

RISK & HAZARD MANAGEMENT

JLG Machine Type	E450A	Safe Working Load (kg)	230	Max. Drive Height (m)	13.72	Max. Height (m)	13.72
	E450AJ		230		13.72		13.72
	M450A		230		13.72		13.72
	M450AJ		230		13.72		13.72

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. Risk and Hazard Likelihood** - The probability of a hazard occurring, and the probable consequence associated with that hazard occurring.
- 3. 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.

TABLE 1: RISK & HAZARD LIKELYHOOD

HAZARD	(A) Likelihood of Occurring	(B) Consequence of Occurring	RISK SCORE*
As listed in Table 2	(1) Rare (2) Very Low (3) Low (4) Moderate (5) High (6) Very High	(1) First Aid (2) Casualty (3) Hospitalisation (4) Disabled (5) Fatality (6) Numerous Fatalities	Risk Scores* are found by adding likelihood (A) & consequence (B) of Occurrence together. Risk Scores range from 2-12

* The higher the risk scores the larger the requirement for the hazard to be addressed and guarded against. Please see Table 2 for identification of hazard types checklist.

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 E450A/E450AJ/M450A/M450AJ boom lift elevating work platform.

³ JLG considers that "reducing the risk as far as practicable" to be an undertaking of out duty of care in that we have addressed the potential to exposure to a risk during design and manufacture and have adhered to the required standards during this time. Any identified additional risks raised 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: E450A/E450AJ/M450A/M450AJ RISK ASSESSMENT AND CONTROL MEASURES

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	NEW RISK SCORE
1	Crushing, collision/striking.	Operating unit in an area where obstacles, other people and plant may be present.	3+6	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".	1+5
2	Crushing.	Between Jib and Basket when rotated.	2+3	Beacon and motion alarm alert others in the area that the unit is in use. Decal fitted to jib warning of crushing hazard.	1+3
3	Crushing.	Between Main Boom and Tower Boom/Turntable.	2+3	Beacon and motion alarm alert others in the area that the unit is in use. Decal fitted on turntable warning of crushing hazard.	1+3
4	Crushing, collision/striking.	Underneath basket when basket is being lowered.	2+6	Beacon and motion alarm alert others in the area that the unit is in use. Section 1.3 of operator's manual (under the heading "Crushing and Collision Hazards") says to warn personnel to keep clear of raised platform and to erect barricades if necessary.	1+5
5	Crushing, striking.	Objects falling from platform.	3+6	Kickboard around bottom of platform. 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.	1+5
6	Crushing, striking.	Sudden or unintended movements.	2+6	Function ramping time may be adjusted to suit owner. Braking and a foot switch is provided to prevent inadvertent movement. Emergency stop buttons are in place to halt movement in the case of an emergency. Controls return to neutral when released. Brakes are spring applied (electric over hydraulic release). Only one set of controls are operable at any given time. Ground controls recessed. Optional padding for platform rails also available.	1+6
7	Crushing.	Machine falling of truck during transport.	2+6	Designated tie-down points are indicated by decals. Correct transport procedures in manual.	1+6
8	Crushing.	Lifting machine incorrectly.	3+6	Designated lifting points are indicated by decals. Correct lifting procedures in manual.	1+6
9	Shearing, entanglement.	Between turntable and tower boom.	2+4	Large clearances maintained between turntable and tower boom. Beacon and motion alarm alert others in the area that the unit is in use. Crushing hazard decals are clearly displayed on the machine as well as slew warning decals. Warnings are placed in manual to prevent entanglement.	1+4
10	Shearing, entanglement.	Between turntable and chassis.	2+4	Large clearances maintained between turntable and chassis. Beacon and motion alarm alert others in the area that the unit is in use. Crushing hazard decals are clearly displayed on the machine as well as slew warning decals. Warnings are placed in manual to prevent entanglement.	1+4
11	Entanglement.	In slew bearing gearing	2+4	Slew gear is out of arms reach during normal operation.	1+4
12	Entanglement, friction, cutting.	Engine components (M450A and M450AJ only)	2+4	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.	1+3
13	Entanglement, friction, cutting.	Maintenance.	2+4	Guarding provided is a fixed permanent nature and can only be removed with tools. Correct maintenance procedures placed in the service manual.	1+4
14	Friction	Mechanical Failure	2+3	Drive motors are self lubricating as they are hydraulic, other friction points have a grease nipple. M450 series engine lubrication points are easily accessed (E450 no engine). 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.	1+3

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	NEW RISK SCORE
15	Cutting, stabbing, puncturing.	General operation.	2+2	Controls and other contact surfaces have no sharp edges.	1+2
16	Falling.	General operation.	2+5	Safety Harness attachment points provided for both people in platform. These are marked by decals. Solid peripheral rail around entire platform. Gate as designed is self closing.	1+5
17	Slipping, tripping.	Slipping or tripping from within platform`	3+1	Platform floor is made from mesh steel, aiding grip and preventing water from building up on the floor. Section 1.2 of Operator's manual says to keep platform floor free of debris, mud, oil, grease and other slippery substances. Footswitch in place to prevent inadvertent movements. Solid handrail to hold on to while operating the platform controls.	1+1
18	Excessive effort.	General operation.	2+1	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.	1+1
19	Excessive effort.	Maintenance.	3+2	Components which require regular maintenance such as filters are placed in an easily accessed area. M450 series has a removable engine cover which enables easy access to the engine.	1+2
20	Operating stress.	General operation.	2+1	Control panels use pictures for functions, and switches, which control 'direction', operate in that direction. Plants are field tested 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.	1+1
21	Lighting.	General operation.	2+1	Positional spotlights are available to fit to the platform if required.	1+1
22	High Temp Components.	Burns from coming in to contact with components.	2+2	High temperature components such as the engine and pumps are positioned within turntable. Exhaust tubing passing out through the turntable cover is designed not to get hot using a loose fitting tube. Potential contact points within covers are covered with insulating sleeving to prevent burns on contact.	1+1
23	High Pressure Components.	High pressure fluid jets resulting puncturing the skin or eyes.	2+3	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.	1+3
24	Suffocation.	Inhalation of exhaust gases.	3+5	Exhaust gas is directed away from the operator. The size of machine prevents operation in confined spaces, therefore exhaust gas inhalation is not considered to pose a problem. On M450 series the generator can be disabled by the operator. No exhaust gas for E450 series.	1+4
25	Electrical.	Electric shock from the electrical system.	2+5	System voltage is 48 volts. 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. Major current carrying cables are marked red for positive, and black for negative. These cables have protective rubber boots over connection points to prevent contact shorting during maintenance.	1+5
26	Electrical.	Loose wire shorts.	2+1	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.	1+1
27	Electrical.	Working too close to power lines.	3+5	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.	1+5

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	NEW RISK SCORE
28	Electrical.	Electromagnetic interference.	2+1	Design is sufficient for normal use. Testing is completed per EN50081-2 Class B and EN50082-2 section 1.1,1.2 and 1.4 per method IEC 801-2	1+1
29	Electrical.	Water bridging.	2+1	Wiring looms of control boxes are covered with water resistant covers. Control cards for functions and flow control are encased in epoxy resin to prevent water damage. Machines are tested for water damage and pressure washing in the IPD (internal product development) process.	1+1
30	Electrical	Pump or motor failure	3+1	In the advent of electrical or mechanical failure a manual lowering system is installed on the machine. Holding valves on cylinders to prevent inadvertent movement. Also, an electrical auxiliary power system is available for movement.	1+1
31	Electrical	Battery charging	2+1	The battery charger senses the charge level to prevent over charging of the battery. Decals with charging instructions are placed on the machine.	1+1
32	Stability.	Overloading the platform.	3+6	Maximum safe working load and number of people is clearly marked on the machine.	1+6
33	Stability.	Excessive manual side forces.	3+6	Maximum allowable manual side force marked on machine. Designed to meet AS 1418.10.	1+6
34	Stability.	Uneven, soft or sloping ground.	3+6	Tilt switch provides an audible and visual alarm when above elevation on a slope exceeding the rated incline, and function speeds are reduced to creep speed. Manual states that the machine is not to be driven and the platform must not be elevated on sloping, uneven or soft ground. Decals stating the maximum load imposed by the tyres on the ground are in place. Brakes designed to hold machine on maximum gradeability.	1+6
35	Stability.	Tyre punctures.	2+6	Tyres are foam-filled or solid.	1+6
36	Stability.	Driving too fast when elevated.	2+6	Control system limits the travel speed when elevated.	1+6
37	Stability.	Machine driven into obstacle.	3+6	Machine meets AS 1418.10 kerb test requirements.	1+6
38	Stability.	Other dynamic effects.	2+6	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.	1+6
39	Stability.	Control valve or interlock failure.	2+6	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. Limiting and cut-out switches are to be check as part of the pre-start function check.	1+6
40	Hydraulic failure.	Excessive pressure build-up.	2+5	Relief valves are used to prevent over pressurizing the hydraulic system. Correct pressures listed in the service manual. 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 in excess of the working pressure. Maintenance schedule provided in the manuals.	1+5
41	Hydraulic failure.	Pump or motor failure.	2+1	Holding valves fitted to all cylinders so boom will not collapse. Manual descent valves (manual lowering system) installed to allow emergency retrieval in the advent of failure. These plants have malfunction signals to assist in fault finding. Codes are placed in the manual. Maintenance schedule provided in the manuals.	1+1

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	NEW RISK SCORE
42	Structural failure.	Platform overload.	2+6	Rigorous stress analysis used to ensure structural soundness. Design calculations independently reviewed. Overload tested at 1.25 x SWL. Maximum safe working load is clearly marked on the machine and in the manual.	1+6
43	Structural failure.	Fatigue.	2+6	Testing and analysis carried out to ensure minimum design life is met. Maintenance schedule provided in the manuals. Annual inspections are required as stated in the manual.	1+6
44	Structural failure.	Wear and corrosion.	3+6	Corrosive surfaces are painted, components subject to wear have provisions to minimize wear by using sacrificial components or lubrication e.g. boom sections use wear pads along telescoping sections, pins use self lubricating bushes. Components which are not self-lubricating have grease nipples provided. Maintenance schedule provided in the manuals.	1+6
45	Structural failure.	General overload.	2+6	Relief valves limit the maximum load that can be lifted. Tools are required to alter pressure settings. Test points are provided for checking of pressures. Warning decals on machine show safe working loads.	1+6
46	Noise.	General operation.	4+4	M450 series motor uses baffled mufflers and is within acceptable sound limits. E450 series has electric motors. Where noise is considered excessive, level testing is done to AS1055.2/AS1269.	1+4
47	Various	Decal removal.	4+6	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. Replacement decals are available for purchase.	1+6
48	Various	Unintended Use	3+4	Only one set of controls is operable at any given time. Ground controls are recessed to prevent inadvertent engagement by hitting an object. Enable switches are incorporated into the control system. 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.	1+4

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 to ensure the safety of the product.

These include:

- JLG Industries (USA) performs computer simulation/modelling of product and internal design calculations.
- European CE design reviews are completed and independently verified for this model machine.
- Independent design review by an independent engineer to local design requirements is completed in Australia.
- Cycle testing of components to ensure fatigue life is adequate.
- Extensive field testing of prototype units to ensure faults and hazards are identified before manufacture is completed.
- JLG conduct an intensive Product Development Process to fully specify, design, risk assessment and safety test and field prove the design. This process is outlined in our proprietary IPD process - which can be viewed on request.
- JLG Industries (Australia) offer training and maintenance courses to any interested companies. World class Operation, Safety, Illustrated Parts, Service and Maintenance manuals are available from JLG Industries (Australia) for each model.
- JLG Industries (Australia) support industry safety for operations and maintenance (being an EWPA member and an AS1418 & AS2550 Standards Association of Australia committee member).