



Nebraska Career Pathways Project

SKILLED AND TECHNICAL SCIENCES

***Transportation, Distribution and Logistics Cluster
Technical Knowledge and Skills***

High School/College COLLISION REPAIR & REFINISH Student Checklist

				STUDENT:	DATE:
2	1	N	CODE	N = Not Exposed to Performance Element, 1 = Progressing with Performance Element, 2 = Mastery of Performance Element	
				STRUCTURAL ANALYSIS AND DAMAGE REPAIR	
2	1	N	CODE	Demonstrate ability in frame inspection and repair (TDLC.FIR)	
			TDLC.FIR.1	<i>Diagnose and measure structural damage using tram and self-centering gauges according to industry specifications.</i>	
			TDLC.FIR.2	<i>Attach frame anchoring devices.</i>	
			TDLC.FIR.3	<i>Straighten and align mash (collapse) damage.</i>	
			TDLC.FIR.4	<i>Straighten and align sag damage.</i>	
			TDLC.FIR.5	<i>Straighten and align sidesway damage.</i>	
			TDLC.FIR.6	<i>Straighten and align twist damage.</i>	
			TDLC.FIR.7	<i>Straighten and align diamond frame damage.</i>	
			TDLC.FIR.8	<i>Remove and replace damaged frame horns, side rails, cross members, and front or rear sections.</i>	
			TDLC.FIR.9	<i>Restore corrosion protection to repaired or replaced frame areas.</i>	
			TDLC.FIR.10	<i>Repair or replace weakened or cracked frame members in accordance with vehicle manufacturer's recommendations/industry standards.</i>	
			TDLC.FIR.11	<i>Identify misaligned or damaged steering, suspension, and power train components which can cause vibration, steering, and wheel alignment problems; align or replace in accordance with vehicle manufacturer's recommendations.</i>	
2	1	N	CODE	Demonstrate ability in unibody inspection, measurement and repair	

				(TDLC.UIMR)
			TDLC.UIMR.1	<i>Identify misaligned or damaged steering, suspension, and power train components which can cause vibration, steering, and 4-wheel alignment problems; realign or replace in accordance with vehicle manufacturer's specifications/procedures.</i>
			TDLC.UIMR.2	<i>Diagnose and analyze unibody vehicle length, height, and width using a tram gauge.</i>
			TDLC.UIMR.3	<i>Determine the locations of all suspension, steering, and power train component attaching points on the body.</i>
			TDLC.UIMR.4	<i>Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system.</i>
			TDLC.UIMR.5	<i>Diagnose and measure unibody vehicles using a universal measuring system (mechanical, electronic, laser).</i>
			TDLC.UIMR.6	<i>Determine the extent of the direct and indirect damage and the direction of impact; plan the methods and sequence of repair.</i>
			TDLC.UIMR.7	<i>Attach body anchoring devices.</i>
			TDLC.UIMR.8	<i>Straighten and align cowl assembly.</i>
			TDLC.UIMR.9	<i>Straighten and align roof rails/headers and roof panels.</i>
			TDLC.UIMR.10	<i>Straighten and align hinge and lock pillars.</i>
			TDLC.UIMR.11	<i>Straighten and align body openings, floor pans, and rocker panels.</i>
			TDLC.UIMR.12	<i>Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/power train mounting points).</i>
			TDLC.UIMR.13	<i>Straighten and align front end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.).</i>
			TDLC.UIMR.14	<i>Use proper heat stress relief methods in high strength steel.</i>
			TDLC.UIMR.15	<i>Use proper cold stress relief methods.</i>
			TDLC.UIMR.16	<i>Remove creases and dents using power tools and hand tools to restore damaged areas to proper contours and dimensions.</i>
			TDLC.UIMR.17	<i>Determine the extent of damage to structural steel body panels; repair or replace.</i>
			TDLC.UIMR.18	<i>Remove and replace damaged sections of structural steel body panels in accordance with manufacturer's specifications.</i>
			TDLC.UIMR.19	<i>Restore corrosion protection to repaired or replaced unibody structural areas.</i>
2	1	N	CODE	Demonstrate ability in fixed glass repair (TDLC.FG)
			TDLT.FG.1	<i>Remove and replace fixed glass (heated and non-heated) using manufacturer's procedures.</i>
			TDLT.FG.2	<i>Remove and replace modular glass using manufacturer's procedures.</i>
2	1	N	CODE	Demonstrate ability in metal cutting and welding (TDLC.MWC)

			TDLC.MWC.1	<i>Identify weldable and non-weldable materials used in collision repair and refinish components.</i>
			TDLC.MWC.2	<i>Weld and cut high-strength steel and other metals using manufacturer's procedures.</i>
			TDLC.MWC.3	<i>Determine the correct welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.</i>
			TDLC.MWC.4	<i>Set up welding equipment.</i>
			TDLC.MWC.5	<i>Adjust the welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the material being welded.</i>
			TDLC.MWC.6	<i>Store, handle, and install high-pressure gas cylinders.</i>
			TDLC.MWC.7	<i>Determine work clamp (ground) location and attach.</i>
			TDLC.MWC.8	<i>Use the proper angle of the gun to the joint and the direction of the gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.</i>
			TDLC.MWC.9	<i>Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.</i>
			TDLC.MWC.10	<i>Protect computers and other electronic control modules during welding procedures according to manufacturer's specifications.</i>
			TDLC.MWC.11	<i>Clean and prepare the metal for welding; fit, align, and clamp as required.</i>
			TDLC.MWC.12	<i>Determine the joint type (reinforced-butt, lap, etc.) for weld being made according to manufacturer's/industry specifications.</i>
			TDLC.MWC.13	<i>Determine the type of weld (continuous, reinforced-butt, plug, etc.) for each specific welding operation according to manufacturer's/industry specifications.</i>
			TDLC.MWC.14	<i>Perform the following welds: continuous, stitch, tack, plug, spot, reinforced-butt, and lap joints.</i>
			TDLC.MWC.15	<i>Perform destructive tests on each weld type.</i>
			TDLC.MWC.16	<i>Identify the causes of spits and sputters, burn through, lack of penetration, porosity, incomplete fusion, excessive spatter, distortion, and waviness of bead; make necessary adjustments.</i>
			TDLC.MWC.17	<i>Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments.</i>
			TDLC.MWC.18	<i>Identify cutting process for different materials and locations in accordance with manufacturer's procedures; perform cutting operation.</i>
				NON-STRUCTURAL ANALYSIS AND DAMAGE REPAIR
2	1	N	CODE	Demonstrate ability in preparation (TDLC.P)
			TDLC.P.1	<i>Review damage report and analyze damage to determine appropriate methods for overall repair; develop repair plan.</i>
			TDLC.P.2	<i>Inspect, remove, store, and replace exterior trim and moldings.</i>
			TDLC.P.3	<i>Inspect, remove, and replace interior trim and components.</i>
			TDLC.P.4	<i>Inspect, remove, and replace non-structural body panels and components that may interfere with or be damaged during repair.</i>
			TDLC.P.5	<i>Inspect, remove, and replace all vehicle mechanical and electrical components that may interfere with or be</i>

				<i>damaged during repair.</i>
			TDLC.P.6	<i>Protect panels and parts adjacent to repair area.</i>
			TDLC.P.7	<i>Remove dirt, grease, and wax from those areas to be repaired.</i>
			TDLC.P.8	<i>Remove corrosion protection, undercoatings, sealers, and other protective coatings necessary to perform repairs.</i>
			TDLC.P.9	<i>Inspect, remove, and replace repairable plastics and other components that are recommended for off-vehicle repair.</i>
			TDLC.P.10	<i>Apply safety procedures associated with vehicle components and systems, i.e. ABS, air bags, refrigerants, batteries, tires, oil, anti-freeze, engine coolants, etc.</i>
			TDLC.P.11	<i>Apply environmental practices associated with vehicle components and systems such as substrates, fluids, refrigerants, batteries, etc.</i>
2	1	N	CODE	Demonstrate ability in outer body panel repair, replacement and adjustments (TDLC.OBRA)
			TDLC.OBRA.1	<i>Determine the extent of direct and indirect damage and direction of impact; develop repair plan.</i>
			TDLC.OBRA.2	<i>Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies.</i>
			TDLC.OBRA.3	<i>Determine the extent of damage to aluminum body panels; repair, weld or replace in accordance with manufacturer's specifications.</i>
			TDLC.OBRA.4	<i>Inspect, remove, replace, and align hood, hood hinges, and hood latch.</i>
			TDLC.OBRA.5	<i>Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.</i>
			TDLC.OBRA.6	<i>Inspect, remove, replace, and align doors, tailgates, hatches, lift gates, latches, hinges, and related hardware.</i>
			TDLC.OBRA.7	<i>Inspect, remove, replace, and align bumper bars, covers, reinforcement guards, isolators, and mounting hardware.</i>
			TDLC.OBRA.8	<i>Check and align front fenders, headers, and other panels.</i>
			TDLC.OBRA.9	<i>Straighten and rough-out contours of damaged panel to a surface condition for body filling or metal finishing using power tools, hand tools, and stud welder.</i>
			TDLC.OBRA.10	<i>Weld cracked or torn steel body panels; repair broken welds.</i>
			TDLC.OBRA.11	<i>Restore corrosion protection.</i>
			TDLC.OBRA.12	<i>Cut out damaged sections of sheet steel body panels and weld in replacements according to vehicle and industry specifications.</i>
			TDLC.OBRA.13	<i>Replace door skins according to manufacturer's procedures.</i>
			TDLC.OBRA.14	<i>Replace intrusion beams in accordance with vehicle manufacturer's specifications.</i>
			TDLC.OBRA.15	<i>Replace or repair rigid, semi-rigid, and flexible plastic panels according to vehicle and industry specifications.</i>
			TDLC.OBRA.16	<i>Restore sealers, mastic, sound deadeners, and foam fillers.</i>
			TDLC.OBRA.17	<i>Diagnose and repair water leaks, dust leaks, and wind noise.</i>

2	1	N	CODE	Demonstrate ability in metal finishing and body filling (TDLC.MFBF)
			TDLC.MFBF.1	<i>Remove paint from the damaged area of a body panel.</i>
			TDLC.MFBF.2	<i>Locate and reduce surface irregularities on a damaged body panel.</i>
			TDLC.MFBF.3	<i>Demonstrate hammer and dolly techniques.</i>
			TDLC.MFBF.4	<i>Heat shrink stretched panel areas to proper contour.</i>
			TDLC.MFBF.5	<i>Cold shrink stretched panel areas to proper contour.</i>
			TDLC.MFBF.6	<i>Mix body filler.</i>
			TDLC.MFBF.7	<i>Apply body filler; cheese-grate during curing.</i>
			TDLC.MFBF.8	<i>Rough sand cured body filler to contour; finish sand.</i>
2	1	N	CODE	Demonstrate ability in moveable glass and hardware (TDLC.MGH)
			TDLC.MGH.1	<i>Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.</i>
			TDLC.MGH.2	<i>Inspect, repair or replace power-driven accessories and related controls (including electrically-heated glass).</i>
			TDLC.MGH.3	<i>Diagnose and repair water leaks, dust leaks, and wind noises; inspect, repair, and replace weather-stripping.</i>
			TDLC.MGH.4	<i>Inspect, repair or replace, and adjust removable, manually or power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sun roofs.</i>
			TDLC.MGH.5	<i>Inspect, remove, reinstall, and align convertible top and related mechanisms.</i>
				MECHANICAL AND ELECTRICAL COMPONENTS
2	1	N	CODE	Demonstrate ability in suspension and steering (TDLC.SS)
			TDLC.SS.1	<i>Identify suspension system fasteners which should not be reused.</i>
			TDLC.SS.2	<i>Inspect and replace rack and pinion steering gear, inner tie rod ends, and bellows boots.</i>
			TDLC.SS.3	<i>Inspect alignment, adjust tension, and replace power steering pump belts.</i>
			TDLC.SS.4	<i>Remove and replace power steering pump; inspect pump mounts.</i>
			TDLC.SS.5	<i>Inspect and replace power steering hoses and fittings.</i>
			TDLC.SS.6	<i>Remove and replace power steering gear (non-rack and pinion type).</i>
			TDLC.SS.7	<i>Remove and replace power rack and pinion steering gear; inspect and replace mounting bushings and brackets; ensure proper mounting location.</i>
			TDLC.SS.8	<i>Inspect and adjust (where applicable) steering linkage geometry (attitude/parallelism).</i>
			TDLC.SS.9	<i>Inspect and replace pitman arm.</i>
			TDLC.SS.10	<i>Inspect and replace relay (center link/intermediate) rod.</i>
			TDLC.SS.11	<i>Remove and replace idler arm and mountings.</i>
			TDLC.SS.12	<i>Remove and replace tie rod sleeves, clamps, and tie rod ends.</i>
			TDLC.SS.13	<i>Remove and replace steering linkage damper.</i>
			TDLC.SS.14	<i>Remove and replace upper and lower control arms.</i>

		TDLC.SS.15	<i>Remove and replace upper and lower control arm bushings, shafts and rebound bumpers.</i>
		TDLC.SS.16	<i>Remove and replace upper and lower ball joints.</i>
		TDLC.SS.17	<i>Remove and replace steering knuckle/spindle/hub assemblies.</i>
		TDLC.SS.18	<i>Remove and replace front suspension system coil springs and spring insulators (silencers).</i>
		TDLC.SS.19	<i>Inspect, replace, adjust front suspension system torsion bars, and inspect mounts.</i>
		TDLC.SS.20	<i>Inspect and replace stabilizer bar bushings, brackets, and links.</i>
		TDLC.SS.21	<i>Inspect and replace MacPherson strut cartridge or assembly, upper bearing, and mount.</i>
		TDLC.SS.22	<i>Remove and replace rear suspension system coil springs and spring insulators (silencers).</i>
		TDLC.SS.23	<i>Inspect, remove, and replace rear suspension system transverse links, control arms, stabilizer bars, bushings, and mounts.</i>
		TDLC.SS.24	<i>Inspect, remove, and replace rear suspension system leaf spring(s), leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.</i>
		TDLC.SS.25	<i>Inspect rear axle assembly for damage and misalignment.</i>
		TDLC.SS.26	<i>Inspect and replace shock absorbers.</i>
		TDLC.SS.27	<i>Inspect and replace air shock absorbers, load-leveling devices, air springs, and associated lines and fittings.</i>
		TDLC.SS.28	<i>Diagnose, inspect, adjust, repair or replace components of electronically-controlled suspension systems.</i>
		TDLC.SS.29	<i>Measure vehicle ride height; determine needed repairs.</i>
		TDLC.SS.30	<i>Remove, replace, and align front and rear frame (cradles/stub).</i>
		TDLC.SS.31	<i>Diagnose steering column damage, looseness, and binding problems (including tilt mechanisms); determine needed repairs.</i>
		TDLC.SS.32	<i>Inspect and replace steering shaft U-joint(s), flexible coupling(s), collapsible columns, and steering wheels.</i>
		TDLC.SS.33	<i>Diagnose manual and power steering gear (non-rack and pinion type) noises, binding, uneven turning effort, looseness, hard steering, and fluid leakage problems; determine needed repairs.</i>
		TDLC.SS.34	<i>Diagnose power rack and pinion steering gear noises, vibration, looseness, hard steering, and fluid leakage problems, ensure proper mounting location; determine needed repairs.</i>
		TDLC.SS.35	<i>Diagnose non-MacPherson front and rear suspension system noises and body sway problems; determine needed repairs.</i>
		TDLC.SS.36	<i>Diagnose MacPherson strut suspension system noises and body sway problems; determine needed repairs.</i>
		TDLC.SS.37	<i>Diagnose vehicle wandering, pulling, hard steering, bump steering, memory steering, torque steering, and steering return problems; determine needed repairs.</i>
		TDLC.SS.38	<i>Adjust front and rear wheel camber on suspension systems with camber adjustments.</i>
		TDLC.SS.39	<i>Check front and rear wheel camber on adjustable and non-adjustable suspension systems; determine needed repairs.</i>
		TDLC.SS.40	<i>Adjust caster on suspension systems with caster adjustments.</i>
		TDLC.SS.41	<i>Check caster on adjustable and non-adjustable suspension systems; determine needed repairs.</i>
		TDLC.SS.42	<i>Check and adjust front wheel toe; determine needed repairs.</i>

			TDLC.SS.43	<i>Center steering wheel.</i>
			TDLC.SS.44	<i>Identify toe-out-on-turns (turning radius) related problems; determine needed repairs.</i>
			TDLC.SS.45	<i>Identify SAI (steering axis inclination)/KPI (king pin inclination) related problems; determine needed repairs.</i>
			TDLC.SS.46	<i>Check rear wheel toe; determine needed adjustment or repair.</i>
			TDLC.SS.47	<i>Identify thrust angle related problems; determine needed repairs.</i>
			TDLC.SS.48	<i>Check for front wheel setback; determine needed repairs.</i>
			TDLC.SS.49	<i>Diagnose tire wear patterns; determine needed repairs.</i>
			TDLC.SS.50	<i>Inspect tires, identify direction of rotation, and location; check and adjust air pressure.</i>
			TDLC.SS.51	<i>Diagnose wheel/tire vibration, shimmy, and tramp (wheel hop) problems; determine needed repairs.</i>
			TDLC.SS.52	<i>Measure wheel, tire, axle, and hub runout; determine needed repairs.</i>
			TDLC.SS.53	<i>Diagnose tire pull (lead) problems; determine corrective actions.</i>
			TDLC.SS.54	<i>Reinstall wheels and torque lug nuts according to manufacturer's specifications.</i>
2	1	N	CODE	Demonstrate ability in electrical diagnosis and repair (TDLC.E)
			TDLC.E.1	<i>Check voltages in electrical wiring circuits with a DVOM (digital volt ohmmeter).</i>
			TDLC.E.2	<i>Check continuity and resistance in electrical wiring circuits and components with a DVOM (digital volt ohmmeter).</i>
			TDLC.E.3	<i>Using a DVOM (digital volt ohmmeter), repair electrical circuits, wiring, and connectors according to manufacturer's specifications.</i>
			TDLC.E.4	<i>Inspect, test, and replace fusible links, circuit breakers, and fuses.</i>
			TDLC.E.5	<i>Perform battery state-of-charge test; determine needed service.</i>
			TDLC.E.6	<i>Inspect, clean, and replace battery.</i>
			TDLC.E.7	<i>Dispose of batteries and battery acid according to local, state, and federal requirements.</i>
			TDLC.E.8	<i>Perform slow/fast battery charge in accordance with manufacturer's recommendations.</i>
			TDLC.E.9	<i>Identify programmable electrical/electronic components; record data for reprogramming before disconnecting battery.</i>
			TDLC.E.10	<i>Inspect, clean, and repair or replace battery cables, connectors, and clamps.</i>
			TDLC.E.11	<i>Inspect alignment, adjust, and replace generator (alternator) driver belts, pulleys, and fans.</i>
			TDLC.E.12	<i>Remove and replace generator (alternator).</i>
			TDLC.E.13	<i>Remove and replace head lamp/light, parking/tail lamp/light, stop lamp/light, flashers, turn-signals, and backup lamp/light; check operation.</i>
			TDLC.E.14	<i>Inspect, replace, and aim head lamp/light bulbs.</i>
			TDLC.E.15	<i>Check operation of retractable head lamp/light assembly.</i>
			TDLC.E.16	<i>Remove and replace motors, switches, relays, connectors, and wires of retractable head lamp/light assembly circuits.</i>

			TDLC.E.17	<i>Inspect, test, and repair or replace switches, relays, bulbs, sockets, connectors, and wires of all light circuits including four-wire tail lamp/light systems.</i>
			TDLC.E.18	<i>Remove and replace horn(s); check operation.</i>
			TDLC.E.19	<i>Check operation of windshield wiper/washer system.</i>
			TDLC.E.20	<i>Check operation of power side windows and power tail-gate window.</i>
			TDLC.E.21	<i>Remove and replace power seat, motors, linkages, cables, etc.; check operation.</i>
			TDLC.E.22	<i>Remove and replace components of electric door and hatch/trunk lock; check operation.</i>
			TDLC.E.23	<i>Remove and replace components of keyless lock/unlock devices and alarm systems; check operation.</i>
			TDLC.E.24	<i>Remove and replace components of electrical sunroof and convertible top. Check operation.</i>
			TDLC.E.25	<i>Check operation of electrically heated mirrors, windshields, back lights, panels, etc.; repair as necessary.</i>
			TDLC.E.26	<i>Remove and replace components of power antenna circuits; check operation.</i>
			TDLC.E.27	<i>Demonstrate the proper self-grounding procedures for handling electrical components.</i>
2	1	N	CODE	Demonstrate ability in brake diagnosis and repair (TDLC.B)
			TDLC.B.1	<i>Inspect brake lines and fittings for leaks, dents, kinks, rust, cracks or wear; tighten loose fittings and supports; replace brake lines (double flare and ISO types), hoses, fittings, and supports.</i>
			TDLC.B.2	<i>Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; remove and replace hoses; tighten loose fittings and supports.</i>
			TDLC.B.3	<i>Select, handle, store, and install brake fluids; dispose of per federal, state, and local regulations.</i>
			TDLC.B.4	<i>Bleed (manual, pressure, vacuum or surge) and/or flush hydraulic brake system in accordance with manufacturer's procedures.</i>
			TDLC.B.5	<i>Pressure test brake hydraulic system; determine needed repair.</i>
			TDLC.B.6	<i>Adjust brake shoes; remove and reinstall brake drums or drum/hub assemblies and wheel bearings.</i>
			TDLC.B.7	<i>Reinstall wheel and torque lug nuts according to manufacturer's specifications.</i>
			TDLC.B.8	<i>Remove and reinstall caliper assembly.</i>
			TDLC.B.9	<i>Clean and inspect caliper mountings for wear and damage.</i>
			TDLC.B.10	<i>Check parking brake system operation.</i>
			TDLC.B.11	<i>Identify and replace ABS wheel speed sensor components according to manufacturer's specifications.</i>
			TDLC.B.12	<i>Depressurize ABS hydraulic system according to manufacturer's procedures.</i>
			TDLC.B.13	<i>Identify the proper procedures for handling brake dust.</i>
			TDLC.B.14	<i>Check for bent or damaged brake system components.</i>
2	1	N	CODE	Demonstrate ability in heating and air conditioning system diagnosis and repair (TDLC.HAC)
			TDLC.HAC.1	<i>Identify and comply with environmental concerns relating to refrigerants and coolants.</i>
			TDLC.HAC.2	<i>Maintain and verify correct operation of certified refrigerant recovery and recharging equipment</i>

			TDLC.HAC.3	<i>Locate and identify A/C system service ports.</i>
			TDLC.HAC.4	<i>Identify and recover refrigerant from A/C system.</i>
			TDLC.HAC.5	<i>Recycle refrigerant in accordance with EPA regulations.</i>
			TDLC.HAC.6	<i>Label and store refrigerant.</i>
			TDLC.HAC.7	<i>Test recycled refrigerant for non-condensable gases.</i>
			TDLC.HAC.8	<i>Evacuate A/C system; check for leaks.</i>
			TDLC.HAC.9	<i>Recharge A/C system with refrigerant; perform leak test.</i>
			TDLC.HAC.10	<i>Identify oil type and maintain correct amount in A/C system according to manufacturer's specifications.</i>
			TDLC.HAC.11	<i>Inspect, adjust, and replace A/C compressor drive belts; check pulley alignment.</i>
			TDLC.HAC.12	<i>Remove and replace A/C compressor; inspect, repair or replace A/C compressor mountings.</i>
			TDLC.HAC.13	<i>Inspect, repair or replace A/C system mufflers, hoses, lines, fittings, and seals.</i>
			TDLC.HAC.14	<i>Inspect A/C condenser for air flow restrictions; clean and straighten fins.</i>
			TDLC.HAC.15	<i>Inspect, test, and replace A/C system condenser and mountings.</i>
			TDLC.HAC.16	<i>Inspect and replace receiver/drier or accumulator/drier.</i>
			TDLC.HAC.17	<i>Inspect and replace evaporator.</i>
			TDLC.HAC.18	<i>Inspect and repair evaporator housing water drain.</i>
			TDLC.HAC.19	<i>Inspect, test, repair or replace heating, ventilating and A/C vacuum components.</i>
			TDLC.HAC.20	<i>Inspect and repair A/C component wiring.</i>
			TDLC.HAC.21	<i>Inspect, test and repair heating, ventilating and A/C ducts, doors, hoses and outlets.</i>
2	1	N	CODE	Demonstrate ability in cooling systems diagnosis and repair (TDLC.CS)
			TDLC.CS.1	<i>Inspect and replace engine cooling and heater system hoses and belts.</i>
			TDLC.CS.2	<i>Inspect, remove and replace radiator, pressure cap, coolant recovery system and water pump.</i>
			TDLC.CS.3	<i>Remove and replace thermostat, by-pass and housing.</i>
			TDLC.CS.4	<i>Recover, refill and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA specifications.</i>
			TDLC.CS.5	<i>Remove and replace fan (both electrical and mechanical), fan pulley, fan clutch and fan shroud.</i>
			TDLC.CS.6	<i>Inspect, remove and replace auxiliary oil coolers; check oil levels.</i>
			TDLC.CS.7	<i>Inspect, remove and replace electric fan sensors; check operation.</i>
2	1	N	CODE	Demonstrate ability in drive train diagnosis and repair (TDLC.DT)
			TDLC.DT.1	<i>Remove, replace and adjust shift or clutch linkage as required.</i>
			TDLC.DT.2	<i>Remove, replace and adjust cables or linkages for throttle valve (TV), kickdown and accelerator pedal.</i>
			TDLC.DT.3	<i>Remove and replace electronic sensors, wires and connectors.</i>

			TDLC.DT.4	<i>Remove and replace powertrain assembly; inspect, replace and align powertrain mounts.</i>
			TDLC.DT.5	<i>Remove and replace front and/or rear drive axle assembly.</i>
			TDLC.DT.6	<i>Measure and/or adjust half shaft position/angle.</i>
			TDLC.DT.7	<i>Remove, inspect and replace front-drive half shafts and axle constant velocity joints (CV).</i>
			TDLC.DT.8	<i>Inspect, remove and replace front and rear drive shafts and universal joints.</i>
2	1	N	CODE	Demonstrate ability in fuel, intake and exhaust system diagnosis and repair (TDLC.FIES)
			TDLC.FIES.1	<i>Remove, inspect and replace exhaust pipes, mufflers, converters, resonators, tail pipes and heat shields.</i>
			TDLC.FIES.2	<i>Remove, inspect and replace fuel tank, fuel tank filter, fuel cap, fuel filler hose, quarter to body seal and inertia switch; inspect and replace fuel lines and hoses; check fuel for contaminants.</i>
			TDLC.FIES.3	<i>Remove, inspect and replace components of air injection systems.</i>
			TDLC.FIES.4	<i>Remove, inspect and replace canister, filter, vent and purge lines of fuel vapor control systems.</i>
2	1	N	CODE	Demonstrate ability in restraint system service and repair (TDLC.RS)
				Active Restraint Systems
			TDLC.RS.1	<i>Inspect, remove and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's procedures.</i>
			TDLC.RS.2	<i>Inspect restraint system mounting areas for damage; repair in accordance with manufacturer's procedures.</i>
			TDLC.RS.3	<i>Verify proper operation of seatbelt in accordance with manufacturer's procedures.</i>
				Passive Restraint System
			TDLC.RS.4	<i>Inspect, remove and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's procedures.</i>
			TDLC.RS.5	<i>Inspect restraint system mounting areas for damage; repair as necessary.</i>
			TDLC.RS.6	<i>Verify proper operation of seatbelt in accordance with manufacturer's procedures.</i>
			TDLC.RS.7	<i>Remove, inspect and replace track and drive assembly, lap retractor, torso retractor, inboard buckle-lap retractor and knee bolster (blocker) in accordance with manufacturer's procedures.</i>
				Supplemental Restraint System (SRS)
			TDLC.RS.8	<i>Disarm SRS in accordance with manufacturer's procedures.</i>
			TDLC.RS.9	<i>Inspect and replace sensors and wiring in accordance with manufacturer's procedures; ensure sensor orientation.</i>
			TDLC.RS.10	<i>Inspect, replace and dispose of deployed SRS modules in accordance with manufacturer's procedures.</i>
			TDLC.RS.11	<i>Verify that SRS is operational in accordance with manufacturer's procedures.</i>
			TDLC.RS.12	<i>Inspect, remove, replace and dispose of non-deployed SRS in accordance with manufacturer's procedures.</i>
			TDLC.RS.13	<i>Use fault codes and test equipment to diagnose and repair SRS.</i>

				PLASTICS AND ADHESIVES
2	1	N	CODE	Demonstrate ability in plastic and adhesives identification and usage (TDLC.PA)
			TDLC.PA.1	<i>Identify the types of plastics to be repaired.</i>
			TDLC.PA.2	<i>Identify the types of plastics repair procedures; clean and prepare the surface of plastic parts in accordance with manufacturer's procedures/industry guidelines.</i>
			TDLC.PA.3	<i>Repair plastic parts with airless welding.</i>
			TDLC.PA.4	<i>Repair plastic parts with urethane or epoxy adhesives; use reinforcements if necessary.</i>
			TDLC.PA.5	<i>Repair holes and cuts in rigid and flexible plastic parts using backing materials and adhesives.</i>
			TDLC.PA.6	<i>Retexture plastic parts.</i>
			TDLC.PA.7	<i>Remove damaged areas from rigid exterior sheet molded compound (SMC) panels; repair with partial panel.</i>
			TDLC.PA.8	<i>Replace bonded sheet molded compound (SMC) body panels; straighten or align panel supports.</i>
			TDLC.PA.9	<i>Prepare repaired areas for refinishing.</i>
				PAINTING AND REFINISHING
2	1	N	CODE	Demonstrate ability to use safety precautions (TDLT.SP)
			TDLC.SP.1	<i>Identify and take necessary precautions with hazardous operations and materials according to federal, state and local regulations.</i>
			TDLC.SP.2	<i>Identify personal health and safety hazards according to OSHA guidelines and "Right to Know" Act.</i>
			TDLC.SP.3	<i>Inspect spray environment for cleanliness and safety hazards.</i>
			TDLC.SP.4	<i>Select and use the NIOSH approved personal sanding respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with industry/manufacturer's specifications.</i>
			TDLC.SP.5	<i>Select and use the NIOSH approved (Fresh Air Make-up System) personal painting/refinishing respirator system.</i>
			TDLC.SP.6	<i>Select and use the proper personal safety equipment for painting/refinishing and sanding (gloves, suits, hoods, eye and ear protection, etc.).</i>
2	1	N	CODE	Demonstrate ability in surface preparation (TDLC.SPP)
			TDLC.SPP.1	<i>Remove, store and replace exterior trim and molding.</i>
			TDLC.SPP.2	<i>Remove dirt, road grime and wax or protective coatings from the area to be refinished and adjacent vehicle surfaces; wash entire vehicle.</i>
			TDLC.SPP.3	<i>Inspect and identify substrate, type of finish and surface condition; develop a plan for refinishing using a total product system.</i>
			TDLC.SPP.4	<i>Remove paint finish.</i>
			TDLC.SPP.5	<i>Dry or wet sand areas to be refinished.</i>
			TDLC.SPP.6	<i>Featheredge broken areas to be refinished.</i>

			TDLC.SPP.7	<i>Apply suitable metal treatment or primer.</i>
			TDLC.SPP.8	<i>Mask trim and protect other areas that will not be refinished.</i>
			TDLC.SPP.9	<i>Mix primer, primer-surfacer or primer-sealer.</i>
			TDLC.SPP.10	<i>Spray primer onto surface of repaired area.</i>
			TDLC.SPP.11	<i>Apply two-component finishing filler to minor surface imperfections.</i>
			TDLC.SPP.12	<i>Dry or wet sand area to which primer-surface has been applied.</i>
			TDLC.SPP.13	<i>Dry sand area to which two-component finishing filler has been applied.</i>
			TDLC.SPP.14	<i>Remove dust from area to be refinished, including cracks or moldings of adjacent areas.</i>
			TDLC.SPP.15	<i>Clean area to be refinished using a final cleaning solution.</i>
			TDLC.SPP.16	<i>Remove, with a tack rag, any dust or lint particles from the area to be refinished.</i>
			TDLC.SPP.17	<i>Apply suitable sealer to the area being refinished when sealing is needed or desirable.</i>
			TDLC.SPP.18	<i>Scuff sand to remove nibs or imperfections from a sealer.</i>
			TDLC.SPP.19	<i>Apply stone chip resistant coating.</i>
			TDLC.SPP.20	<i>Restore corrosion-resistant coatings, caulking and seam sealers to repaired areas.</i>
			TDLC.SPP.21	<i>Prepare adjacent panels for blending.</i>
2	1	N	CODE	Demonstrate ability in spray gun and related equipment operation (TDLC.SGD)
			TDLC.SGD.1	<i>Inspect, clean and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source and spray environment).</i>
			TDLC.SGD.2	<i>Check and adjust the operation of conventional spray gun.</i>
			TDLC.SGD.3	<i>Check and adjust spray gun operation for HVLP (high volume, low pressure) or LVLP (low volume, low pressure) guns.</i>
			TDLC.SGD.4	<i>Set-up (fluid needle, nozzle, and cap), adjust and test spray gun using fluid, air and pattern control valves.</i>
2	1	N	CODE	Demonstrate ability in paint mixing, matching and applying (TDLC.PMMA)
			TDLC.PMMA.1	<i>Determine type and color of paint already on vehicle by manufacturer's vehicle information label.</i>
			TDLC.PMMA.2	<i>Shake, stir, reduce, catalyze and strain paint according to manufacturer's procedures.</i>
			TDLC.PMMA.3	<i>Use spray technique (gun arc, gun angle, gun distance, gun speed and spray pattern overlap) appropriate for finish being applied.</i>
			TDLC.PMMA.4	<i>Apply selected product on test and let-down panel in accordance with manufacturer's recommendations; check for color match.</i>
			TDLC.PMMA.5	<i>Apply single stage topcoat for refinishing.</i>
			TDLC.PMMA.6	<i>Apply basecoat/clearcoat for spot and panel blending or overall refinishing.</i>
			TDLC.PMMA.7	<i>Color sand, buff and polish finishes where necessary.</i>
			TDLC.PMMA.8	<i>Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials, preparation and refinishing procedures.</i>

			TDLC.PMMA.9	<i>Refinish rigid, semi-rigid or flexible plastic parts.</i>
			TDLC.PMMA.10	<i>Clean, condition or refinish vinyl (e.g. upholstery, dashes and tops).</i>
			TDLC.PMMA.11	<i>Apply multi-stage (tricoat) coats for spot repair, panel blending or overall refinishing.</i>
			TDLC.PMMA.12	<i>Identify and mix paint using a formula.</i>
			TDLC.PMMA.13	<i>Tint color using formula to achieve a blendable match.</i>
2	1	N	CODE	Demonstrate ability in paint defects – causes and cures (TDLC.PD)
			TDLC.PD.1	<i>Identify blistering (raising of the paint surface); determine the cause(s) and correct the condition.</i>
			TDLC.PD.2	<i>Identify blushing (milky or hazy formation); determine the cause(s) and correct the condition.</i>
			TDLC.PD.3	<i>Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.</i>
			TDLC.PD.4	<i>Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition.</i>
			TDLC.PD.5	<i>Identify lifting; determine the cause(s) and correct the condition.</i>
			TDLC.PD.6	<i>Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition.</i>
			TDLC.PD.7	<i>Identify orange peel; determine the cause(s) and correct the condition.</i>
			TDLC.PD.8	<i>Identify an overspray; determine the cause(s) and correct the condition.</i>
			TDLC.PD.9	<i>Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition.</i>
			TDLC.PD.10	<i>Identify sags and runs in paint surface; determine the cause(s) and correct the condition.</i>
			TDLC.PD.11	<i>Identify sanding marks (sandscratch swelling); determine the cause(s) and correct the condition.</i>
			TDLC.PD.12	<i>Identify contour mapping (shrinking and splitting) while finish is drying; determine the cause(s) and correct the condition.</i>
			TDLC.PD.13	<i>Identify color difference (off-shade); determine the cause(s) and correct the condition.</i>
			TDLC.PD.14	<i>Identify tape tracking; determine the cause(s) and correct the condition.</i>
			TDLC.PD.15	<i>Identify low gloss condition; determine the cause(s) and correct the condition.</i>
			TDLC.PD.16	<i>Identify poor adhesion; determine the cause(s) and correct the condition.</i>
			TDLC.PD.17	<i>Identify paint cracking (crowsfeet or line-checking, micro-checking, etc.); determine the cause(s) and correct the condition.</i>
			TDLC.PD.18	<i>Identify rust spots; determine the cause(s) and correct the condition.</i>
			TDLC.PD.19	<i>Identify dirt in the paint surface; determine the cause(s) and correct the condition.</i>
			TDLC.PD.20	<i>Identify water spotting; determine the cause(s) and correct the condition.</i>
			TDLC.PD.21	<i>Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.</i>
			TDLC.PD.22	<i>Identify finish damage caused by airborne contaminants (acids, soot and other industrial-related causes); correct the condition.</i>
			TDLC.PD.23	<i>Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition.</i>

			TDLC.PD.24	<i>Identify chalking (oxidation); determine the cause(s) and correct the condition.</i>
			TDLC.PD.25	<i>Identify bleed-through (staining); determine the cause(s) and correct the condition.</i>
			TDLC.PD.26	<i>Identify pin-holing; determine the cause(s) and correct the condition.</i>
			TDLC.PD.27	<i>Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.</i>
			TDLC.PD.28	<i>Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition.</i>
			TDLC.PD.29	<i>Measure mil thickness.</i>
2	1	N	CODE	Demonstrate ability in final detail (TDLC.FD)
			TDLC.FD.1	<i>Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc.</i>
			TDLC.FD.2	<i>Buff and polish finish as required.</i>
			TDLC.FD.3	<i>Clean interior, exterior and glass.</i>
			TDLC.FD.4	<i>Clean body openings (door jams and edges, etc.).</i>
			TDLC.FD.5	<i>Remove overspray.</i>

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