

ACADEMY / STUDY BOOK

Suspension Inspection & Repair Planning

Connect ride, handling, noise, and tire-wear complaints to a documented inspection plan for steering and suspension components.



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How to use this book

Read the lessons, work each example, then complete the practice questions before checking the answer explanations. Write your evidence and next step in the exercises. Training examples are not vehicle service specifications.

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Before you begin

Basic chassis identification. Lifting, spring handling and component inspection require supervised training and the actual vehicle procedure.

Learning objectives

- Translate ride and handling complaints into a controlled inspection.
- Select the correct support and joint-inspection condition.
- Separate wear patterns from proven causes.
- Plan torque, alignment, calibration and verification requirements.

Course contents

Turn a complaint into an inspection plan

Inspect components in the correct state

Use tire wear and geometry as evidence

Build and verify the complete repair plan

Worked shop cases / Practical worksheet / Practice assessment / Answer explanations / Further study

Turn a complaint into an inspection plan

Classify the concern before choosing parts: noise, vibration, pull, wander, uneven ride height or excessive movement. Ask whether it occurs on a sharp bump, during braking, while turning, on smooth pavement or only with a particular load. Record speed, temperature, road surface, recent impacts, tire service and previous repairs. “Clunk” is not the same as “failed strut.”

Inspect tire size, pressure and condition early because they affect ride and can imitate suspension complaints. Record the applicable load and ride-height setup. A vehicle carrying heavy equipment may sit differently from its specified test condition. Measure at the defined points instead of comparing fender gaps by eye.

Plan a safe way to verify the complaint. Do not reproduce a dangerous handling condition on a public road. If there is a serious tire defect, insecure component or uncertain vehicle stability, stop the driving test and arrange controlled inspection. Road testing and lift operation require shop authorization and training.

Case: a bump-related clunk

The driver reports a single front clunk on sharp bumps, with no noise on smooth roads. Start by documenting those conditions, checking tires and visible security, and planning inspection of relevant links, joints, mounts and hardware. The report narrows the system, but does not yet justify replacing both struts.

Write two plausible causes and the evidence that would distinguish them. A good inspection plan can reject a hypothesis, not just find information that agrees with it.

Separate the jobs of the components

Springs support load and influence ride height. Dampers control suspension motion; they are not interchangeable with springs merely because both affect ride. Arms, links, joints and bushings locate the wheel while allowing the intended movement. Steering components transmit steering input. A complaint may involve more than one function, so name the system behavior before naming a component.

A clunk over a single-wheel bump can suggest a different investigation from a continuous speed-related vibration or a pull during braking. Record speed, road input, load, steering angle, temperature and recent work. Note whether the concern was reported or actually reproduced. Tire and brake conditions can mimic a suspension complaint; the customer's word “suspension” should not limit the evidence considered.

Use a comparison deliberately

Comparing left and right observations can reveal a difference, but symmetry is not a universal specification. Both sides could be worn, or the vehicle could have a design-specific difference. Compare each condition with the applicable method and limit. A useful intake note ends with a testable question, such as which operating condition produces the noise, rather than a guaranteed replacement recommendation.

Turn a noise description into an observation plan

A noise should be described by where it seems to originate, the maneuver that produces it and the conditions under which it does not occur. A right-turn clunk over uneven pavement is a better starting point than “bad strut.” The direction perceived in the cabin may not identify the failed component; sound can transmit through the body. Separate the customer's report from a technician-reproduced observation.

Build an inspection plan that respects the mechanical design and the permitted test method. A component may need to be loaded, unloaded or positioned in a particular way for its movement to be assessed. A wheel that appears firm in one state does not prove all joints are serviceable. Record the state so another technician can repeat the check rather than relying on “checked front end.”

Symptom-led inspection

- Describe Maneuver, surface, load and location
- Select Correct inspection state and procedure
- Observe Movement, condition and repeatability
- Interpret Compare with the applicable criteria

Try it before reading the answer

The noise is reported during right turns but was not reproduced on a smooth straight road. What can the technician conclude?

Worked answer and reasoning

Only that the complaint was not reproduced under those different conditions. That result does not establish no fault. Plan an appropriate safe check of the reported conditions and document the limits of any attempted reproduction.

Inspect components in the correct state

Suspension architecture determines how a joint is loaded. Some checks require the suspension supported at a specified point; others require a different state. Applying a memorized loaded or hanging-wheel test to every design can hide play or create misleading movement. Read the inspection method, permitted movement and measuring direction for the installed system.

Inspect springs, dampers, mounts, bushings, joints, steering links, boots, fasteners and related wheel-end components. Record the precise location and condition. Distinguish a surface observation from a measured failure criterion. A torn boot may require action under the procedure, but is not itself a numerical play measurement. Likewise, a fluid film should be judged using the relevant manufacturer's condition criteria rather than an invented universal rule.

Use the correct measurement tool and reference point. Keep hands and tools clear of pinch points. Springs store substantial energy; this course does not teach unsupervised disassembly or improvised compression methods. If suitable tools, training or support are unavailable, stop and refer the work.

Fictional joint check

The exercise procedure permits no more than 0.50 mm movement in a stated direction. A correctly performed test measures 0.80 mm. It fails that criterion. A measurement taken in the wrong support condition is not a valid substitute, even if the number appears smaller.

Record procedure reference, support state, tool, direction, reading, unit and limit. That record allows another technician to repeat the check.

Why support state changes a joint check

Suspension geometry and spring force can load or unload a joint depending on the design and support position. A check that reveals movement on one architecture may mask it on another. Identify the installed design, required support points and specified inspection state before interpreting movement. The absence of visible movement under an arbitrary setup is not a universal pass.

Observe the joint, boot, fasteners and surrounding structure as required. A damaged boot is a condition to document, but it is not automatically a measured amount of internal play. Likewise, movement observed at the tire may involve more than one component. Localize the source through the appropriate procedure rather than assigning all movement to the first nearby joint.

Make findings recheckable

Record the side, exact component, support state, applied inspection method and measured or observed result. Compare it with the applicable criterion and note inaccessible areas. Photographs should identify this vehicle and the feature being discussed. A generic red circle around an entire wheel does not show which joint moved or how the check was performed.

State and direction belong with the reading

The fictional measurement below is meaningful only with its supplied method. The allowed movement is 0.40 mm along the specified axis under the stated support condition. A valid 0.65 mm reading exceeds that limit by 0.25 mm. A separate 0.20 mm reading taken in an unapproved state cannot cancel the first result. The difference may reflect method rather than an intermittent component.

Inspect the supporting components and interfaces named in the applicable procedure. If movement is seen, determine which interface moves rather than attributing all movement at the wheel to one joint. Do not improvise leverage against a boot, seal or part not intended as a test point. If the proper support or measuring equipment is unavailable, stop and arrange the correct setup.



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Concept illustration - not a lifting-point map.

Support condition changes the inspection Identify the exact vehicle, lift/support instructions and joint test procedure. The vehicle silhouette intentionally shows no universal support points. Concept illustration; use the vehicle-specific procedure for service.

Fictional movement check

Observation	Method	Meaning
0.65 mm	Specified axis and support state	Compare with 0.40 mm maximum
0.20 mm	Different unsupported method	Not a substitute comparison
Movement location	Interface must be identified	Wheel movement alone is incomplete

Try it before reading the answer

Calculate the excess over the training limit. List two details that must accompany the number.

Worked answer and reasoning

$0.65 - 0.40 = 0.25$ mm above the supplied limit. Include the exact component/interface and axis, support/load state, method, units and reference. A smaller reading from a different method cannot be used to manufacture a pass.

Use tire wear and geometry as evidence

Tire wear can guide diagnosis, but patterns are not unique component labels. Feathering, one-shoulder wear, cupping and uneven tread depth can involve pressure, alignment, looseness, damping, runout, rotation history or several conditions together. Record where and how the tread was measured. “Tires worn” conceals information that could help distinguish causes.

Compare sides, ride heights and relevant alignment readings using the correct vehicle setup. A low corner can influence geometry; adjusting an angle without understanding a spring or load problem may conceal rather than repair it. Check for impact damage and altered parts where history supports that investigation, but do not condemn a component from history alone.

Training evidence log

Observation	What it supports	What it does not prove
One shoulder worn	Need to inspect tire and geometry	A specific failed joint
Low measured ride height	Check load and suspension condition	Toe adjustment is the repair
Excess play by specified test	A failed inspection criterion	Every adjacent part is failed

For an intermittent noise, use a controlled comparison and keep the test conditions repeatable. If inspection does not identify the source, state that honestly and define the next test. Replacing a package of parts may change the noise without demonstrating which condition caused it.

Practice explaining the difference between observation, interpretation and recommendation. The customer should be able to see why a proposed repair follows from the evidence.

Read a pattern without turning it into a verdict

Uneven tread wear, low ride height, leakage and abnormal movement are clues with different meanings. A worn tire records past operating conditions; it does not identify which suspension part failed. A low corner may involve loading, spring or structural conditions and must be evaluated using the proper reference points. A convenient fender gap is not automatically a valid ride-height measurement.

For a fictional vehicle, the supplied reference is 380-390 mm at a named point. Left measures 385 mm and right 372 mm under the documented load. The right reading is outside that exercise range. Before naming a component, confirm measurement method, load, tire conditions and repeatability, then inspect the relevant structure and components. An alignment correction should not be used to hide an unresolved underlying condition.

Build an evidence-to-action table

Use columns for observation, reference, interpretation, remaining possibilities and next check. This prevents “noise plus mileage” from becoming a parts list. Prioritize immediate safety concerns, then work through the relevant uncertainty. If a required check cannot be completed with the equipment or skill available, state the limitation and arrange appropriate escalation.

Use tire wear and alignment as clues

A tire-wear pattern or alignment value helps direct investigation but rarely identifies a unique failed suspension part. Record the pattern by tire position and relate it to pressure history, fitment, geometry and component condition. The same visible pattern may have more than one contributing cause. Replacing a part because the pattern resembles a familiar case skips the evidence needed for this vehicle.

Distinguish historical wear from current geometry. A tire retains evidence of previous service conditions even after a correct adjustment. A fresh in-range alignment report does not remove existing wear, and an old uneven tire does not alone prove today's adjustment failed. Explain what the current measurements establish and what the tire condition still requires.

Combine evidence without overclaiming

- Wear record Position and pattern, not a parts verdict
- Setup Pressure, fitment and vehicle condition
- Geometry Readings against applicable limits
- Mechanical check Confirm the suspected interface or fault

Try it before reading the answer

A worn outer shoulder remains after geometry is corrected. Does this prove the alignment failed or the tire can remain in service?

Worked answer and reasoning

Neither conclusion follows from wear history alone. Inspect tire condition against applicable criteria, verify final geometry under the correct setup and explain that existing wear does not disappear after adjustment. Tire serviceability is a separate decision.

Build and verify the complete repair plan

A complete plan includes the failed condition, parts, labor, fasteners, required setup, alignment or calibration steps, and the method of checking the original complaint. Obtain authorization for the whole scope, not just the visible replacement part. A low parts price can misrepresent the job if required geometry checks and one-time hardware are omitted.

Follow the specified torque sequence, values and component position. Some bonded-rubber joints require final tightening at a defined ride-height position; do not assume every bushing follows the same rule. Use the actual procedure. One-time-use hardware and special tools are requirements, not suggestions that can be replaced by extra torque or threadlocker.

After repair, verify security, routing, clearance and any required initialization. Recheck affected angles and complete specified calibration steps. Before a road check, establish that the vehicle is safe to move. Compare the original conditions, note steering center, noise and warning status, and inspect for new concerns. An alignment screen does not prove that a bump-related noise is gone.

Repair-order handoff

“Measured joint movement exceeded the supplied limit using the specified support condition. Replacement and required alignment were authorized. Final fastener procedure, alignment readings and safe verification are attached.” If the noise remains, mark it unresolved and seek approval for further diagnosis.

Keep deferred findings separate from completed work. The certificate for this course records knowledge of inspection planning; it does not replace supervised competence in spring or suspension service.

Plan the complete repair boundary

A repair plan includes more than the main component. Identify required hardware, applicable one-time fasteners, mounting procedures, alignment checks, calibration needs and verification. Some bushing fasteners have a specified tightening position; the correct vehicle procedure controls. Do not substitute a universal hanging-suspension or full-load rule for every joint and bushing.

Explain why each associated operation is included. If replacement changes geometry, a relevant alignment check may be necessary; if an electronic system requires calibration, a mechanical part replacement does not perform it automatically. The plan should separate required work from optional recommendations and obtain approval for the actual scope.

Verify the function that prompted the visit

Recheck the repaired condition, fastener/procedure requirements and any affected system. When safe, compare the original complaint under the documented operating conditions. A quiet stationary vehicle is limited evidence for a bump-related clunk. Record remaining symptoms rather than promising that all ride or tire concerns were solved. The final handoff should connect the initial evidence, authorized work and verification result.

Build a repair plan with dependencies

A repair plan includes more than the visibly worn item. Identify required hardware, fastener conditions, alignment, initialization or calibration dependencies from the actual vehicle procedure. A part that requires a particular tightening state must be installed accordingly; convenience on the lift does not change the requirement. Do not substitute a universal torque or assume every reused fastener is permitted.

At completion, verify both the measured defect and the original concern where safe and feasible. A joint that now meets its movement limit supports that correction; it does not prove every noise was caused by the joint. If the clunk remains, preserve that distinction and agree on further diagnosis. The customer needs a truthful account of the completed work and remaining issue.

Repair-plan handoff example

Work item	Gate before completion
Component correction	Authorized scope and specified hardware
Assembly	Specified tightening condition
Geometry / electronics	Required follow-on checks completed
Original clunk	Repeat concern check; record outcome

Try it before reading the answer

A joint repair passes its movement check but the clunk remains. Write the status without dismissing the customer or condemning another part.

Worked answer and reasoning

“The authorized joint correction meets the documented check. The reported clunk remains and requires further diagnosis.” Record how the concern was checked, what is known and the next authorized step; do not label a second component failed without evidence.

Work the shop cases

A clunk and a convenient parts guess

A vehicle clunks over alternating small bumps. A boot is visibly damaged, but no valid joint-play measurement or support-state record exists. The technician recommends that joint as the confirmed source of the noise. A second link has not been inspected.

Separate the observed defect from the noise diagnosis. Write a next-check plan and a customer explanation that does not dismiss the damaged boot or overstate its meaning.

Your evidence, decision and next step:

Compare with the model answer

The damaged boot is an established observation. The source of the clunk remains unconfirmed. Identify the design and required support state, inspect the relevant joints and links through their procedures, and localize movement/noise evidence. Record the boot condition as its own finding and determine its service significance from applicable guidance. Tell the customer what is known and that additional inspection is needed to connect a component to the complaint. A visible defect can merit attention without proving every symptom.

Ride height and alignment disagree with the plan

The exercise reference is 380-390 mm. Left height is 385 mm and right is 372 mm using the named points. The right camber is outside its supplied limit. An advisor has quoted only a toe adjustment and promised to correct tire wear.

Identify the failed comparison, two setup checks, the unsupported promise and the additional plan required before approving a repair.

Your evidence, decision and next step:

Compare with the model answer

The right height is below range while the left is within it. Confirm the required loading, reference points, tire conditions and measurement repeatability. Investigate related component and structural evidence before assigning the low corner to one part. Toe correction does not explain the height/camber findings or reverse existing tire wear. Revise the recommendation to include the appropriate diagnostic scope, then quote supported work and required geometry verification. Preserve the initial readings and explain any uncorrected condition at handoff.

Apply it to a job

Create a complaint statement for a clunk over sharp bumps. List three possible sources and a test to distinguish each. Build a joint-inspection record with support state, direction, reading and limit. Use 0.80 mm versus a fictional 0.50 mm maximum to write a finding. Add required alignment, hardware and verification to a sample estimate.

Concern / scenario

Observation, measurement and reference

Interpretation and next action

Unknowns and who needs to review

Verification and handoff

Check your understanding

- Explain spring, damper and locating-component functions.
- Select a joint-inspection state from the actual design.
- Separate a damaged boot, measured play and a noise diagnosis.
- Interpret ride-height data without guessing a failed component.
- Plan associated geometry and verification work.

Practice assessment

Ungraded practice, separate from the final assessment. Answers and reasoning follow in the next section.

1. A clunk occurs only on sharp bumps. What does that establish?

- A. A useful condition for targeted inspection
- B. A confirmed strut failure
- C. A confirmed alignment fault
- D. A confirmed wheel imbalance

2. A joint is tested in a different support state from the procedure. Is the reading conclusive?

- A. Yes if movement is small.
- B. No; repeat using the specified state.
- C. Yes if the vehicle is old.
- D. Only the tool brand matters.

3. A tire has one-shoulder wear. What should the learner do?

- A. Condemn one ball joint immediately.
- B. Replace only the tire and close diagnosis.
- C. Document it and inspect relevant tire, geometry and component conditions.
- D. Assume all wear is pressure-related.

4. A replacement affects alignment geometry. What belongs in the plan?

- A. Only the part price
- B. Only a wash
- C. A universal toe setting
- D. Required alignment and any specified calibration

5. Which report is most reproducible?

- A. Named joint, axis, support state, reading, units and reference
- B. Front end has play
- C. Joint feels loose
- D. Wheel moves more than expected

6. A customer calls the noise a bad strut. How should intake preserve it?

- A. Record strut failure as established
- B. Record the reported noise conditions and keep the component cause unconfirmed
- C. Remove the customer's description entirely
- D. Order both struts before inspection

7. An alignment value is out of range after an impact. What is still needed?

- A. Automatic replacement of the nearest joint
- B. A new tire as proof of correction
- C. Setup and component investigation before naming the cause
- D. An average with the opposite side

8. A required calibration has not been completed after repair. What is the accurate job state?

- A. Ready because parts are installed
- B. Ready because the invoice is approved
- C. Closed because the noise improved
- D. Repair work performed; required completion step pending

Answer explanations

1. A useful condition for targeted inspection

The condition narrows the investigation but does not uniquely identify a part.

Review: Turn a complaint into an inspection plan

2. No; repeat using the specified state.

Loading affects observed movement. A small number from an invalid method cannot clear the joint.

Review: Inspect components in the correct state

3. Document it and inspect relevant tire, geometry and component conditions.

Multiple causes can produce wear; the pattern alone is not a unique diagnosis.

Review: Use tire wear and geometry as evidence

4. Required alignment and any specified calibration

The complete job includes affected systems and vehicle-specific verification, not a generic adjustment.

Review: Build and verify the complete repair plan

5. Named joint, axis, support state, reading, units and reference

The complete record lets another technician repeat the method and comparison.

Review: Inspect components in the correct state

6. Record the reported noise conditions and keep the component cause unconfirmed

Preserve the report without converting a guess into a diagnosis.

Review: Turn a complaint into an inspection plan

7. Setup and component investigation before naming the cause

Geometry directs investigation but does not uniquely name a failed part.

Review: Use tire wear and geometry as evidence

8. Repair work performed; required completion step pending

Required dependencies remain part of completion.

Review: Build and verify the complete repair plan

Further study

Use current vehicle and equipment information for actual service. These resources support further learning; lessons and questions in this book are original.

ASE suspension and steering task outline

https://www.ase.com/wp-content/uploads/ASE_Automobile_Study_Guide.pdf

Hunter equipment guidance

<https://www.hunter.com/en-ca/support/equipment-digital-resources/>

Lift operation and support training - ALI

<https://www.autolift.org/be-a-smart-auto-lift-user/>