RISK & HAZARD MANAGEMENT

JLG Machine Type	20AM	Safe Working Load (kg)	160	Max. Drive Height (m)	No Drive	Max. Height (m)	6.22
	25AM		160		No Drive		7.67
	30AM		136		No Drive		9.09
	36AM		136		No Drive		11.05
	41AM		136		No Drive		12.42

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 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.

NOTE: This assessment is based 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) 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 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 an AM Series 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 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 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 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 (AM SERIES)	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 AS1418.10-1.5.11 Operational Code 2550.10-9 Plant Code 81/1995-305.		Guards are provided in accordance with plant code requirements for guarding, eg. on chains and lift ram. Guarding is of a fixed permanent nature that 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. 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		2+1	Guarding provided.	As above.
-Crushing, shearing		1+1	Lifting arms are of mast type and retract along themselves, which reduces the chance of crushing.	As above.
-Friction		1+1	Operators protected from moving parts with guards. Mechanical failure due to friction is prevented with lubrication free pins or chains, and where this can not be achieved lubrication points are provided.	As above.
-Striking		2+1	Machine is pushed not driven, so generally only low speeds are achieved. Machine cannot move once outrigger jacks are in place.	As above. (Also safe pushing procedures are included in the manual.)
-Cutting, stabbing, puncturing		1+1	Contact surfaces such as handles and platform entry points are either ground smooth or protected with rubber surfacing.	As above.

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

** See Table 1 for Risk Ratings

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B. ERGONOMIC, SLIPPING, RIPPING, FALLING	Design Code AS1418.10-1.10,1.5.10		Interlocks are provided to ensure against inadvertent operation by user when in a hazardous situation. Enable button must be pressed before machine operation.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
-Seating	N/A	0	No seating required	
-Excessive effort, bad posture		1+1	Controls are designed to operate with one hand and are either toggle or button type. Non-assisted controls are minimised using electrical actuation. Where controls are mechanical in nature operating effort is reduced as far as practicable.	
-Operating stress		1+1	Control panels use pictures for functions, showing which control operates in that direction. Field tested in IPD*** process.	Warning decals are used to warn of incorrect operating procedures.
-Lighting		1+1	Where lighting is requested, positional spotlights are fixed to mounts on the platform rail at waist height.	
C. HIGH TEMP OR PRESSURE FIRE/EXPLOSION	Design Code AS1418.10-1.14 Maintenance Code AS2550.10-10	2+2	High temperature components are protected with guarding, high pressure hydraulic hose lines are secured with fasteners and in potential damage areas are either hard piped or covered in spiral wrap at flexible joints.	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 3 times the working pressure.	Inspection and maintenance procedures (including warnings) are placed in manual.
-high temperatures	Design Code AS1418.10-1.5.11.3	1+1	Hot surfaces are covered using guards or shrouds.	Operating & maintenance procedures are placed in manual. Warning decals used.
D. SUFFOCATION / DROWNING	N/A	0	Electrical plant i.e. no exhaust gas generated.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.

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*** 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.

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E. ELECTRICAL	Design Code AS3000 AS1418.10-1.7		This EWP is not fitted with high voltage (ie above 32V a.c). Those units fitted with 240 V a.c. outlets have an earth leakage circuit breaker and wiring is in accordance to AS3000 as applicable.	A decal warning of insulation protection/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.	Regular inspections to AS2550.10
-Loose wire shorts		2+1	Connectors used are either insulated crimp lugs or permanent type clamps. Wiring is protected against rubbing in exposed areas with flexible plastic sheathing.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
-Working too close to power lines	Design Code AS1418.10-1.5.13.2(b) Operational Code AS2550.10-9.3	3+3	Plants can be fitted with a moulded plastic basket, which reduces chance of electrical contact.	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 are 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. Machines are tested for water damage in the IPD** process.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
-Servo controller , motor failure		3+1	'Fail-safe' systems are used, in the advent of electrical failure a manual lowering system is installed on the machine.	These plants have malfunction signals to assist in fault finding. Codes are placed in the manual.

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F. STABILITY	Design Code ANSI/SAE A92.3/6/9 AS1418.10-4.2		The plant is designed to meet A92.3-4.7 for stability. In and out of service braking is spring applied (mechanical or electrical release).	The plant is tested in accordance with ANSI/SIA A92.9-4.7, and AS1418.10 for stability requirements.
-Outrigger failure	Design Code AS1418.10-1.5.12	0	The outriggers are manually operated and so can not fail due to hydraulics. Stress calculations and testing to make sure outriggers won't fail under normal operating conditions. Interlock in place to make sure outrigger beam is fully extended.	Operating instructions for setting up outriggers are included in manual.
-Control valve or interlock failure	Design Code AS1418.10-1.8,1.10.4 AS1418.1-8.8	2+4	Interlocks are self-monitoring i.e. they are normally off/open so that in the event of malfunction motion is prevented. Velocity fuses or holding valves are installed to prevent unsafe decent in advent of 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.
-Setup hazards (eg. slope, side force)	Operational Code AS2550.1 Design Code AS1418.10-1.10.2/4 Design Code As1418.10-1.15	3+4	Interlocks or tilt switches prevent plant operation when set-up on excessive slope or without brakes engaged. Counterweight is added to Australian units, above ANSI requirements.	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 AS418.10-1.125.2.3(a) AS1418.10-1.5.10.6 Operational Code AS2550.10-9.1/2/3	4+4	Interlocks to make sure outrigger beams are extended. Machine has no drive and so can not be moved: once outriggers are in place; platform is raised. Outrigger jacks can be used to level the machine. Machine is tested for dynamic stability in various conditions. E.g. side loading and side slope per AS1418.	Warning decals are placed on machine, and safe operation and transportation procedures placed in the manual.

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G. HYDRAULIC FAILURE	Design Code AS1418.10-1.8		Relief valves are used to prevent over pressurising the hydraulic system. Either holding valves or velocity fuses prevent unsafe descent in the advent of 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		3+2	Manual descent valves are installed to allow emergency retrieval in the advent of check 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		3+2	As above	
H. STRUCTURAL FAILURE	Design Code AS1418.10-1.5.4 ANSI/SIA A92.6-4.5 ANSI/SIA A92.3-4.2		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 independent engineer. The machine has been overload tested in accordance with AS1418.10 which calls for 1.25 times the S.W.L.
-component failure due to fatigue	Design Code AS1418.10-1.5.6	2+4	The plant has been cyclic tested beyond its rated design life cycle against fatigue	Regular inspection in accordance with AS2550.10.
-component failure due to corrosion or wear		1+4	Corrosive surfaces are painted, components subject to wear have provisions to minimise wear by using sacrificial components or lubrication eg. sliding boom sections have wear pads, chains are lubricated.	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 overload eg. use as a crane (which is unintended).		3+4	A relief valve is used to prevent excessive loads being lifted by the platform.	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.

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I. MAINTENANCE	Design Code AS1418.10-1.14.3 Maintenance Code AS2550.10-10		Historical records are used in design to reduce maintenance (and thus risk) as far as practicable.	Inspection and maintenance procedures are placed in the manual and are to be in accordance with AS2550.10-10.
-routine inspection or maintenance		0	Components that require regular maintenance such as filters are placed in an easily accessed area.	Illustrated parts list is provide in manuals for ordering replacement parts.
-battery charging	Design Code AS3000	3+3	The plant incorporates a battery charger that has a saturation circuit, which limits current when battery has reached full charge which reduces gas (hydrogen) build up.	Warning decals are placed on the machine which instruct charging of batteries to be done in a well ventilated area, away from spark. Safe charging procedures are placed in the manual.
-adjusting Equipment	Design Code AS1418.10-1.8	0	Test pressure locations are provided for checking hydraulic system pressures. Adjustment points require tools to alter pressure settings.	Correct adjusting procedures are placed in the manual. Hydraulic (and other) specifications are listed to enable adjustment.
-guard removal	Plant code 81/1995-305	3+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		Provision is provided for lifting and tie down points for transportation.	Safe transportation procedures are placed in the manual. Decals are placed on the machine at lifting and or tie down points.
-objects falling from plant		4+2	Components are designed to withstand vibration, and are tested in harsh conditions in excess of normal use. The platform has a kick rail to avoid objects falling.	Inspection and maintenance procedures are placed in the manual and are to be done in accordance with AS2550.10-10.
K. OCCUPATIONAL HAZARDS	Operational Code AS2550.10		Plants with duplicate controls can be over- ridden from ground for emergency retrieval.	Safe operating procedures are placed in the manual in agreement with AS2550.10.
-excessive noise	Design Code AS1055.2/AS1269	0	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.
-decal or safety sign removal	AS1418.10-1.15	4+4	Decals have permanent marking & fastening.	Safety warnings are placed in manual.
-unintended use	AS1418.10-1.5.8	2+3	Control boxes have a removable key switch.	Vandal protection provided upon request.

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 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) perform 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 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 Integrated 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).