Vehicle servicing and repairing

NTQF Level II

Learning Guide #29

Unit of Competence: **Maintain and Repair Under Chassis Systems**

Module Title: Maintaining and Repairing Under Chassis Systems

LG Code: **EIS VSR2 M08 0919 LO1-LG 29**
TTLM Code: **EIS VSR2 TTLM 0919V1**

LO3. Carry out maintenance and repairs

Instruction Sheet	Learning Guide #29

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- WHS requirements
- Identify and source procedures and information
- Identify tool/equipment requirements and Techniques for repair
- Implement methods of repair.
- Make adjustments

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- ❖ WHS requirements, including individual State/Territory regulatory requirements and personal protection needs are observed throughout the work
- ❖ Procedures and information are identified and sourced
- ❖ Technical and tool requirements for repair are identified and support equipment identified and prepared
- ❖ Methods for repair are implemented in accordance with workplace procedures and manufacturer/component supplier specifications
- ❖ Adjustments are made during the repair in accordance with manufacturer/component supplier specifications

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 6.
3. Read the information written in the “Information Sheets 1, Information Sheets 2, Information Sheets 3, Information Sheets 4 and Information Sheets 5”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4 and Self-check 5” **in page 6, 10, 12, 14, 17 respectvely**

5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.

Information Sheet-01	WHS requirements

1. **Preparation for work includes the following tasks:-**

Identifying and Confirming nature and scope of work requirements, Observing ***OH&S*** requirements, including individual State/Territory regulatory requirements and personal protection needs are throughout the work, Sourcing procedures and information such as workshop manuals and specifications, and ***tools and equipment*** and Identifying and preparing technical and/or operational requirements for inspecting and repairing steering systems are sourced and support tooling and equipment.

2. **What is a SOW?**

The scope of work is a narrative description of products or services to be delivered by the project.

Service manual and power steering system encompass those tasks diagnosis, inspect, test and service manual and power steering system components For internal projects, the project initiator or sponsor provides the SOW based on the business needs, products, or service requirements.

For external projects, the SOW can be received from the customer as part of a bid document, for example, request for proposal, request for bid, or as part of a contract. The SOW references:

3. **Work Shop Safety**

Safety means protecting yourself and others from possible danger and injuring in the shop, you are ' Safe' when you protect your eyes, your fingers, your hands all of yourself from danger as well as others.

The preparation of work shop to supply equipment helps to -

- ✓ Keep environment well being
- ✓ Finish with specified our time pre-summing
- ✓ Identify the work and its implementing tools and equipment the purpose designed for.
- ✓ Decide the work procedure
- ✓ Keep tools, equipment and resource prevent ourselves from injury
- ✓ Done the work with quality

4. Safety rules

1. Always read and follow the work place instructions.
2. Know where the emergency stop buttons are positioned in the workshop. If you see an accident at the other side of the workshop you can use the emergency stop button to turn off all electrical power to machines.
3. Always wear an apron as it will protect your clothes and hold loose clothing such as ties in place.
4. Wear safety shoes, training shoes are not suitable.
5. When attempting practical work all tools should be put away.
6. Bags should not be brought into a workshop as people can trip over them.
7. When learning how to use a machine, listen very carefully to all the instructions given by the professionals. Ask questions, especially if you do not fully understand.
8. Do not use a machine if you have not been shown how to operate it safely by the teacher.

9. Always be patient never rush in the workshop.
10. Always use a guard when working on a machine.
11. Keep hands away from moving/rotating machinery.
12. Use hand tools carefully, keep both hands behind the cutting edge.
13. Always be patient never rush in the workshop.

5. Observing *OH&S* requirements

5.1 Occupational Health & Safety Objectives:

• To secure the health, safety and welfare of persons at work
• To protect the persons at the workplace, against the hazards ascending out of the activities.
• To promote an occupational environment for individuals at work, with concern to the physiological and psychological needs.

5.2 Types of Hazards in the workplace:

■ Unsafe Act
■ Unsafe Conditions

Accidents are not always caused by a person hurting himself. But rather, an accident are caused by a person failing to act safely or to correct an unsafe condition.

Some typical examples relating to unsafe acts:

- Using equipment without receiving training in its use.
- Using tools and equipment the wrong way
- Fails to use personal protective equipment
- Fooling around or playing practical jokes during work.
- Hurrying and taking dangerous workshops short cuts through the workshop.
- Distracting others from work or allowing yourself to be distracted.

Here are some examples of unsafe conditions:

- Lack of instruction in safe workplace methods
- Lack of training
- Unsuitable clothing for the task
- Poor lighting, excessive noise
- Lack of safeguards on machines or engines

Self-Check -1	Written Test

Directions

: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the preparation of work shop to supply equipment helps to (10 point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-02	Identify and source procedures and information

Identify and source procedures and information

When spacing the chassis for a vocational vehicle, the ultimate objective should be to ensure that the completed vehicle is optimized for its intended application. This process results in a safer, more productive vehicle while minimizing the overall lifecycle cost of ownership.

Far too often, fleets select a chassis for a given application based on intuitive factors, including past experience, recommendations from others, or just a guess as to the size or kind of chassis required. There is, however, an orderly procedure that should be followed to identify chassis requirements.

While a comprehensive explanation in chassis spec'ing can take several hours, the procedure outlined here describes the basic elements. One caveat before outlining this procedure, however. Fleets must look at their specific vehicle applications in relation to a particular specification. For example, spec'ing a dump truck that carries abrasive or caustic material must consider that material's effect on the truck body.

How to Identify Key Factors

To properly spec a chassis, several key factors must be identified first:

- Second-unit (upfitting) requirements.
- Completed vehicle performance criteria.
- Regulatory and other design constraints.

These requirements will ultimately determine the final design of the completed vehicle, and therefore, they should drive the chassis specification process. Once the initial factors are pinpointed, the overall design and specification process can be broken down into 10 discrete steps. Following this process helps ensure the completed vehicle is right for the desired application.

The 10 steps listed here include examples of the types of information required for each step.

Step 1: Identify Basic Application Requirements

- What will the vehicle be used for?
- What are the performance requirements for the second unit?
- What is the application's projected duration?
- What type of second-unit body and/or special equipment is desired?

Step 2: Determine Applicable Design Constraints

- Dimensional limits (width, height, length, weight).
- Operational restrictions.
- Regulatory issues.
- Contractual requirements.
- Financial constraints.

Step 3: Determine Net Payload Requirements.

- Payload weight.
- Payload volume.
- Dimensional requirements (size of transported materials).

Step 4: Identify Primary Special Equipment/Second-Unit Requirements

- Size of special equipment and/or second unit to be upfitted to the chassis.
- Weight of upfitting components.
- Cargo storage and security requirements.
- Component installation requirements (chassis frame requirements, clear cab-to-axle distance, exhaust system location restrictions, etc.).
- Operational requirements (equipment power sources and access requirements, etc.).

Step 5: Identify Secondary Special Equipment/BodyRequirements

Secndary special equipment and body requirements can include generators, hose reels, etc., as well as service bodies, dump bodies, and more.

- Size of accessory items.
- Weight.
- Installation requirements.

Step 6: Determine Gross Payload Requirements

- Net payload.
- Second unit weight.
- Special equipment weight.
- Trailer towing loads (tongue weight/total weights).
- Crew weight.
- Fuel requirements (weight).
- Operational requirements.

Step 7: Identify Vehicle Operating Conditions and Environment

- Duty cycle – percentage on/off road; operational cycle (desired cycle times, daily hours of operations, etc.).
- Loading cycle – static or dynamic loading (impacts selection of suspension components).
- Climate / weather.
- Terrain.
- Maintenance considerations, including existing vehicle maintenance histories.

Step 8: Determine Desired Vehicle Performance Requirements

- Starting gradability, on/off road.
- Maximum gradability.
- Reserve gradability.
- Maximum road speed.
- Braking requirements.

Step 9: Preliminary Chassis Design

- Availability of appropriate chassis: GVWR/GCWR, frame, dimensions, and powertrain options.
- Completed unit's estimated weight.

Step 10: Final Chassis Specification

Spec the chassis, ensuring that all critical design factors have been addressed, including:

- Gross axle weight loadings do not exceed GAWRs (including trailer loadings).
- Gross vehicle weight does not exceed GVWR (including trailer loadings).
- Gross combined weight does not exceed GCWR (with heaviest trailer).
- Frame selection meets or exceeds chassis OEM and equipment requirements.
- Suspension is matched to other requirements.
- Powertrain provides desired performance (engine, transmission, and final drives).
- Support systems, such as electrical, cooling, etc., meet or exceed identified requirements.
- Auxiliary equipment requirements are addressed (PTO provisions, exhaust system routings, etc.).

Other non-functional considerations:

- Employee retention / productivity issues (comfort and convenience).
- Resale value. Return on items added for resale value should cover carrying cost for life of the unit.
- Driver / operator skills.

Self-Check -2	Written Test

Directions

: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. **Identify Primary Special Equipment/Second-Unit Requirements**

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-03	Identify tool/equipment requirements and Techniques for repair

Identify tool/equipment requirements and Techniques for repair

Removing, refitting and adjusting components to ensure the vehicle system operates within specifi cation is a summary of almost all the work you will be doing. The use, care, calibration and storage of test equipment are therefore very important. In this sense, 'test equipment' means:

- measuring equipment, e.g. a micrometer
- hand instruments, e.g. a spring balance
- electrical meters, e.g. a digital multimeter (DMM) (F ig. 1.73) or an oscilloscope.

The operation and care of this equipment will vary with different types. Therefore, you should always read the manufacturer's instructions carefully before use, or if you have a problem. The following list sets out good general guidelines:

- Follow the manufacturer's instructions – at all times.
- Handle with care – do not drop keep the instrument in its box.
- Ensure regular calibration – check for accuracy.

This is an oscilloscope that works through a laptop or computer. It will test all engine management systems and other electrical and electronic devices.

Self-Check -3	Written Test

Directions

: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the guidelines to calibrate the equipments?(10 point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-04	Implement methods of repair

To prevent your car from getting rusty, wash it consistently. All cars eventually succumb to rust, however you can delay this process by washing all salt and chemicals from your car immediately. Make sure you regularly wax your car so that you protect the paint.

Keep track of all the repairs and maintenance you do on your vehicle. It's wise to keep them in your glove compartment in case you need to go to a auto repair shop on the fly. Auto repair mechanics and professionals will need the records. They help them figure out what's wrong quickly.

Keep a record of every car repair. If further issues develop later, the mechanic may want to see the historical documentation of what has already been done. If you do not have documentation, you may have duplicate services performed.

Don't get stuck with a mechanic who will make repairs on your vehicle that are not necessary. All reputable mechanics will notify you before doing any repairs and will inform you of any parts that could require repairs in the immediate future. If you notice a mechanic has made unnecessary repairs to your vehicle, do not go to the same one next time. When getting auto repairs, take all items out of your car.

The mechanic may need to remove these items in order to do their job, and they are not responsible if you find out later that something is missing. Everything needs to be taken out of your trunk too.

Learn to recognize potential problems before they happen. This may help you learn how to fix simple auto repair problems. Keep this advice in mind if your car gives you problems.

Self-Check -4	Written Test

Directions

: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why auto mechanics and professionals will need the records?(10point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-05	Make adjustments

Condition	Remedies
Loose at Corner Entry	● Reduce right rear air pressure ● Move right rear wheel in ● Use narrower right rear wheel or more offset ● Raise chassis ride height front and rear ● Take out tilt (raise left side) ● Add right rear cross weight ● Use less bar split ● Use softer right rear bar ● Drive car in straighter
Loose At Mid-Corner	● Move Right Rear tire in (start with 1") ● Reduce stagger ● Raise ride height front and rear ● Use softer rebound shock valving at left front and left rear ● Use higher gear ● Take tilt out (raise left side) ● Raise forward end of left rear radius rod ● Move wing back or use more wing angle
Loose At Corner Exit	● Reduce stagger ● Raise front ride height ● Use higher gear ● Move wing back or use more wing angle ● Use softer rebound shock valving at right front ● Increase left rear cross weight ● Use softer right front spring rate ● Use softer spring rate at right front and right rear ● Roll into the throttle smoother
Loose Through Entire Corner	● Raise ride height front and rear ● Take out tilt (raise left side) ● Reduce stagger ● Move wing back ● Use softer spring rate at right front and right rear
Tight At Corner Entry	● Increase right rear air pressure ● Move right rear wheel out ● Use less wheel offset at right rear ● Use wider right rear wheel ● Add tilt (lower left side) ● Use more bar split front & rear ● Use stiffer right rear torsion arm ● Use softer left rear & left front torsion bars

	● Use stiffer shock rebound valving at left rear
Tight At Mid Corner	● Move Right Rear tire out (start with 1") ● Increase stagger ● Lower chassis ride height ● Use more tilt (lower left side) ● Lower left rear radius rod forward end ● Move wing forward ● Use stiffer shock rebound valving left front
Tight At Corner Exit	● Increase stagger ● Lower the front ride height ● Move wing forward ● Increase nose wing angle ● Use stiffer shock rebound valving on both front shocks
Tight Through Entire Corner	● Increase right rear air pressure ● Increase stagger ● Move wing forward ● Use softer left front torsion bar ● Move right rear wheel out

Self-Check -2	Written Test

Directions

: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. When the vehicle condition is loose at corner entry ,the remedy is----(10point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation Sheet 1	Identify and source procedures and information

Techniques for Identify and source procedures and information

Step 1: Identify Basic Application Requirements
Step 2: Determine Applicable Design Constraints
Step 3: Determine Net Payload Requirements.
Step 4: Identify Primary Special Equipment/Second-Unit Requirements
Step 5: Identify Secondary Special Equipment/BodyRequirements
Step 6: Determine Gross Payload Requirements
Step 7: Identify Vehicle Operating Conditions and Environment
Step 8: Determine Desired Vehicle Performance Requirements
Step 9: Preliminary Chassis Design
Step 10: Final Chassis Specification
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LAP Test	Practical Demonstration

Name: _____ Date: _____
Time started: _____ Time finished: _____
Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hour.
Task 1. Identify methods of repair
Task 2. Preparation of work shop safety.
Task 4. Identify the necessary of safety.

List of Reference Materials

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5. Automotive Chassis Systems by: Birch, Thomas W. 2.
6. Automotive Mechanics 10th Ed. by: Crouse and Anglin 3.

7. Automotive Excellence 4. Hilton's Truck & Van Repair Manual (93-97)