RISK & HAZARD MANAGEMENT

JLG Machine Type	3509	SafeWorking Load (kg)	1200	Max. Drive Height(m)	9	Max. Height (m)	9
	3513		1000		13		13
	4009		1200		9		9
	4013		1300		13		13

INTRODUCTION/SCOPE

The aim of this report is to conduct an investigation into the hazards[1] and risks involved with the operation, maintenance, servicing, inspection, transportation and storage of the above plants[2]. 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 maximise 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 practicable[3]. Additional measures taken to control risk are also listed. 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 occuring.

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.

NOTE: This assessment is bsed on the design of the unit prior to additional hazard control measures incorporated into the Australian build design.

TABLE 1 : RISK & HAZARD LIKELYHOOD

HAZARD	(A) Likelyhood 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 score the larger the requirement for the hazard to be addressed and guarded against. Please see Table 1 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 510AJ boomlift mobile 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.
B. ERGONOMIC. **SLIPPING.** **TRIPPING.** **FALLING .**	-can anyone be injured due to poorly designed seating or 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 burns. -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 Chanber of Manufacture hazard identification guide, & specifications from the Elevating Work Platform purchasing Specification and Operating Guide by the Electiricity Association NSW - 1996, and pr EN280.

TABLE 3 - HAZARD TYPES (510 SERIES BOOM LIFTS)	RELEVANT CODE* ADDRESSED	RISK SCORE**	DESIGN CONTROL MEASURES (To reduce risk as far as practicable)	ADDITIONAL STEPS TAKEN TO REDUCE RISK
A. CRUSHING, ENTANGLEMENT, CUTTING, STABBING, PUNCTURING, SHEARING, FRICTION, STRIKING.	Design Code BS EN1459:1999-5.6.5-5.6.3-5.4.4 Operational Code 2550.10-9 Plant Code 81/1995-305.		Guards are provided in accordance with plant code requirements for guarding, eg's. ● Motor is enclosed under covers. ● Fan blades have a shroud around their circumference ● Pinch points on boom section are out of arms reach during operation. ● Operators cabin incorporates protective bars to guard against falling objects Guarding is of a fixed permanent nature which can only be removed with tools. Over and above ANSI/SIA A92.5 a motion alarm is fitted to Australian units to warn of any movement.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10. The manual provided with the plant is in accordance with AS1418.10-1.4. Warning decals are placed on the plant, and safe operating procedures are placed in the manual.
-Entanglement		1+3	Design of plant ensures operator is protected by the cabin on all sides therefore free from areas of antanglement.	Crushing hazard decals are clearly displayed on the machine. Warnings are placed in manual to prevent entanglement.
-Crushing, shearing		1+3	Motion alarms are fitted to plant to warn of movement.	The boom is clearly labelled with warning decals due to the potential crushing hazard associated with boom type plants. Correct maintenance and operating procedures and safety instructions are placed in the manual.
-Friction		N/A, Likelihood <<1	Operators are not subject to friction as there are no high speed exposed components. Mechanical failure due to friction is reduced with self lubricating bushes & wear pads. Drive motors are self lubricating as they are hydraulic, other 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 oil/grease types to be used.

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Codes of practice used at time of publication are the Australian OHS Plant Code No.81/1995.

** See Table 1 for Risk Ratings

TABLE 3 - HAZARD TYPES (510-SERIES BOOM LIFTS)	RELEVANT CODE* ADDRESSED	RISK SCORE**	DESIGN CONTROL MEASURES (To reduce risk as far as practicable)	ADDITIONAL STEPS TAKEN TO REDUCE RISK
-Striking		1+1 (operator) 1+3 (pedestrian)	Striking due to sudden machine movements when driving is restricted with smooth and accurate control of steering and braking systems. . Braking is achieved through the use of closed loop hydraulics and a manual park brake lever. Operator location provides good visual access to extremities of plant.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10. The manual provided with the plant is in accordance with AS1418.10-1.4. Warning decals are placed on the plant, and safe operating procedures are placed in the manual
-Cutting, stabbing, puncturing		1+1	Contact surfaces such as cabin grab rails and latches at entry points have no sharp edges. Operator controls and seating are ergonomically designed. A seat belt is provided to ensure the operator remains in sync with the movements of the plant	As above.
B. ERGONOMIC, SLIPPING, RIPPING, FALLING	Design Code BS EN1459:1999-5.6.2-5.6.1	1+1 Risk applies to falls within platform of while entering or exiting.	Interlocks are provided to ensure against inadvertent operation by user when in a hazardous situation. Cabin door is self latching upon closure. Sprung seating and seat belt ensures operator remains at controls during operation. Grab rails and non slip step provide safe entry and exit to control station	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10
-Seating		0	Fully adjustable seating provides a comfortable envireonment for the operator	The additional security of a seat belt is provided for the operator. Safe operating procedures and limitations are provided at the control station and in the operators manual.
-Excessive effort, bad posture	Design Code BS EN1459:1999-3.21-5.6.1	1+1	Controls are multi-funtional in operation, which reduces hand movements for the operator and aids in reducing fatigue.Controls are designed to operate with one hand and are either of joystick, toggle or button type. Steering is power assisted. Non-assisted controls are minimised using electrical actuation. Where controls are mechanical in nature operating effort is reduced as far as practicable. Controls return to neutrol upon release and movement will only occur when physically actuated.	Safe operating procedures are placed in the manual.

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-Operating stress		1+1	Control panels use illustrations for functions, and switches, which control operation in that direction. Plants are field tested in IPD*** process for controlability and ease of use. A seat belt is provided for additional support during motion.	Warning decals in conjunction with visual and audible indicators are used to warn of incorrect operating procedures.
-Lighting		1+1	Headlights are provided to illuminate the work area. A tail light assembly provides a visual indication of stopping and turning. Turn indicators are also provided at the front of the machine. All cabin controls are illuminated.	Warning decals and operators manuals provide cautions for unusual operating conditions
C. HIGH TEMP OR PRESSURE FIRE/EXPLOSION	Design Code BS EN1459:1999-5.6.4 Maintenance Code AS2550.10-10	1+2	High temperature components (motor and pump)are positioned within frame and are protected by covers. Exhaust system is out of arms reach, even when engine cover is raised. High pressure hydraulic hoses are secured together with fasteners and in potential failure areas (tight radius bends) are covered in spiral wrap.	These hazards are related to incorrect and or lack of maintenance. Correct inspection and maintenance procedures are placed in the manual. Regular maintenance in accordance with AS2550.10 is required.
-high pressure fluid jets	Design Code AS3791	1+2	Hydraulic hoses used have a bursting pressure of three times the working pressure.	Inspection and maintenance procedures (including warnings) are placed in manual.
-high temperatures	Design Code BS EN1459:1999-5.6.4	1+1	Hot surfaces are positioned within frame covers.	Operating & maintenance procedures are placed in manual.
D. SUFFOCATION / DROWNING	N/A	0	Exhaust gas is directed away from the operator. The size of plant prevents operation in confined spaces, therefore exhaust gas inhalation is not considered to pose a problem.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
E. ELECTRICAL	Design Code AS3000		This TMH is not fitted with high voltage (ie above 32V a.c).	A 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 AS2550.10-10.
-Accidental electrical shock		1+1	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 maintenence	Regular inspections to AS2550.10. Maintenance procedures are placed in the manual maintenance should be carried out by trained personnel.

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** See Table 1 for Risk Ratings.

*** IPD is a internal JLG process used in research and development of new products. This process includes exhaustive testing and evaluation of new machines by engineers, safety experts and operators.

TABLE 3 - HAZARD TYPES (510-SERIES BOOM LIFTS)	RELEVANT CODE* ADDRESSED	RISK SCORE**	DESIGN CONTROL MEASURES (To reduce risk as far as practicable)	ADDITIONAL STEPS TAKEN TO REDUCE RISK
-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.	Plants use a diagnostic type control system which warns of any abnormalities within the control system (which include high temperature, low oil, safety alerts etc) fault codes are explained in the manual.
-Working too close to power lines	Design Code BS EN1459:1999 Operational Code AS2550.10-9.3	3+3	Plant is clearly marked with electrical warning decals to reduce the risk.	Warning decals are placed on the machine and the machine is marked non-insulating. Safe operating procedures and allowable distance to power lines are placed in the manual.
-Electromagnetic interference	Design Code AS3000	1+1	Design is sufficient for normal use.	Plants can be fitted with shielding for special applications.
-Water bridging		2+1	Wiring looms of control boxes are covered with water resistant covers. Looms are clamped together with ties to prevent vibration damage. Control cards are encased in epoxy resin to prevent water damage. Plant is tested for water damage in the IPD** process. Electrical connections are prevented from corroding with a dialectic silicone grease. Sensitive control systems are located within operators cab for additional protection.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10. **NOTE:** Manuals have weatherproof storage containers.
-Pump or motor failure	Design Codes BS EN1459:1999-5.5.3.3	3+1	Hydralic cylinders are equipped with load holding valves and will remain locked in the event of electrical or mechanical failure	These plants have malfunction signals to assist in fault finding. Codes are explained in the manual.
F. STABILITY	Design Code BS EN1459:1999 – 5.7		The plant is designed to meet BS EN1459:1999-5.7 for stability. In and out of service braking is manually applied.	The plant is tested in accordance with BS EN1459:1999-5.7 for stability requirements. Upon commisioning of a new machine the customer is provided with a short operator training session which reduces the chance of the machine being put in an unstable position.
-Outrigger failure	Design Code BS EN1459:1999	0	The outriggers are not required for stability and are only optional. Relief valves are used to prevent over pressurizing the hydraulic system. Holding valves prevent instability in the advent of failure. Interlocks are in place to prevent cylinder retraction while the plant is elevated.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.

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-Control valve or interlock failure	Design Code BS EN1459:1999-5.5.3.1	1+3	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.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10. A daily inspection list is included in the manual which details checking of manual descent. The manuals provided with the plant are in accordance with AS1418.10-1.4.
-Setup hazards (eg. slope, side force)	Operational Code AS2550.1 Design Code BS EN1459:1999 Design Code As1418.10-1.15	2+4	Interlocks or tilt switches provide an audible and visual alarm when plant is put in a dangerous situation. Function cutouts become active during instability or overload. The ability to level the chassis is provided in order to correct potentially unstable conditions.	A permanent type specification plate is permanently attached to the plant which shows S.W.L , max slope, max side force and wind speed etc. Warning decals are placed on machine, and safe operating procedures are placed in the manual
-Travelling hazards (eg. rough surface, dynamic loading.)	Design Code BS EN1459:1999 Operational Code AS2550.10-9.1/2/3	2+4	Audible and visual alarms warn the operator when driven onto excessive slope. Travel speed is also limited when elevated. Braking is designed to hold the unit on its maximum rated gradeability.	Warning decals are placed on plant, and safe operation and transportation procedures placed in the manual. The plant is tested for braking on its max gradeability and a kerb test performed. A permanent type specification plate is stamped with machine design limits.
G. HYDRAULIC FAILURE	Design Code BS EN1459:1999-5.5.3.1-5.5.3.2		Relief valves are used to prevent over pressurising the hydraulic system. Holding valves prevent unsafe descent in the event of control or relief valve failure.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10. The manuals provided with the plant are in accordance with AS1418.10-1.4.
-check or relief valve failure		1+2	Relief valves are used to prevent over pressurising the hydraulic system. Holding valves prevent unsafe descent in the event of control or relief valve failure.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10. The manuals provided with the plant are in accordance with AS1418.10-1.4.
-general failure		1+2	As above	
H. STRUCTURAL FAILURE	Design Code BS EN1459:1999		Rigourous stress analysis plus IPD process is used to ensure structural soundness. Full rated life cycle testing is carried out before introduction to the workplace.	Design calculations have been reviewed by a local independant engineer. Also the plant has been overload tested at 1.25 times the S.W.L. required by AS1418.10.

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-component failure due to fatigue	Design Code BS EN1459:1999-5.5.1-6	1+4	The plant has been cyclic tested beyond its rated design life cycle against fatigue.	Regular inspection in accordance with AS2550.10. Annual inspections are required as stated in manual. A full 10 year rebuild is also required per AS2550.
-component failure due to corrosion or wear		2+4	Corrosive surfaces are painted, components subject to wear have provisions to minimise wear by using sacrificial components or lubrication eg.boom sections use wear pads along telescoping sections, pins use self lubricating bushes. Components which are not self lubricating have grease nipples provided.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10. The manuals provided with the plant are in accordance with AS1418.10-1.4. Lubrication points and a schedule for maintenance are included in the manual to reduce chance of fatigue.
-general overload		1+4	A load moment indicator is used to prevent excessive loads being lifted by the plant. Special access to system is required to alter settings.	Warning decals are placed on machine to show safe working loads. Safe operating procedures are placed in manual - manuals explicitly state that the plant should not be used as a crane. Correct pressure settings are placed in the manual.
I. MAINTENANCE	Design Code BS EN1459:1999 Maintenance Code AS2550.10-10		Historical records are used in design to reduce maintenance (and thus risk) as far as practicable. This is part of the IPD process.	Inspection and maintenance procedures are placed in the manual and are to be in accordance with AS2550.10-10. **NOTE:** Manuals have weatherproof storage containers.
-routine inspection or maintenance		0	Components which require regular maintenance such as filters are placed in an easily accessed area.	Illustrated parts list is provided in manuals for ordering replacement parts. Additional to this, JLG conducts operator and service training courses to all customers. Decals list required daily walk around inspection.
-battery charging	Design Code AS3000	1+1	Battery is automatically charged while engine is running and, as it is only being trickle charged, gas (hydrogen) buildup is not considered a problem.	Service instructions are placed in the manual.

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-adjusting equipment	Design Code BS EN1459:1999	0	Test points are provided for checking of all hydraulic pressure settings. Adjustment points require tools to change.	Correct adjusting procedures are placed in the manual. Hydraulic (and other) specifications are listed to enable adjustment.
-guard removal	Plant code 81/1995-305	1+2	Guards are provided in accordance with plant code requirements for guarding. Guarding is of a fixed permanent nature which can only be removed with tools.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
J. TRANSPORT	Operational Code AS2550.10-9.4	0	Provision is provided for both lifting and tie down points (which double as one) on chassis section.	Decals are placed on the plant to clearly lable lifting/tie down points. Safe transportation procedures are placed in the manual.
-objects falling from plant	Design Code BS EN1459:1999-5.8.1	1+2	Components are designed to withstand vibration, and are tested in harsh conditions in excess of normal use. Locking type hardware is used to reduce the risk of components working loose.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
-unintended use	BS EN1459:1999	2+3	Plants have a removeable key switch which prevents operation by unintended personnel. The control cabin is lockable to prevent unintended access.	Correct operating procedures are placed in the manual. Warning decals are placed on the plant. Safety warnings are also placed in the manual. Additional to this, JLG conducts operator and service training courses to all customers.
-excessive noise	Design Code AS1055.2/AS1269	1+1	Motors use baffled mufflers and are within acceptable sound limits.	Where noise is considered excessive, level testing is done to AS1055.2/AS1269.

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K. OCCUPATIONAL HAZARDS	Operational Code AS2550.10		A single control station ensures the operator has full control at all times.	Safe operating procedures are placed in the manual in agreement with AS2550.10.
-decal or safety sign removal	BS EN1459:1999	3+3	Decals have permanent type marking & weatherproof backing. Specification plate is stamped for longevity.	Safety warnings are placed in manual. Annual inspection requires that decals are checked for readability and are in place.
-energy supply failure	Various	1+2	See previous control measures such as "indicator warning lights"	Emergency procedures are placed in the manual.

Please see over page for other safety related initiatives undertaken on all JLG manufactured machines.

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OTHER SAFETY RELATED INITIATIVES

Please Note : That the risk assesment 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) perform computer simulation/modelling of product and internal design calculatons.

- European CE design reviews are completed and independently verified for this model machine.

- Independant design review by an independant engineer to local design requirements is completed in Australia.

- Cycle testing of components to ensure fatigue life is adequate for a 10 year life is completed.

- 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 and all machines come with a world class Operation, Safety, Service and Maintenance manual.

- JLG Industries (Australia) support industry safety for operations and maintenance (being an EWPA member and an AS1418 & AS2550 Standards Association of Australia committee member).