

5 RISK & HAZARD MANAGEMENT

JLG Machine	ES1932	Safe Working	230	Max. Drive	5.72	Max. Height (m)	5.72
Type	ES2632	Load (kg)	230	Height(m)	7.77		7.77
	ES3246		320		9.75		9.75
	ES2646		545		7.77		7.77

INTRODUCTION/SCOPE

The aim of this report is to conduct an investigation into the hazards¹ and risks involved with the operation, maintenance, servicing, inspection, transportation and storage of the above plant². Our aim is to ensure people at work (and any other personnel) are protected against health and safety risks associated with the use of the plant detailed within this report. Possible hazards and risks are to be assessed with respect to use of the plant and control measures incorporated to maximize safety. For each identified risk the probability and consequences of occurrence are assessed and the control measures implemented to reduce this risk as far as practicable³. The following procedure will be used:

1. Identifying Hazards - associated with the plant or 'systems of work'⁴

2. Controls implemented to reduce Hazards & Risks - these include design and any other measures which are put in place to reduce risks and hazards as far as practicable.

¹ A hazard is anything with potential to cause injury, illness or harm when the plant is operated, maintained, serviced, repaired, inspected, transported and stored.

² Plant in this case is defined as a JLG model ES1932 scissor lift elevating work platform.

³ In fulfilling its obligation to reduce the risk as far as practicable, JLG has adhered to the required standards for design and manufacture, and addressed the potential for exposure to risks as part of the design process. Any additional risks identified during this assessment have been addressed and eliminated for normal machine operation by trained personnel.

⁴ Systems of work describe all operating/maintenance procedures and in general systems used by workers in servicing, inspecting, transportation and storage

TABLE 2
***HAZARD TYPE CHECKLIST**

A. CRUSHING. ENTANGLEMENT. CUTTING. STABBING. PUNCTURING. SHEARING. FRICTION. STRIKING.	-can anyone's hair, clothing, gloves, cleaning apparatus or any other materials become entangled in moving parts, or objects in motion. -crushing due to material falling from plant. -uncontrolled motion or unexpected movement of plant. -inadequate stopping devices of plant to control movement. -support structure collapse. -being thrown from or within plant. -cutting, stabbing & puncturing due to contact with sharp or flying objects. -parts of plant or worksite material disintegrating or falling. -movement of plant. -can anyone's body parts be sheared between moving parts or surfaces of the plant. -can anyone be burnt due to contact with moving parts or surfaces of the plant. -can anyone be struck by moving objects due to uncontrolled or unexpected movement of plant or workpieces.
B. ERGONOMIC. SLIPPING. TRIPPING. FALLING.	-can anyone be injured due to the design of seating or due to repetitive body movements. -constrained body posture or the need for excessive effort. -design inefficiency causing mental or psychological stress. -inadequate or poorly placed lighting of plant or workers. -lack of failsafe measures against human error. -mismatch of plant with natural human limitations.
C. HIGH PRESSURE FLUIDS. HIGH TEMPERATURES. FIRE/EXPLOSION.	-can anyone come into contact with fluids under high pressure, due to plant failure or misuse. -can anyone come into contact with objects at high temperatures, or objects which can cause fire or burning. -can anyone suffer illness due to exposure to high or low temperatures. -can anyone be injured by explosion of gases, vapours, liquids, dusts or other substances triggered by the operation of the plant or workpieces.
D. SUFFOCATION. DROWNING.	-can anyone be suffocated or drowned due to lack of oxygen, or atmospheric contamination.
E. ELECTRICAL.	-can anyone be injured by electric shock due to the plant coming into contact with live conductors. -plant being too close to high tension power lines. -overload of electrical circuits. -electrical wiring or switch shorting. -lack of insulation against water contact shorting. -magnetic interference from workplace corrupting electrical components.
F. STABILITY.	-can machine tip or roll over due to outriggers not extending. -outriggers failing mechanically, or retract unintentionally. -control valve or interlock failure. -set up on soft ground, unlevel or uneven ground, excessive slope. -driving on rough surfaces, over potholes, hitting fixed objects, excessive side loads e.g wind.
G. HYDRAULIC FAILURE.	-hydraulic system failure. -check valve or relief valve failure. -hose or cylinder failure - mechanical or fatigue.
H. STRUCTURAL FAILURE.	-boom or scissor arm failure due to fatigue, corrosion, or overloading. -pin, cable or linkage failure. -general overload- lifting excessive load, loading platform/ basket in an unintended way.
I. MAINTENANCE.	-can anyone be injured while carrying out routine, preventative or corrective maintenance. -explosion due to welding spark etc. near charging battery -adjusting equipment for essential components faulty or seized. -guard removal.
J. TRANSPORT.	-can anyone be injured due to machine instability while transporting. -plant or objects falling from transport truck.
K. OCCUPATIONAL HAZARDS	-plant obstructing other plants at site. -unauthorised use by untrained personnel. -unintended use of duplicate controls while working. -hearing loss or communication interference due to excessive noise. -safety signs or decals removed. -energy supply failure (chemical, electrical or mechanical).

* Table 2 is based upon N.Z Chamber of Manufacture hazard identification guide, & specifications from the Elevating Work Platform purchasing Specification and Operating Guide by the Electricity Association NSW - 1996, and pr EN280.

TABLE 3: ES-Family RISK ASSESSMENT AND CONTROL MEASURES

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO		CONTROL MEASURES TO REDUCE RISK	
1	Crushing, collision/striking.	Operating unit in an area where obstacles, other people and plant may be present.		Beacon and motion alarm alert others in the area that the unit is in use. Reflective warning stripes fitted to platform. Section 1.3 of operator's manual contains instructions and guidelines for operating in these circumstances, under the heading "Crushing and Collision Hazards".	
2	Crushing.	Between scissor arms, underneath platform		Beacon and motion alarm alert others in the area that the unit is in use. Scissor arms are clearly labelled with warning decals due to the potential crushing hazard associated with scissor type plants. Correct maintenance and operating procedures and safety instructions are placed in the manual.	
3	Crushing, collision/striking.	Underneath platform when platform is being lowered.		Beacon and motion alarm alert others in the area that the unit is in use. A permanently fixed safety prop is provided for securing scissor arms during maintenance. Scissor arms are clearly labelled with warning decals due to the potential crushing hazard associated with scissor type plants. Correct maintenance and operating procedures and safety instructions are placed in the manual.	
4	Crushing, striking.	Objects falling from platform.		Components are design to withstand vibration, and are tested in harsh conditions in excess of normal use. Kickboard around bottom of platform to avoid objects falling. Section 1.3 of operator's manual (under the heading "Crushing and Collisions") says to warn personnel to keep clear of area beneath platform and to erect barricades if necessary. Section 1.3 also says that head gear is to be worn by ground personnel.	
5	Crushing, striking.	Sudden or unintended movements.		Striking due to sudden platform movements when driving is restricted with speed limiting limit switches. Braking and an enable button provided to prevent inadvertent movement of plant.	
6	Crushing.	Machine falling of truck during transport.		Provision is provided for both lifting and tie down points. Correct transport procedures in manual.	
7	Crushing.	Lifting machine incorrectly.		Designated lifting points are indicated by decals. Correct lifting procedures in manual.	
8	Shearing, entanglement.	Between scissor arms		Scissor arms are spaced apart greater than finger width which reduces pinch points. Beacon and motion alarm alert others in the area that the unit is in use. Crushing hazard decals are clearly displayed on the machine. Warnings are placed in manual to prevent entanglement.	
9	Entanglement, friction, cutting.	Engine components.		Operators are not subject to friction as there are no high speed exposed components. Engine components are enclosed under covers. Fan blades shrouded. Warning decals in place. Maintenance to be carried out by qualified personnel.	
10	Entanglement, friction, cutting.	Maintenance.		Guards are provided in accordance with plant code requirements for guarding. Guarding provided is a fixed permanent nature and can only be removed with tools. Correct maintenance procedures placed in the service manual.	
11	Friction	Mechanical Failure		Mechanical failure due to friction is reduced with self lubricating bushes and wear pads. Friction points have a grease nipple. Locations of lubrication points are shown on a chart in the manual. Also, a lubrication schedule is provided along with grease types to be used.	
12	Cutting, stabbing, puncturing.	General operation.		Controls and other contact surfaces have no sharp edges. Controls are ergonomically designed. The platform entrance has a non-slip step and foam rubber padding over the top of the entry bar where head contact may occur.	

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO		CONTROL MEASURES TO REDUCE RISK	
13	Falling.	General operation.		Interlocks are provided to ensure against inadvertent operation by user when in a hazardous situation. An enable button must be pressed before machine operation. Operators are protected from falling from platform with a solid peripheral rail around entire platform. The access door opens inwards and self latches as per AS1418.10. A red emergency stop button is positioned at top and ground controls.	
14	Slipping, tripping.	Slipping or tripping from within platform		Section 1.2 of Operator's manual says to keep platform floor free of debris, mud, oil, grease and other slippery substances. Interlocks in place to prevent inadvertent movements. An enable button must be pressed before operation. Solid handrail to hold on to while operating the platform controls.	
15	Excessive effort.	General operation.		Controls are designed to operate with one hand and are either of joystick, toggle or button type. Non-assisted controls are minimized using electrical actuation. Where controls are mechanical in nature operating effort is reduced as far as practicable. Controls return to neutral upon release and movement will only occur when physically actuated.	
16	Excessive effort.	Maintenance.		Components which require regular maintenance such as filters are placed in an easily accessed area. These plants feature hinged trays which rotate batteries, motor, valve bank etc, away from the chassis for easy access.	
17	Operating stress.	General operation.		Control panels use pictures for functions, and switches, which control 'direction' operate in that direction. Plants are field tested in IPD process for controllability and ease of use. Handrails are provided around control station for support during motion. Warning decals are used to warn of incorrect operating procedures.	
18	Lighting.	General operation.		Positional spotlights are available to fit to the platform rail at waist height if required.	
19	High Temp Components.	Burns from coming in to contact with components.		High temperature components such as the engine and pumps are positioned within chassis out of arms reach. Potential contact points within covers are covered with insulating sleeving to prevent burns on contact. These hazards are related to incorrect or lack of maintenance. Correct inspection and maintenance in accordance with AS2550.10 is required.	
20	High Pressure Components.	High pressure fluid jets resulting puncturing the skin or eyes.		High pressure hydraulic hoses are secured together with fasteners and in potential failure areas (tight radius bends) are covered in spiral wrap. Hydraulic hoses used have a bursting pressure well over the working pressure. Instructions regarding relieving the operating pressure are contained in the service manual. Maintenance to be carried out by qualified personnel. Relief valves are used to prevent over pressurizing the hydraulic system. Correct pressures listed in the service manual.	
21	Suffocation.	Inhalation of exhaust gases.		Electrical plant i.e. no exhaust gas generated	
22	Electrical.	Electric shock from the electrical system.		System voltage is below 32 V AC. Those units fitted with 240 V AC outlets have an earth leakage circuit breaker and wiring is in accordance to AS3000 as applicable. Cables insulated & secured to plant. Decal warning of insulation protection and electrical hazard as per AS1418.10-1.15(j)/(m) is placed on the plant. Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10.	
23	Electrical.	Loose wire shorts.		Connectors used are either insulated crimp lugs, locking plastic plugs, or permanent type clamps. Wiring is protected against rubbing in exposed areas with flexible sheathing. Plants are fitted with the JLG "Smart System" which uses malfunction/error signals to assist in fault finding. Codes are placed in the manual.	

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO		CONTROL MEASURES TO REDUCE RISK	
24	Electrical.	Working too close to power lines.		Some insulation of platform is offered as the platform is isolated from scissor arms through wear pads. However this is not a control measure. Warning decals are placed on the machine and are marked Non-insulating. Operator's manual states that the machine is not insulated. Safe operating procedures and minimum approach distances are placed in the manual.	
25	Electrical.	Electromagnetic interference.		Design is sufficient for normal use. Plants are fitted with shielding for special applications.	
26	Electrical.	Water bridging.		Wiring looms of control boxes are covered with water resistant covers. Looms are clamped together with ties to prevent vibration damage. Machines are tested for water damage in the IPD (Internal Product Development) process. Electrical components are prevented from corroding with silicon type paste.	
27	Electrical	Pump or motor failure		In the advent of electrical or mechanical failure, a manual lowering system is installed on the machine. Ground controls are recessed to prevent damage from inadvertently hitting objects while driving. These plants have malfunction signals to assist in fault finding. Codes are placed in the manual.	
28	Electrical	Battery charging		The plant incorporates a battery charger which has a saturation circuit which limits current when batteries reach full charge which reduces gas (hydrogen) build-up. Warning decals are placed on the machine to instruct charging of batteries to be done in a well ventilated area, away from spark. Safe charging procedures are placed in the manual.	
29	Stability.	Overloading the platform.		Maximum safe working load and number of people is clearly marked on the machine.	
30	Stability.	Excessive manual side forces.		Maximum allowable manual side force marked on machine. Designed to meet AS 1418.10.	
31	Stability.	Slope, side force		Interlocks or tilt switches prevent plant operation on excessive slope or without pot hole protection engaged. Counterweight is added to Australian units, above ANSI requirements to ensure unit is stable. A permanent type specification plate is permanently attached to the plant which shows SWL, max slope, max side force and wind speed etc. Manual states that the machine is not to be driven and the platform must not be elevated on sloping, uneven or soft ground. Warning decals are placed on machine, and safe operating procedures are placed in the manual.	
32	Stability	Travelling hazards		Interlocks or tilt switches prevent plant operation on excessive slope. Braking is designed to hold the unit on its maximum rated gradeability. A pot hole protection system is used to prevent instability on uneven ground, and greatly reduces the hazards associated with overturning. Machine is tested for dynamic stability in various conditions as per AS1418.10 requirement. Warning decals are placed on machine, and safe operation and transportation procedures are placed in the manual. A permanent type specification plate is stamped with machine design limits.	
33	Stability.	Tyre punctures.		Tyres are foam-filled.	
34	Stability.	Driving too fast when elevated.		Control system limits the travel speed when elevated.	
35	Stability.	Machine driven into obstacle.		Machine meets AS 1418.10 kerb test requirements.	

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO		CONTROL MEASURES TO REDUCE RISK	
36	Stability.	Other dynamic effects.		Dynamic load factors included in calculations and test loads. Manual says machine must not be used as a crane (which could produce swinging loads). Braking is designed to hold the unit on its maximum rated gradeability.	
37	Stability.	Control valve or interlock failure.		Interlocks are self-monitoring i.e. they are normally off/open so that in the event of malfunction motion is prevented. Holding valves are installed to prevent decent due to hydraulic failure. A manual mechanically actuated emergency descent is installed for emergency retrieval. Inspection and maintenance procedures, and daily inspection list are placed in the manual	
38	Hydraulic failure.	Excessive pressure build-up.		Relief valves are used to prevent over pressurizing the hydraulic system. Holding valves prevent unsafe descent in the advent of failure. Correct pressures listed in the service manual. Hydraulic hoses used have a bursting pressure well in excess of the working pressure. Inspection and maintenance procedures are placed in the manuals.	
39	Hydraulic failure.	Check or relief valve failure.		A manual descent valve is installed to allow emergency retrieval in the advent of check or relief valve failure. Inspection and maintenance procedures are placed in the manuals.	
40	Hydraulic failure	Adjusting equipment		Test points are provided for checking of pressure settings e.g. drive and lift relief. Adjustment points require tools to change. Correct adjusting procedures are placed in the manual. Hydraulic (and other) specifications are listed to enable adjustment.	
41	Structural failure.	Platform overload.		Rigorous stress analysis plus IPD process is used to ensure structural soundness. Design calculations reviewed by local independent engineer. Overload tested at 1.25 x SWL. Maximum safe working load is clearly marked on the machine and in the manual.	
42	Structural failure.	Fatigue.		The plant has been cyclic tested beyond its rated design life cycle against fatigue. Maintenance schedule provided in the manuals. Annual inspections are required as stated in the manual.	
43	Structural failure.	Wear and corrosion.		Corrosive surfaces are painted, components subject to wear have provisions to minimize wear by using sacrificial components or lubrication e.g. scissor rails use wear pads, pins are self-lubricating. Lubrication points and a schedule for maintenance are provided in the manual.	
44	Structural failure.	General overload.		A relief valve is used to prevent excessive loads being lifted by the platform. Tools are required to alter pressure settings. Test points are provided for checking of pressures. Warning decals on machine show safe working loads. Safe operating procedures are placed in manual.	
45	Noise.	General operation.		The electric drive motors are very quiet and are not considered to pose noise problems. Where noise is considered excessive, level testing is done to AS1055.2/AS1269.	
46	Various	Decal removal.		Decals have permanent type marking & weatherproof backing. Specification plate is stamped for longevity. Recommended inspections require that decals are checked for readability and in place. Safety warnings are in manual.	
47	Various	Unintended Use		Only one set of controls may be used at one time. Ground controls are recessed to prevent inadvertent engagement by hitting an object. Plants have a removable key switch which prevents operation by unintended personnel. A clearly visible emergency stop button is positioned at top and bottom controls to stop unintended movement. Correct operating procedures are placed in the manual. JLG conducts operator service training courses to all customers.	

TABLE 4: ES-Family PIPE RACK OPTION RISK ASSESSMENT AND CONTROL MEASURES

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO		CONTROL MEASURES TO REDUCE RISK	
48	Crushing, striking	General operation		Straps are provided to tie down the load. The pipe racks lock into place when they are swung out for use, preventing inadvertent movement. There are no sharp edges on any of the pipe rack components. All pipe rack components are operated by hand, there are no powered components. Safe operating procedures are placed in the manual. The manual states that the pipe racks are to be returned to the stowed position when not in use.	
49	Ergonomic, slipping, ripping, falling	General operation		The pipe racks are simple in design and easy to use. There are no sharp edges on the pipe rack components. When installed, the racks are at approximately waist height. Safe operating procedures are placed in the manual.	
50	Electrical	Working too close to power lines		The pipe racks installation permits some over hanging load, but this is limited by the capacity decal to at most 2.15m. The capacity decal also restricts the use of the pipe racks to zero-wind (indoor) conditions. Warning decals are placed on the machine and are marked non-insulating. Operator's manual states that the machine is not insulated.	
51	Stability	General operation		The machine is de-rated to indoor use only with this option. The capacity decal states the maximum allowable pipe weight, diameter and length. It also states that the load is positioned so that any overhang is distributed evenly between the front and back of the machine and that the extension deck must be retracted when using this option. Designed to meet the stability requirements of AS1418.10. The manual states that this option must only be fitted to specified models. It also says that if any other material handling accessories are installed on the machine, only one may carry load at any one time. The manual refers the operator to the revised machine ratings shown on the capacity decal.	
52	Structural failure	General overload, fatigue		All JLG options undergo stress analysis and rigorous testing before being place into service. The pipe racks are subject to only relatively light loads. The inspection procedure in the manual says to check for cracked welds, torn or frayed tie-down straps, loose fasteners and any general damage.	
53	Occupational hazards	General operation		The design and operation of this option is extremely simple. The pipe racks are manually operated so occupational hazards associated with power supplies and control systems are avoided. Clear and simple operating instructions are contained in the manual. Inspection procedures say to check that decals are present and legible, reducing the risk of unintended uses.	

TABLE 5: PANEL CARRIER RISK ASSESSMENT AND CONTROL MEASURES (ES1932)

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
54	Crushing	General operation	No Moving Parts; Panels are secured to carrier/holder; Panel/sheet is carried on the outside of the side rails of the platform; Never in the lead direction of machine's forward/reverse directional drive travel;
55	Ergonomic, slipping, ripping, falling	General operation	The panel carrier is simple in design and easy to use. Locates the panel/sheet on the outer side of the rail, out of the platform & out of the way of any personnel in the platform;
56	Electrical	Working too close to power lines	The panel/sheet size restrictions prevent any real protrusion outside of the platform's physical envelope, as the panel/sheet hugs the side rails; The capacity decal also restricts the use of the panel carrier to zero-wind (indoor) conditions. Warning decals are placed on the machine and are marked non-insulating. Operator's manual states that the machine is not insulated.
57	Stability	General operation	The machine is de-rated to zero-wind (indoor) condition use only with this option. The capacity decal states the maximum allowable sheet material weight, height and length. Designed to meet the stability requirements of AS1418.10. The manual states that if any other material handling accessories are installed on the machine, only one may carry load at any one time. The manual refers the operator to the revised machine ratings shown on the capacity decal.
58	Structural failure	General overload, fatigue	All JLG options undergo stress analysis and rigorous testing before being place into service. The preparation & inspection procedure in the manual says to check for and replace (if necessary), any missing/damaged components & make sure all hardware is properly torqued;
59	Occupational hazards	General operation	The design and operation of this option is extremely simple. The panel carrier is manually operated so occupational hazards associated with power supplies and control systems are avoided. Clear and simple operating instructions are contained in the manual. Inspection procedures say to check that decals are present and legible, reducing the risk of unintended uses.

OTHER SAFETY RELATED INITIATIVES

Please Note: That the risk assessment compiled and attached is prepared in ADDITION to many other activities which have been undertaken by JLG.

These include:

JLG Industries (USA) performs computer simulation/modelling of product and internal design calculations.

Independent design review by an independent engineer to local design requirements is completed in Australia.

Operator and Safety, Illustrated Parts, Service and Maintenance manuals are available from JLG Industries (Australia) for each model.