Prince Edward Island
CANADA

Education and Early Childhood Development
English Programs

Prince Edward Island
Technology Education Curriculum

Career and Technical Education

CURRICULUM

Automotive 801E
Suspension Systems

2010

Prince Edward Island Department of Education

and Early Childhood Development

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Automotive Technology
Suspension Systems (AUT801E)

Course Description

Suspension and steering components are second only to brakes among the most crucial safety systems in any vehicle. Students will learn about common steering angles and how each affects vehicle handling, and about basic alignment procedures. They will also cover suspension systems and steering linkages, and will learn how to diagnose and correct problems related to vehicle suspension and steering components.

Classroom Component—Suggested time: 54 hours

This component of the curriculum is required to teach the knowledge and skills associated with the learning outcomes of the curriculum.

Skill Development Component—Suggested time: 56 hours

This component of the curriculum is required by the student to apply the knowledge and develop the skills related to the learning outcomes of the curriculum.

SCO - Identifies the **Specific Curriculum Outcome (SCO)**	
Column 1 **SCO - Delineations** Describes what the students are expected to know, be able to do, and value in order to achieve the SCO. The teacher is responsible for the planning and facilitation of learning as well as the assessment of each SCO - Delineation.	**Column 2** **Student Knowledge, Abilities, and Competencies** Provides clarity to the SCO by describing the **knowledge, abilities, and competencies** that the students develop. This column is designed to indicate the depth and breadth of the SCO. It is not necessary to use all of these suggestions or that all of the students be engaged in the same learning activity.
Column 3 **Teacher Lessons / Demonstrations** Provides suggestions for developing and delivering the content for student learning. **Student Activities / Assessments** Provides suggestions for creating meaningful activities to allow the student to achieve the **SCO**.	**Column 4** **Resources** Lists a variety of **resources** that support the teaching and learning related to the SCO. These resources are suggested to support the teacher in developing an effective instructional package for delivery to the students.

Module 1: Steering Angles (~14 hours Classroom Component)

30. Students will be able to describe the common steering angles and how each affects vehicle handling.

Students will be expected to
30.1 describe the function and effect of caster in vehicle operation
30.2 describe the function and effect of camber in vehicle operation
30.3 describe the function and effect of steering axis inclination in vehicle operation
30.4 describe the function and effect of toe in vehicle operation
30.5 describe the effect of thrust angle in vehicle operation
30.6 describe the measurement procedures for each wheel alignment angle
30.7 describe the adjustment procedures for each wheel alignment angle

Module 2: Alignment Procedures (~18 hours Classroom Component)

31. Students will be able to perform a pre-alignment inspection and determine alignment settings.

Students will be expected to
31.1 perform a pre-alignment inspection to locate and identify faulty components
31.2 select the most appropriate alignment settings within specifications for a given vehicle type and load condition
31.3 perform a wheel alignment to adjust the alignment angles according to guidelines
31.4 adjust steering linkage to establish the correct toe setting and properly centre the steering wheel
31.5 road-test a vehicle to verify correct alignment or confirm alignment problems

Module 3: Suspension and Steering Linkages (~13 hours Classroom Component)

32. Students will be able to service and repair suspension systems and steering linkages.

Students will be expected to
32.1 describe the construction and design features of common suspension systems
32.2 explain the principles of operation of suspension systems
32.3 diagnose and service suspension systems
32.4 identify steering linkage types and explain their operation
32.5 diagnose and service steering linkages

Module 4: Suspension and Steering Diagnosis (~9 hours Classroom Component)

33. Students will be able to diagnose and correct suspension and steering problems.

Students will be expected to
33.1 diagnose problems related to steering systems
33.2 diagnose problems related to suspension systems
33.3 choose the most appropriate repair method to correct suspension and steering problems

Steering Angles

(~14 hours Classroom Component)

Introduction

A properly aligned vehicle will offer less rolling resistance and provide optimal handling and turning control. This proper alignment is achieved through five steering angles that compose the wheel alignment. The apprentice must comprehend how each angle contributes to the overall handling of the vehicle.

Specific Curriculum Outcome

30. Students will be able to describe the common steering angles and how each affects vehicle handling.

SCO - Delineations

Students will be expected to

30.1 describe the function and effect of caster in vehicle operation
30.2 describe the function and effect of camber in vehicle operation
30.3 describe the function and effect of steering axis inclination in vehicle operation
30.4 describe the function and effect of toe in vehicle operation
30.5 describe the effect of thrust angle in vehicle operation
30.6 describe the measurement procedures for each wheel alignment angle
30.7 describe the adjustment procedures for each wheel alignment angle

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 090104f, *Steering Angles*
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)

Steering Angles (~14 hours Classroom Component)

SCO 30. Students will be able to describe the common steering angles and how each affects vehicle handling.

SCO - Delineations	Student Knowledge, Abilities, and Competencies
Students will be expected to	*Topic: Caster*
30.1 describe the function and effect of caster in vehicle operation	• List the five steering angles. • List the three main design characteristics manufacturers try to optimize in steering alignment design. • Define "caster". • Describe the location of the steering axis. • Explain the purpose of caster, as related to steering stability. • Explain how caster could be set to adjust for road crown. • Explain how positive and negative caster affect the vehicle during turning. • Describe the process for measuring caster. • List three effects of both positive and negative caster.
30.2 describe the function and effect of camber in vehicle operation	*Topic: Camber* • Define "camber". • List the four main purposes of camber. • Describe how camber affects directional control. • Describe the process to measure camber. • List three effects of incorrect camber.

Steering Angles (~14 hours Classroom Component)

SCO 30. Students will be able to describe the common steering angles and how each affects vehicle handling.

Teacher Lessons / Demonstrations

Topic: Caster

- Show CDX videos on the basic principles of wheel alignment and caster.
- Describe the effects of positive and negative caster.
- Use visuals from the ILM to support a class discussion on caster.
- Organize small group demonstrations on how to measure caster on a shop car.

Topic: Camber

- Show CDX videos on camber, and review the handout activities and knowledge check for all three videos.
- Use visuals from the ILM to support a class discussion on camber.
- Organize small group demonstrations on how to measure camber on a shop car.

Student Activities / Assessments

- Label diagrams related to camber and caster.

Literacy

- *Vocabulary Development:* Use as a during-reading strategy. Complete one of these tables for each of the five steering angles.

Vocabulary Term *Caster*	**Visual Representation** *Draw image here*
Definition *The forward or backward tilt of the steering axis at the top when viewed from the side*	**Personal Association** *A bicycle has positive caster and therefore has predicatable directional control*

Resources

Texts / Teacher Resources
Alberta Module 090104f
Steering Angles
pp. 3-13

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Steering Angles

Steering Angles (~14 hours Classroom Component)

SCO 30. Students will be able to describe the common steering angles and how each affects vehicle handling.

SCO - Delineations	Student Knowledge, Abilities, and Competencies
Students will be expected to	
30.3 describe the function and effect of steering axis inclination in vehicle operation	*Topic: Steering Axis Inclination* • Define "steering axis inclination (SAI)". • List six purposes of SAI. • Explain how SAI affects directional control. • Describe the process to measure SAI. • Explain the "included angle"and how it is calculated. • Describe scrub radius. • List effects of positive and negative scrub radius.
30.4 describe the function and effect of toe in vehicle operation	*Topic: Toe* • Define toe. • List the purpose of "toe". • Explain the concept of zero toe. • Describe the process to measure toe. • List the effects of incorrect toe. • Explain how turning radius relates to toe. • Describe how turning radius is encorporated in a vehicle's design. • Describe the process to measure turning radius.
30.5 describe the effect of thrust angle in vehicle operation	*Topic: Thrust Angle* • Define "thrust angle". • Explain the three lines of reference: - vehicle centreline (VCL) - geometric centreline (GCL) - thrust line • Describe how to measure thrust angle. • Explain the effects of incorrect thrust angle.

Steering Angles (~14 hours Classroom Component)

SCO 30. Students will be able to describe the common steering angles and how each affects vehicle handling.

Teacher Lessons / Demonstrations

Topic: Steering Axis Inclination

- Show CDX videos *Scrub Radius* and *Steering Axis Inclination* (SAI).
- Describe the effects of positive and negative scrub radius.
- Use visuals from the ILM to support a class discussion of SAI.
- Organize small group demonstrations on how to measure SAI and scrub radius on a shop car.

Topic: Toe

- Show CDX videos *Toe In, Toe Out on Turns and Turning Radius*.
- Describe the effects of toe in and toe out on tires and vehicle handling.
- Use visuals from the ILM to support a class discussion of toe.
- Review the knowledge checks and handout activities in CDX for all of the videos listed with the class.
- Organize small group demonstrations on how to measure toe and turning radius on a shop car.

Topic: Thrust Angle

- Describe the effects of positive and negative thrust angle.
- Use visuals from the ILM to support a class discussion on thrust angle.
- Organize small group demonstrations on how to measure thrust angle on a shop car.

Student Activities / Assessments

- *ALLDATA*: Locate manufacturer's specifications related to steering angles.
- Working in groups of two or three review all of the information on steering angles, then work on a shop car to determine the correct measurements of all the steering angles.
- *CDX : Tasksheet* C220—inspect tires and check and adjust air pressure, (paying particular attention to tire wear related to steering angle faults).

Literacy

- *Vocabulary Development:* Use as a during-reading strategy (include the terms "steering angle inclination", "scrub radius", "toe in", "toe out", "camber", and "caster").

Resources

Texts / Teacher Resources
Alberta Module 090104f
Steering Angles
pp. 14-28

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Steering Angles

Steering Angles (~14 hours Classroom Component)

SCO 30. Students will be able to describe the common steering angles and how each affects vehicle handling.

SCO - Delineations

Students will be expected to

30.6 describe the measurement procedures for each wheel alignment angle

30.7 describe the adjustment procedures for each wheel alignment angle

Student Knowledge, Abilities, and Competencies

Topic: Measurement

- Demonstrate an understanding of a pre-alignment inspection.
- Describe the alignment procedure to measure all five steering angles.
- Demonstrate a thorough comprehension of angle measurement in decimals, fractions, degrees, minutes, and seconds.
- Identify various alignment measuring equipment.

Topic: Adjustment

- Identify rear camber and toe adjustments.
- Demonstrate an understanding of the procedure to adjust rear toe and camber.
- Identify rear wheel camber/toe shims.
- Identify front wheel caster and camber adjustments.
- Demonstrate an understanding of the procedures to adjust front caster and camber.
- Consult service manuals to obtain manufacturer's specifications and instructions for caster and camber.
- Demonstrate an understanding of the procedures to adjust front toe angles.
- Locate manufacturer's specifications and instructions to adjust toe angles (ALLDATA).

Steering Angles (~14 hours Classroom Component)

SCO 30. Students will be able to describe the common steering angles and how each affects vehicle handling.

Teacher Lessons / Demonstrations

Topic: Measurement

- Demonstrate pre-alignment inspection procedures and measurement of steering angles.
- Refer to ILM 090104g *Alignment Procedures* for pre-inspection procedures.
- Demonstrate proper care and handling of alignment measuring equipment.

Topic: Adjustment

- Demonstrate proper adjustment of steering angles.

CBL

- *Guest Speaker:* Invite a representative from a local alignment shop to share information, discuss career opportunities, and tell real-life stories related to wheel alignment and steering angles.

Numeracy

- Develop a 7-step math-enhanced lessons on steering angles, measuring angles, and the concept of degrees.

Student Activities / Assessments

- Perform pre-alignment inspections.
- Measure all steering angles.
- Safely and properly use all alignment measuring tools.
- *ALLDATA:* Locate manufacturer's specifications on steering angle tolerances.
- Locate steering angle adjustments on a vehicle.
- Correct steering angle problems.

Numeracy

- Measure and interpret angles.

CBL

- *Job Shadowing:* Arrange to job-shadow an auto service technician working at a local alignment shop.

Resources

Texts / Teacher Resources
Alberta Module 090104f
Steering Angles
pp. 29-39

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Steering Angles

Visuals / Handouts / Tests
Self-Test
Steering Angles, pp. 40-45

Alignment Procedures

(~18 hours Classroom Component)

Introduction

Vehicle alignment procedures are designed to restore the vehicle's handling characteristics to manufacturer's specifications. The alignment technician must follow all of the steps in sequence to properly align the vehicle.

Specific Curriculum Outcome

31. Students will be able to perform a pre-alignment inspection and determine alignment settings.

SCO - Delineations

Students will be expected to

- *31.1 perform a pre-alignment inspection to locate and identify faulty components*
- *31.2 select the most appropriate alignment settings within specifications for a given vehicle type and load condition*
- *31.3 perform a wheel alignment to adjust the alignment angles according to guidelines*
- *31.4 adjust steering linkage to establish the correct toe setting and properly centre the steering wheel*
- *31.5 road-test a vehicle to verify correct alignment or confirm alignment problems*

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 090104g, *Alignment Procedures*
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)

Alignment Procedures (~18 hours Classroom Component)

SCO 31. Students will be able to perform a pre-alignment inspection and determine alignment settings.

SCO - Delineations	Student Knowledge, Abilities, and Competencies
Students will be expected to	*Topic: Pre-Alignment Inspection*
31.1 perform a pre-alignment inspection to locate and identify faulty components	• List and describe the steps and sequence involved in performing a wheel alignment. • Perform a pre-alignment inspection. • Conduct a customer interview. • Perform a visual inspection. • Describe a road-test procedure. • Inspect wheels and tires. • Perform measurements to check vehicle tracking. • Perform a shock absorber test and inspection. • Perform a ride height inspection and collect vehicle measurement data. • Perform a ball joint inspection. • Inspect the CV boots and joints. • Inspect the control arm bushings. • Perform a steering linkage inspection. • Inspect strut rods and stabilizer bars. • Inspect rear suspension members. • Inspect the steering gear. • Perform an under-hood inspection.
31.2 select the most appropriate alignment settings within specification for a given vehicle type and load condition	*Topic: Manufacture Specifications* • Demonstrate proficiency in the use of units of measurement. - degrees expressed using minutes and seconds - degrees expressed using fractions and decimals - linear, metric, imperial • Interpret service manuals to determine the specification range for alignment angles. • Describe and list the three alignment angle selection rules. • Use the caster-camber selection chart. • Perform calculations to determine alignment angles for specified vehicles.

Alignment Procedures (~18 hours Classroom Component)

SCO 31. Students will be able to perform a pre-alignment inspection and determine alignment settings.

Teacher Lessons / Demonstrations

Topic: Pre-Alignment Inspection

- Demonstrate a pre-alignment inspection procedure, including all points on the opposite page.
- Show videos from CDX related to the inspection and service of suspension and steering components.

Topic: Manufacturer's Specifications

- Demonstrate how to find manufactures specifications from multiple sources (ALLDATA, service manuals, etc).

Literacy

- *KWH (know, what, how):* Use as a pre- and during-reading strategy for pp. 3-20 Focus the KWH on pre-alignment inspection. Model the KWH with the class prior to assigning the reading.

Component	Know (function)	What (diagnosis)	How (service)
Ball Joints	provide pivot points for suspension	- locate ball joints and determine whether they are followers or load carrying - followers should have no movement - load-carrying should function with manufacturer's specifications	check wear indicators, load-carrying function, and manufacturer's specifications, and replace as necessary

Numeracy

Demonstrate how to calculate caster and camber ranges.

Student Activities / Assessments

- Perform pre-alignment inspections.
- *ALLDATA:* Locate manufacturer's specifications related to alignment procedures.

Literacy

- *KWH:* Use as a during-reading strategy (complete chart).

Numeracy

- Complete the exercises on pp. 21-25 of the *Alignment Procedures* ILM.

Resources

Texts / Teacher Resources

Alberta Module 090104g
Alignment Procedures
pp. 3-25

Software / Databases

CDX Global

StudentsAchieve (SAS)
AUT801E/Alignment Procedures

Alignment Procedures (~18 hours Classroom Component)

SCO 31. Students will be able to perform a pre-alignment inspection and determine alignment settings.

SCO - Delineations	Student Knowledge, Abilities, and Competencies
Students will be expected to	
31.3 perform a wheel alignment to adjust the alignment angles according to guidelines	*Topic: Wheel Alignment* • Measure all steering angles. • Adjust all steering angles. **Note: This outcome is supported by the outcomes covered in the *Steering Angles* module (30.1–30.7). **
31.4 adjust steering linkage to establish the correct toe setting and properly centre the steering wheel.	*Topic: Steering Linkage* • Explain the importance of centring the steering wheel. • Make necessary adjustments to centre the steering wheel. **Note: This outcome is supported by the outcomes covered in the *Steering Angles* module (30.1 - 30.7). **
31.5 road-test a vehicle to verify correct alignment or confirm alignment problems	*Topic: Road Test* • Demonstrate an understanding of the procedure to follow when performing final road test.

Alignment Procedures (~18 hours Classroom Component)

SCO 31. Students will be able to perform a pre-alignment inspection and determine alignment settings.

Teacher Lessons / Demonstrations

Topic: Wheel Alignment

- Demonstrate the measurement and adjustment of all steering angles.

Topic: Steering Linkage

- Demonstrate the inspection and adjustment of the steering linkage.

Topic: Road Test

- Discuss the function of the road test.

Student Activities / Assessments

Literacy

- *Free Writing:* Use as a pre- or post-reading strategy. Write on what you know about alignment procedures.

Resources

Texts /Teacher Resources
Alberta Module 090104g
Alignment Procedures
pp. 26-32

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Alignment Procedures

Suspension and Steering Linkage Systems

(~13 hours Classroom Component)

Introduction

The apprentice must express a clear understanding of the suspension components, their characteristics, and service procedures. The ability to analyse, diagnose, and repair suspension systems while ensuring the designed integrity of the vehicle is an essential skill for the technician.

Specific Curriculum Outcome

32. Students will be able to service and repair suspension systems and steering linkages.

SCO - Delineations

Students will be expected to

32.1 describe the construction and design features of common suspension systems
32.2 explain the principles of operation of suspension systems
32.3 diagnose and service suspension systems
32.4 identify steering linkage types and explain their operation
32.5 diagnose and service steering linkages

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 090204b, *Suspension and Steering Linkage Systems*
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)

Suspension and Steering Linkages (~13 hours Classroom Component)

SCO 32. Students will be able to service and repair suspension systems and steering linkages.

SCO - Delineations	Student Knowledge, Abilities, and Competencies
Students will be expected to	*Topic: Common Suspension Systems*
32.1 describe the construction and design features of common suspension systems	• Explain the purpose of the springs. • List and describe the types of springs. • Explain the purpose of shock absorbers. • Explain the operation of the shock absorbers. • List and describe the various types of shock absorber. • Explain the purpose and location of stabilizer bars. • Demonstrate an understanding of the function and operation of the control arms. • Demonstrate an understanding of the function and types of suspension bushings. • Demonstrate an understanding of the function and types of ball joints. • Explain the transfer of forces through the suspension components (tension, compression, torsion). • Identify and describe the operation of common solid axle suspension designs. • Identify and describe the operation of various common independent front suspensions. • Identify and describe the operation of various common types of rear wheel suspensions.
32.2 explain the principles of operation of suspension systems	*Topic: Operating Principles* • Demonstrate an understanding of the function and operation of vehicle suspensions. • Explain the various forces that are placed on a vehicle under typical driving conditions. • Explain the concept of sprung and unsprung weight. • Demonstrate an understanding of the design and operation of air suspension systems. • Demonstrate an understanding of the design and operation of electronic dampening systems.

Suspension and Steering Linkages (~13 hours Classroom Component)

SCO 32. Students will be able to service and repair suspension systems and steering linkages.

Teacher Lessons / Demonstrations

Topic: Common Suspension Systems

- *CDX:* There are 17 short videos in CDX related to the information found in the ILM. Below are the section headings in CDX.
  - Suspension Fundamental Principles (4 videos)
  - Types of Suspensions (3videos)
  - Types of Springs (3 videos)
  - Front Suspension Types and Components (3 videos)
  - Rear Suspension Types and Components (4 videos)
- Create visuals using the graphics from the ILM to support the information covered on the videos and explain the components and their function.
- Organize small group demonstrations showing how to locate the components of a suspension system on a shop car.

Topic: Operating Principles

- Show related videos from CDX (see list above).
- Review the information covered in the videos by using as a class the knowledge check and handout activities in CDX.

Literacy

- *Anticipation Guide:* Use as a pre-reading strategy for pp. 3-30.

Student Activities / Assessments

- Label diagrams of suspension systems and components.
- *Component ID:* Locate suspension components on a vehicle.

Literacy

- *SQ3R*: Use as a reading strategy to cover the information from pp. 3-30.
- *Component Map:* Use as a during-reading strategy.

Component *Springs*	**Visual Representation** *Draw image here* *(could be multiple examples)*
Function *Used to support the vehicle and its load and absorb shock*	

Resources

Texts /Teacher Resources
Alberta Module 090104b
Suspension and Steering Linkage Systems
pp. 2-30

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Suspension and Steering Linkage

Suspension and Steering Linkages (~13 hours Classroom Component)

SCO 32. Students will be able to service and repair suspension systems and steering linkages.

SCO - Delineations

Students will be expected to

32.3 diagnose and service suspension systems

Student Knowledge, Abilities, and Competencies

Topic: Suspension Service

- Measure ride height of a vehicle.
- Collect and interpret manufacturer's specifications for a specific vehicle's ride height measurement.
- Collect and interpret a manufacturer's specifications for ball joints.
- Demonstrate the ability to inspect ball joint movement or wear.
- Describe the design and operation of wear indicators on ball joints.
- Demonstrate the ability to inspect and evaluate suspension bushings.
- Demonstrate the ability to inspect and evaluate shock absorbers and struts.
- Describe the additional components to check on computerized suspension systems.
- Explain the dangers involved in servicing suspension systems.
- Identify specialty tools used in the removal and replacement of ball joints.
- Demonstrate the ability to remove and replace a ball joint.
- Demonstrate the ability to inspect and service control arms and bushings.
- Demonstrate the ability to inspect and service stabilizers.
- Identify and list four precautions to consider while working with struts.
- Demonstrate the ability to remove and replace struts.

Suspension and Steering Linkages (~13 hours Classroom Component)

SCO 32. Students will be able to service and repair suspension systems and steering linkages.

Teacher Lessons / Demonstrations

Topic: Suspension Service

- *CDX:* There are 4 short videos in CDX related to the information found in the ILM on procedures having to do with suspension.
- Demonstrate how to perform a front and rear suspension inspection.
- Demonstrate safe and proper use of specialty tools and hand tools used when overhauling suspension systems.

Literacy

- *KWH (know, what, how):* Use as a pre- and during-reading strategy for pp. 31-43.
- Model the KWH with the class prior to assigning the reading (focus the KWH on the service and repair of suspension components).

Component	Know (function)	What (diagnosis)	How (service)
Ball Joints	provide pivot points for suspension	inspect for signs of binding, damaged grease seals, and excessive movement (p. 32 of ILM)	check wear indicators, load - carrying function, and manufacturer's specifications. and replace as necessary

Student Activities / Assessments

- Perform front and rear suspension inspections.
- *CDX:* Complete the following tasksheets:
  - C190—remove, inspect, and install strut rods (compression/ tension) and bushings
  - C196—remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount
  - C198—remove, inspect, and install coil springs and spring insulators
  - C201—remove, inspect, and install strut cartridge or assembly, strut coil spring, and insulators (silencers)
  - C202—inspect, remove, and replace shock absorbers
  - C204—test and diagnose components of electronically controlled suspension systems using a scan tool

Literacy

- *KWH:* Use as a during-reading strategy (complete a table similar to the one above).

Resources

Texts / Teacher Resources
Alberta Module 090104b
Suspension and Steering Linkage Systems
pp. 31-43

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Suspension and Steering Linkage

Suspension and Steering Linkages (~13 hours Classroom Component)

SCO 32. Students will be able to service and repair suspension systems and steering linkages.

SCO - Delineations

Students will be expected to

32.4 identify steering linkage types and explain their operation

32.5 diagnose and service steering linkages

Student Knowledge, Abilities, and Competencies

Topic: Steering Linkage

- Describe the purpose of the steering linkage.
- Identify four types of common steering linkage.
- Identify the various components of the steering linkage systems.
- Explain the design and operation of the steering linkage components.

Topic: Service Steering Linkage

- List three conditions to check while inspecting steering linkage components.
- Collect and interpret manufacturer's specifications.
- Identify specialty tools for steering component service.
- Demonstrate an ability to follow the proper procedures for removal and replacement of steering linkage components.

Suspension and Steering Linkages (~13 hours Classroom Component)

SCO 32. Students will be able to service and repair suspension systems and steering linkages.

Teacher Lessons / Demonstrations

Topic: Steering Linkage

- Show a CDX video on steering linkages.
- Review the knowledge check and handout activities as a class.
- Create visuals from the ILM to support a class discussion on the function and operation of the steering linkage.

Topic: Service Steering Linkage

- Demonstrate proper inspection procedures to follow when inspecting the steering linkage.
- Small group demonstrations on how to remove and replace a tie rod, pitman arms, idler arms and inner sockets.

Student Activities / Assessments

- *ALLDATA*: Locate manufacturers' specifications related to the service of the steering linkage.
- *Component ID:* Locate all components of the steering linkage on a shop vehicle.
- Perform an inspection of a steering linkage.
- Remove and replace a tie rod, idler arm, pitman arm, and inner socket.

Resources

Texts / Teacher Resources

Alberta Module 090104b
Suspension and Steering Linkage Systems
pp. 44-52

Software / Databases

CDX Global

StudentsAchieve (SAS)
AUT801E/Suspension and Steering Linkage

Suspension and Steering Diagnosis

(~9 hours Classroom Component)

Introduction

Suspension and steering components are second only to brakes among the most critical safety feature on any vehicle. The apprentice must be able to diagnose and service the steering and suspension systems, maintaining the vehicle to original specifications.

Specific Curriculum Outcome

33. **Students will be able to service, test, and diagnose problems related to batteries.**

SCO - Delineations

Students will be expected to

33.1 diagnose problems related to steering systems

33.2 diagnose problems related to suspension systems

33.3 choose the most appropriate repair method to correct suspension and steering problems

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 090104i, *Suspension and Steering Diagnosis*
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)

Suspension and Steering Diagnosis (~9 hours Classroom Component)

SCO 33. Students will be able to diagnose and correct suspension and steering problems.

SCO - Delineations

Students will be expected to

33.1 diagnose problems related to steering systems

Student Knowledge, Abilities, and Competencies

Topic: Steering Systems

- List typical steering complaints.
- Demonstrate an inspection of the steering linkage.
- Demonstrate the procedure to check the steering gears for looseness, roughness, and binding.
- List two things that should be checked first when diagnosing power steering noise.
- Perform power steering belt inspection and tension check.
- Demonstrate an understanding of the procedure to pressure-test a power steering system.
- Demonstrate an understanding of power steering pull and demonstrate a check for this condition.
- Inspect a power steering system for leakage and suggest appropriate repair procedures.
- Diagnose problems related to a steering wheel off centre.
- Describe conditions of understeer and oversteer.
- List four conditions to check in response to complaints of understeer or oversteer.
- Demonstrate an understanding of the condition of bump steer, discuss possible causes, and suggest a diagnosis path.
- Demonstrate an understanding of torque steer, discuss possible causes, and suggest a diagnosis path.
- Demonstrate an understanding of memory steer, discuss possible causes, and suggest a diagnosis path.
- State causes for tire squeal.
- Explain how to check turning radius and inspect steering arms.

Suspension and Steering Diagnosis (~9 hours Classroom Component)

SCO 33. Students will be able to diagnose and correct suspension and steering problems.

Teacher Lessons / Demonstrations

Topic: Steering

- *CDX:* Show video on inspecting and adjusting steering systems.
- Demonstrate proper inspection methods in response to common steering complaints.

Literacy

- *Anticipation Guide:* Use as a pre-reading strategy for pp. 2-12.

Student Activities / Assessments

- Inspect and diagnose steering problems on shop vehicles.
- Respond to customer complaints related to steering problems.

Resources

Texts / Teacher Resources
Alberta Module 090104i
Suspension and Steering Diagnosis
pp. 2-12

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Suspension and Steering Diagnosis

Suspension and Steering Diagnosis (~9 hours Classroom Component)

SCO 33. Students will be able to diagnose and correct suspension and steering problems.

SCO - Delineations

Students will be expected to

33.2 diagnose problems related to suspension systems

33.3 choose the most appropriate repair method to correct suspension and steering problems

Student Knowledge, Abilities, and Competencies

Topic: Suspension Systems

- Explain how noises may be used to identify suspension problems.
- Describe which defective components could cause excessive body roll.
- Describe which defective component would cause vehicle bounce.
- List common conditions responsible for vibrations and shimmy.
- Explain three conditions that would cause brake-induced pull.
- Explain three conditions that would cause tire pull.
- List factors to consider while diagnosing bent or damaged steering and suspension components.
- Analyse a steering system to determine how and where adjustments are made to camber.
- Demonstrate an ability to check for a bent strut or steering knuckle.
- Demonstrate an ability to check for cradle shift.
- Demonstrate an ability to check for a bent control arm.

Topic: Repair

- Explain why suspension components should never be straightened by using heat.
- Consult and interpret manufacturers' service manuals and on-line services to obtain appropriate service procedures.
- Demonstrate an ability to replace suspension and steering components while consulting the appropriate service manual information.

Suspension and Steering Diagnosis (~9 hours Classroom Component)

SCO 33. Students will be able to diagnose and correct suspension and steering problems.

Teacher Lessons / Demonstrations

Topic: Suspension

- *CDX:* Show video on servicing a suspension system.
- Demonstrate proper inspection procedures for common suspension complaints.

Topic: Repair

- Review *Suspension and Steering Linkages* module.

Student Activities / Assessments

- *ALLDATA:* Reference and interpret manufacturers' specifications for the service and repair of steering and suspension systems.

Literacy

- *KWL:* Use as pre-reading and post-reading strategy. Refer back to the *Manual Steering* and *Suspension Steering and Linkages* modules to help you identify what you know and what questions you have.

Resources

Texts / Teacher Resources
Alberta Module 090104i
Suspension and Steering Diagnosis
pp. 13-20

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801E/Suspension and Steering Diagnosis

Visuals / Handouts / Tests
Self-Test
Suspension and Steering Diagnosis,
pp. 21-23