

Vehicle Mounted Scissor lift (Mobile Platform) for Various Agricultural and Industrial Applications

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SUMMARY

The objective of this paper is to design, develop, and execute a low-cost wire and wireless Vehicle Mounted Scissor lift (Mobile Platform) for various Agricultural and Industrial Application. It despite developments in Scissor lift (Mobile Platform) and their widespread applications, today's industry demands for Scissor lift (Mobile Platform) are on the rise. Also to perform work at height is very risky & hazardous also requires too much time for the operation but using scissor lift we can easily do our work at a height smoothly and safely. Working at height which necessitates repetitive work and very risky, makes it tedious, time-consuming, and effort-intensive. When Scissor lift (Mobile Platform) is correctly incorporated into jobs, the entire operational process can be better managed, resulting in cost savings in human labour and time. Furthermore, it would provide the opportunity to limit or eliminate human exposure to tough and dangerous situations, resolving the majority of the issues associated with safety when many operations are occurring at the same time. The creation of a Scissor lift (Mobile Platform) system is motivated by these factors. To emphasise accuracy in system design Scissor lift (Mobile Platform) and safety.

INTRODUCTION

The Hydraulic Scissor lifts are work platforms used to safely move workers vertically up, down and to different locations in a variety of industries including construction, entertainment, retail, manufacturing and various agricultural field operations. Also you'll commonly find scissor lifts used for a variety of tasks from performing building repairs to reaching materials stored high in warehouses. This lift Platform raises load smoothly to any desired height. Also to perform work at height is very risky & hazardous also requires too much time for the operation but using scissor lift we can easily do our work at a height smoothly and safely. It has complex design and light in weight and easy to operate by taking safety precautions. It has some of the moving parts which will require lubrication. This hydraulic scissors lift is to design for lift up to a height of 6 meters and with the carrying capacity of 1000 kilograms (kg) or 1 TON. The driving mechanism of the lift must be a hydraulic cylinder. Calculations of the inner stresses must be done properly and a 3D model must be created. Its material selection criteria are one of the most important factors.



Figure 1.1: Process of completion of Scissor Lift

Material Selection

It is necessary to evaluate the particular type of forces imposed on components with a view to determining the exact mechanical properties and necessary material for each equipment. A very brief analysis of each main component of the lift follows:

The main components of the lift are shown:

- I. Scissor Arms
- II. Base Platform (Base Frame)
- III. Top Platform (Top Frame)
- IV. MS Chequered Plate (4mm)
- V. Battery
- VI. Hydraulc Power Pack
- VII. Hydraulic Cylinder
- VIII. Floor Lock
- IX. Detachable Railing (25*25*2.5 MM Sq. Tube)

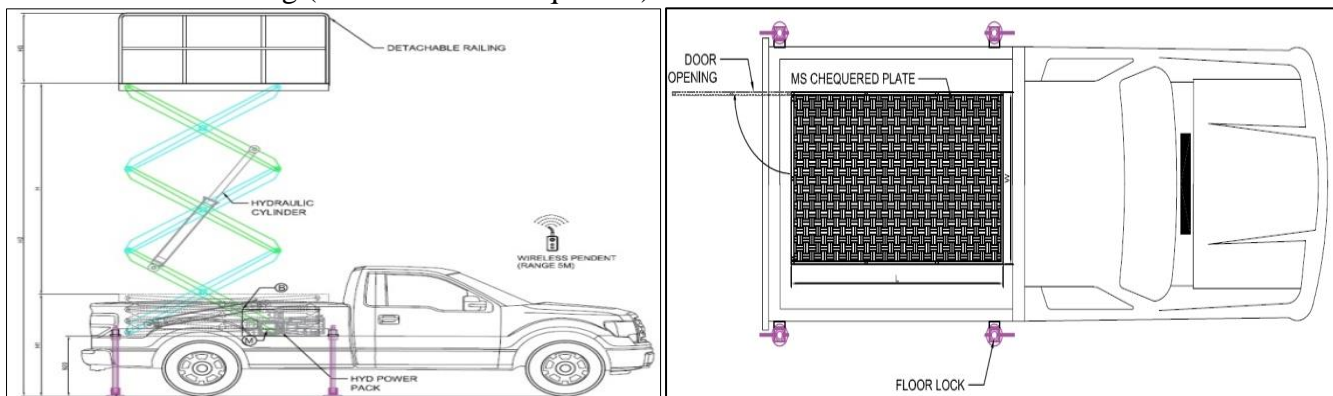


Figure 1.2: Main components

I. Scissors Arms: This component is subjected to uniformly distributed load considered. Hence based on strength, stiffness, plasticity and hardness. A recommended material is mild steel. The legs extend from the base to the platform. They raise the platform as they constrict and lower the platform as they expand. The legs are in a pantograph or criss-cross pattern.

II. Top Platform: This component is subjected to the weight of the workman and his equipment, hence strength is required, the frame of the platform is mild steel and the base is of MS Chequered Plate.

III. Base Platform: This component is subjected to the weight of the top platform and the scissors arms. The base serves as the foundation of the lift and is made with rigid metal. It is also responsible for the stability of the whole assembly; therefore strength, hardness and stiffness are needed mechanical properties. this component is manufactured by using mild steel.

IV. MS Chequered Plate: Similarly, the size of the base also depends on the model of top frame. This thick sheet of 4mm size is installed over the frame.

V. Battery: A rechargeable battery that is used to supply the power to motor of power Pack. Its main purpose is to provide an electric current to the electric-powered starting motor, which in turn starts the chemically-powered that actually used by power source for lifting mechanism. Once the engine is running, power for the lifts electrical systems is still supplied by the battery, with the alternator charging the battery as demands increase or decrease.

VI. Hydraulc Power Pack: The power source can range from a self-contained motor or a remote power pack. There are many ways a scissor lift is powered (Ex. Hydraulic, Pneumatic, Electric and Diesel)

VII. Down valve: This valve controls the flow of compressed air or hydraulic fluid by allowing it to go back into its original container. This ensures the scissor lift doesn't descend too fast. The down valve isn't activated until the power source activates it.

VIII. Flow control valve: This valve handles the speed of the platform's descent by managing how quickly the fluid or compressed air leaves the cylinder.

IX. Hydraulic Cylinder: This component is considered as a strut with both ends pinned. It is subjected to direct compressive force which imposes a bending stress which may cause buckling of the component. It is also subjected to internal compressive pressure which generates circumferential and longitudinal stresses all around the wall thickness. Hence necessary material property must include strength, ductility, toughness and hardness. The recommended material is mild steel. A scissor lift will have one cylinders attached to it. The cylinder contents depend on the type of scissor lift. For example, a hydraulic scissor lift has a cylinder filled with hydraulic fluid, while another type of cylinder called pneumatic pump fills with compressed air.

IIIX. Floor Lock: A floor lock allows you to create a stationary item from a mobile one, but does not interfere with movement when not in use. Primarily used in heavy duty applications on carts, platform trucks, and dollies. Floor Locks are an independent mechanism that can be attached to an item.

IIIX. Detachable Railing:

MS material Railing having dimensions of 25*25*2.5 MM Sq. Tube with door opening at one side attached to work platform which can be detachable mechanism. And which is very helpful for safety of worker for smooth running operation.

How to safely use scissor lifts:

Employers need to assess the worksite to identify all possible hazards in order to select the appropriate equipment for the task. Employers who use scissor lifts need to evaluate and implement effective controls that address fall protection, stabilization and positioning. Only trained workers should be allowed to use scissor lifts, and employers should make sure that those workers show that they can use a scissor lift properly. Safe scissor lift use includes properly maintaining the equipment, following the manufacturer's instructions, providing workers training and needed personal protective equipment (PPE), and implementing safe work practices.

1. Fall Protection
2. Stabilization
3. Positioning

Operating at great heights poses obvious safety risks for operators. Here are a few ways you can stay safe on a scissor lift.

- Conduct a pre-operation safety check to ensure everything works properly, including the brakes and emergency stop button.
- Confirm all crew members received training and are familiar with the scissor lift in use for the day.
- Clear the surrounding area of potential safety hazards.

Scissor lifts are ideal heavy equipment options for completing work in high areas in a safe and efficient way. Check out our wide selection to see what works best for your project.

Observations and Results

The complete manufacturing process of the scissor lift is Figure 1.1. The scissor lift can lift any capacity of weight to desire height to work. There are two options for smooth operation and handling the scissor lift installing the lift on the floor or on the level with the floor. The standard is to place the remote control for the lift to the left at a certain distance. If necessary, the location of the control panel may be placed or attached with the railing of scissor lift.

• **The main technical capabilities:**

1. The automatic device for blocking of mechanisms for safe work in any situation;
2. The valves which are switching when hydraulic actuators are damaged;
3. Valve for control of speed of lowering;
4. The electro-hydraulic device for stopping the lowering in case of destruction of the basis of the elevator;
5. Electrically the switched-on device for protection of legs of the user;
6. The self-greased hinges.

• **Requirements for the floor:**

1. The elevator has to be installed on a floor maintaining loading in 20 kN or 2 Tons.

3. The floor has to maintain loading not lower than 1,3 kg/cm²;

It is necessary to be convinced that the voltage in an electricity circuit corresponds to the elevator supply voltage ignores if suitable battery is installed. If the voltage does not comply it is necessary to rebuild circuit.

• Safety Features

1. Hose burst valve to avoid free fall of scissor lift in case of hose failure.

2. Pressure relief valve to avoid overloading condition.

The scissors lift has a Platform (table) surface where the weight can be placed. The rising of a platform is carried out due to work of a hydraulic cylinder. The management of the elevator is carried out by the Wire as well as Wireless control panel which has four buttons: the main switch, lowering, rise, and blocking. As rising/lifting speed on average 3 Mtr per minute and lowering speed can be adjustable. Lifting / lowering operation can be done from platform top.

The technical characteristics of the lift are shown in below,

Sr. No	Description of Component	Technical Characteristic
1	Lifting Capacity	700Kg (Payload)
2	Lifting Speed	Approx. 3mtr/min
3	Lowering Speed	Adjustable
4	Mass Weight	900 kg
5	Platform length	2000 mm
6	Platform width	1000 mm
7	Minimum Height	1800 mm
8	Maximum Height	6000 mm
9	Lift Height	4200 mm
10	Railing Height	900 mm
11	Scissors Arm	4 No's
12	Battery (Exide)	12Volt alfa drive makes
13	Motor	1.2KW
14	Wireless control system	1 (Range within 5mtr)
15	Wired control System	1
16	MS Chequered Plate	4 mm
17	Detachable Railing	25*25*2.5 MM Sq. Tube
18	Floor Lock	4 No's

Table 1.1: Technical Characteristic of the lift

Applications:

- Maintenance
- Material Handling
- Transportation of Goods and Heavy Materials
- Reaching materials stored high in warehouses
- Building Repairs
- Trimming Trees
- Cleaning the windows
- Painting
- Loading & Unloading work

Advantages:

- Reduces time required for work

- Reduces human efforts
- Less cost required
- Less Manpower required
- Efficiency of Work

Features:

- Lifting height up to 40 feet
- Fixed and Mobile type.
- Excellent performance
- Rugged design
- Maximum capacity

CONCLUSION

Scissor Lift is freely can perform multiple operations with vertical and horizontal movement operated by a trained operator. As easy to operate and reduces human efforts. The mechanism is very simple so that make complex. The design and fabrication of a portable work platform elevated by a hydraulic cylinder was carried out meeting the required design standards. The portable work platform is operated by hydraulic cylinder which is operated an operator working in the company premises is a responsibility of an organization. It is an important thing to give some comfort to the operator. Hence, by making this hydraulic lifter we improved the comfort level of the operator working on the scissor lift platform. Material handling and providing comfort to the operator was our main motive behind developing this lifter this was considered as a radical improvement in the productivity by the company. The scissor lift can be design for high load also if a suitable high capacity hydraulic cylinder is used. The hydraulic scissor lift is simple in use and does not required routine maintenance. It can also lift heavier loads. The main constraint of this device is its high initial cost, but has a low operating cost. The shearing tool should be heat treated to have high strength. Savings resulting from the use of this device will make it pay for itself with in short period of time and it can be a great companion in any engineering industry dealing with rusted and unused metals.

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