RISK & HAZARD MANAGEMENT

JLG Machine Type	530LRT	Safe Working Load (kg)	680	Max. Drive Height(m)	9.75	Max. Height (m)	16.2

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 plant[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 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 practicable[3]. 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 1930ES/2032ES/2632ES/2646ES/3246ES 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: 530LRT 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. 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. 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.
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 interlocks are provided to ensure against inadvertent operation by user when in a hazardous situation. A trigger switch must be depressed before joystick functions are activated. Braking provided to prevent inadvertent movement of plant. Braking is achieved through the use of spring applied brakes, hydraulic release.
6	Crushing.	Machine falling of truck during transport.	Provision is made for both lifting and tie down points (which double as one). 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. A permanently fixed safety prop is provided for securing scissor arms during maintenance. 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.

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
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	Operators are not subject to plant to friction as there are no high speed exposed components. Mechanical failure due to friction is reduced with self lubricating bushes and 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 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.
13	Falling.	General 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. Harness attachment points are provided on the platform. 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. Braking and interlocks are in place to prevent inadvertent movements. A trigger switch must be depressed before joystick functions are activated. 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. Nonassisted 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.

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
20	High Pressure Components.	High pressure fluid jets resulting puncturing the skin or eyes.	High pressure hydraulic hoses are secured together with fasteners and routed to prevent chaffing. 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.	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.
22	Electrical.	Electric shock from the electrical system.	System voltage is 12V DC. Those units fitted with 240V AC outlets have an earth leakage circuit breaker and wiring is in accordance to AS3000 as applicable. Cables insulated & secured to plant. These cables have protective rubber boots over connection points to prevent contact shorting during maintenance. 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 routed to prevent chaffing. Plants are fitted with the JLG control system which uses malfunction/error signals to assist in fault finding. Codes are placed in the manual.
24	Electrical.	Working too close to power lines.	Machine is clearly marked with electrical warning deals to reduce the risk. 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. Testing is completed per EN50081-2Class B and EN50082-2 Sections 1.1, 1.2 and 1.4 per method IEC 801-2.
26	Electrical.	Water bridging.	Wiring looms of control boxes are covered with water resistant covers. Machines are tested for water damage in the IPD (internal product development) process. Control cards for functions and flow control are encased in epoxy resin to prevent water damage. Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
27	Electrical	Battery charging	Battery is automatically charged while engine is running and, as it is only being trickle charged, gas (hydrogen) build-up is not considered a problem. Safe charging procedures are placed in the manual.
28	Mechanical	Pump or motor failure	In the advent of pump or motor failure, a manual lowering system is installed on the machine. Holding valves on cylinders to prevent inadvertent movement. These plants have malfunction signals to assist in fault finding. Codes are placed in the manual.
29	Stability.	Overloading the platform.	Platform overload indicator (if equipped) illuminates when the platform becomes overloaded. A circuit breaker will open when there is an overload. Relieve valve is used to prevent excessive loads being lifted by 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.

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
31	Stability.	Slope, side force	Interlocks prevent plant operation on excessive slope. Tilt switch provides an audible and visual alarm when plant is put in an out of level condition. Levelling jacks are provided as an option for machine's self levelling capability. Machine is counterweighted to meet Australian requirements. A permanent type specification plate is permanently attached to the plant which shows SWL, may 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.	Tyre punctures.	Tyres are foam-filled.
33	Stability.	Driving too fast when elevated.	Control system limits the travel speed when elevated.
34	Stability	Travelling hazards	Travel speed is limited when elevated. Interlocks prevent plant operation on excessive slope. Braking is designed to hold the unit on its maximum rated gradeability. 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.
35	Stability.	Machine driven into obstacle.	Machine meets AS 1418.10 kerb test requirements.
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	Levelling jacks failure (optional)	Relieve valves are used to prevent over pressurizing the hydraulic system. Holding valves prevent instability in the advent of failure, and also to prevent cylinder retraction while the plant is elevated.
39	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.
40	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.

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
41	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.
42	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.
43	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.
44	Structural failure.	Wear and corrosion.	Corrosive surfaces are painted, components subject to wear have provisions to minimise 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.
45	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.
46	Noise.	General operation.	Motors have a shroud around them and are not considered to pose noise problems. Where noise is considered excessive, level testing is done to AS1055.2/AS1269.
47	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. Replacement decals are available for purchase.
48	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.
48	Crushing, striking	General operation	Mechanisms are manually operated, slow moving and immediately reversible. Straps are provided to tie down the load. Pins are used to lock rollers. No inadvertent movements of the SkyPositioner itself occur as the accessory is hand operated. Safe operating procedures are placed in the manual.
49	Shearing, friction, entanglement	General operation	Operators are not subject to friction as there are no high speed exposed components. Gaps are maintained between components. Mechanisms are manually operated. Motions are slow and easily reversed.
50	Cutting, stabbing, puncturing	General operation	Contact surfaces such as handles have no sharp edges.

TABLE 4: SKY POSITIONER OPTION RISK ASSESSMENT AND CONTROL MEASURES

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
51	Ergonomic, slipping, ripping, falling	General operation	This accessory reduces the risks associated with manual and overhead handling. It is simple in design and easy to use. Jacks maybe wound in and out without excessive effort when positioning the load. Safe operating procedures are placed in the accessories manual.
52	Electrical	Working too close to power lines	No electrical components. Maximum pipe and duct sizes are indicated in the capacity decal. Warning decals are placed on the machine and are marked non-insulating. Operator's manual states that the machine is not insulated.
53	Stability	General operation	The SkyPositioner installation is centred on the platform. Decal indicates the maximum allowable load length and instructs operators to centre any load being carried between the two jacks. Straps are fitted to tie down loads. The rollers used to position pipe are lockable. The plant is designed to meet the stability requirements AS1418.10.
54	Structural failure	General overload, fatigue	All JLG accessories undergo stress analysis and rigorous testing before being place into service. This option is manually operated and is only likely to be subjected to a low number of cycles. Corrosive surfaces are painted, components subject to wear have provisions to minimise wear by using sacrificial components or lubrication. The inspection procedure in the manual says to check for cracked welds, torn or frayed tie-down straps, loose fasteners and any general damage. Maximum capacity is indicated in the manual.
55	Transport	Objects falling from plant	The SkyPositioner is platform mounted and is removable for transport. Straps are provided to die down the load. Pins are used to lock rollers. Correct transport procedures in manual.
56	Occupational hazards	General operation	The design and operation of the SkyPositioner is simple. The accessory 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.