1.1.4 Storage and Racking of Parts

Hazards include: High force requirement and awkward postures from lifting, lowering and handling of tires and or wheel assemblies. The workshop personnel could fall from heights and level surfaces as a result of tripping.

Figure 1.4: Storage system kept below shoulder height

Table 1.4: Storage and Racking of Parts

	TASK / ACTIVITY	**RULES/SAFETY MEASURES**
i	Forklifts and lifting equipment	➢ Strict traffic management must be ensured while operating Forklifts and other lifting equipment. ➢ Tyres/parts stored in racks can be stacked with forklifts. ➢ Mechanical aids are to be used to lift tyres/parts up to racks above shoulder level or to a warehouse.
ii	Storage Systems	➢ No tyre/parts storage should be above shoulder height. ➢ Minimum stock on-site should be based on usage rate. ➢ Limits on pyramid stacking are to be strictly followed
iii	Working at heights	➢ Mobile access platforms are to be used to access stocks above shoulder height. ➢ Appropriate “A” frame platform ladder is to be used. ➢ Parts storage floors (rooms) are to have guard rails and purpose-built stair access with hand rails.
iv	Lifting and moving of larger tyres, parts and wheels	➢ Size and the type of the tyre and wheel are to be known and appropriate number of people and mechanical aid allotted to the job. ➢ Mechanical equipment are to be used to move or stack truck tyres and wheels.

1.1.5 Awkward Postures

When work is done in an awkward posture, the body muscles are strained. When such position is sustained for a long time, the body could lock up and spinal injuries may occur.

Hazards: Awkward or sustained postures could lead to employee injury.

Figure 1.5: High risk examples

Table 1.5: Awkward Postures

	TASK / ACTIVITY	RULES/SAFETY MEASURES
i	Working under the bonnet	➢ Working positions adopted should be between the shoulder and the knee. ➢ Work should be carried out close to the body. ➢ Forces required to carry out a job must be low. ➢ Postures are not held for a long duration. ➢ Lifting appliances are to be employed. ➢ Vehicles are designed with maintenance access and mechanics manual handling needs in mind, to minimize the risk of injury.
ii	Working under a vehicle	➢ This may be done by differing height vehicle hoists, platforms for employee to stand on, use of ground pits, and safely changing and holding the position of the vehicle. ➢ Forces required to carry out a job

		must be low. ➢ Postures are not held for a long duration. ➢ Lifting appliances are to be employed. ➢ Vehicles are designed with maintenance access and mechanics manual handling needs in mind, to minimize the risk of injury.

1.1.6 Handling Heavy Parts

Hazards: High force and awkward postures while lifting, lowering and handling heavy components e.g. Wheel assemblies, engines, gearbox etc.

Figure 1.6: Low risk examples

Table 1.6: Handling Heavy Parts

	TASK / ACTIVITY	**RULES/SAFETY MEASURES**
i	Removing gearboxes, transmissions, rear axles, truck wheels and brake drums, etc.	➢ Manual handling aids are needed to lift, lower, carry or drag heavy components for all task undertaken. ➢ The handling aids should be designed to hold the components being worked on in a comfortable working position during repairs and maintenance. ➢ Floor surfaces are meant to be clear and level allowing easy use of handling aids.
ii	Removing and working on engines	➢ Engines are removed with load rated lifting equipment e.g. Hydraulic Crane,

		etc. ➢ Engines are placed into a mobile engine stand for servicing.

2.0 WORKSHOP PLANNING AND LAYOUT

2.0 Sections in the Workshop

i. Receptionist & Preinspection:

This is a space in an automotive workshop were clients are received. In addition to this, auto parts & accessories, demonstration specification sheets and promotion materials which are placed beside the reception desk are seen here. This space is divided for some functions:

a) Reception

Registration and preinspection are done here and there should be enough space for car driving. This space is for clients visiting, and it is to prevent the unnecessary access of the clients into workshop. There should be interlinking rooms between reception and workshop to handle documentation (inspection papers, client's database and invoices) and coffee break room for clients.

b) Coffee Break Room:

This is the space where clients take rest during waiting for after-sale service on their cars, the space is provided with internet, TV, newspapers, magazines, coffee, and even snacks, etc. There should be a big glass wall between this room and workshop for clients to monitor the processes. In the corner of the room, promotion materials, such as catalogues, accessories for cars, small gifts, souvenirs for clients to purchase or enquiry could be put in place.

ii) Part warehouse

This space is for storage of auto parts, which can be minimum quantity for repair demands, or even clients can buy from the list of parts and accessories list directly. Some optional parts, such as alloy rims, special tyre, car beauty stuff can be put on a shelf near Coffee break room, or warehouse. There should be a warehouse office nearby the warehouse, to make sure a good control on stock calculation, and filing when in and out.

iii) Repair Space

To carry out repairs, inspection, and maintenance on cars, the space should be divided into some independent spaces by functions. All tools and cabinet, pipes, should be well organized to let the space looked clean and well managed. If there is not enough floor space, an extendable workshop could be design with a lifting bridge which is used as second floor.

iv) Management Offices space

Administration space should be divided as an independent area. These areas should not be visible to clients and staffs. Also the same should apply to meeting rooms, training rooms, financial rooms etc. If there is second floor, these rooms will be better set up in the second floor.

2.1 Vehicle Maintenance Equipment

Equipment used for vehicle maintenance are grouped below as follows:

2.1.1 Workshop Equipment

- Air compressor
- Dryer
- Exhaust extractor system
- Gas Tank
- Air hose reel

2.1.2 Service Equipment

- Car lift
- Body alignment
- Tyre Changer
- Spray booth
- Prep station booth
- Baking varnish lamp
- Vulcanizing machine
- Welding machine
- Lathe machine
- MAG welding
- Brake drum/disc cutting machine

2.1.3 Equipment for Examining /Testing

- Wheel balancer
- Alignment
- Electrical headlight tester
- Vehicle brake tester
- Fuel Injector cleaner tester
- Engine analyzer
- Automotive emission analyzer
- Cylinder endoscope
- Automotive Electrical System Multifunction Test-bed
- Vehicle test line
- Vehicle chassis dynamo meter

2.1.4 Pneumatic Tools

- Pneumatic drill
- Pneumatic spanner
- Pneumatic grinder
- Spanner sleeve

2.1.5 Equipment for Examining

- Vacuum gauge
- Tire pressure gauge
- Avon meter Fuel system pressure gauge
- Test pencil
- Oscilloscope
- Noise meter
- Radiator examination table
- Timing lamp
- Refrigerant leak detector
- Brake fluid test
- Benz and BMW special-purpose tool

2.1.6 Hydraulic Tool

- Hoisting Jack
- Butter gun
- Shop Press
- Engine Crane
- Low position Jack
- Transmission Jack

2.1.7 Maintenance Equipment

- Vacuum cleaner
- Water scooping machine
- Car battery charger
- Inflator machine
- Nitrogen Generator
- Pneumatic component cleaner
- Inflator machine
- Automatic gear-box cleaner
- A/C pipeline cleaning machine
- Ultrasonic wave components clearer
- Car washer
- Spray gun
- Fuel system cleaning machine