
<tr>
<td>313</td>
<td>Check pintle hook assembly and mounting, if applicable.</td>
<td></td>
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<tr>
<td>314</td>
<td>Lubricate all fifth wheel grease fittings and plate, of applicable.</td>
<td></td>
</tr>
<tr>
<td>315</td>
<td>Inspect frame and frame members for cracks and damage.</td>
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<tr>
<td>316</td>
<td>English: 10.5, 11.5</td>
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<td>317</td>
<td>History and Social Science: GOVT.9, GOVT.16</td>
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<td>318</td>
<td>English: 10.5, 11.5</td>
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<td>319</td>
<td>English: 10.5, 11.5</td>
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<td>English: 10.5, 11.5</td>
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<td>English: 10.5, 11.5</td>
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<td>338</td>
<td>English: 10.5, 11.5</td>
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Entrepreneurship Infusion Units

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked “optional.” Teachers can find the infusion/unit in the course listing.
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- ASE Certification Examinations
- ASE Entry-Level Certification Examinations
- College and Work Readiness Assessment (CWRA+)
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- Diesel Technology Assessment
- Mobile Communications and Electronics Installer (MCEI) Examination
- National Career Readiness Certificate Assessment
- Professional Communications Certification Examination
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Diesel Equipment Technology II (8614/36 weeks, 280 hours)

Career Cluster: Transportation, Distribution and Logistics

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<td>Diesel Service Technician</td>
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