RISK & HAZARD MANAGEMENT

JLG Machine Model	Metro-LED	Aggregate Trailer Mass (kg)	1150	Maximum Trailer Towing Speed (km/hr)	80	Maximum Height Mast (m)	9.0

INTRODUCTION/SCOPE

This assessment identifies and lists the hazards[1] and risks associated with the operation, maintenance, servicing, inspection, transportation and storage of the above plant[2]. JLG's primary consideration is to ensure personnel and the workplace is protected against the health and safety risks associated with the use of the plant detailed within this assessment. Possible hazards and risks are assessed with respect to the plant's intended use and to the control measures taken to ensure safe operation. 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]

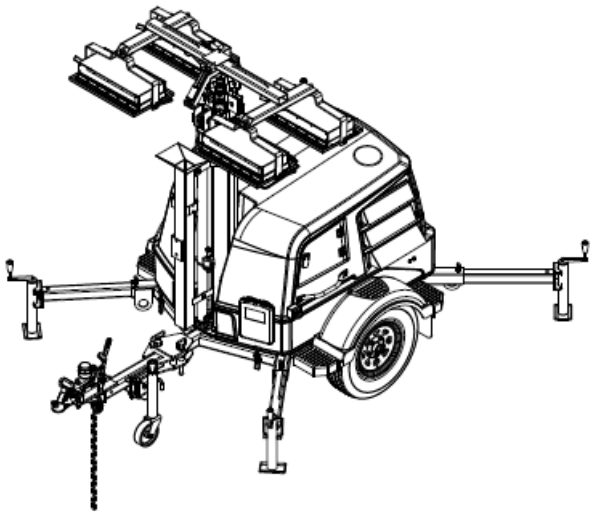
2. Risk and Hazard Likelihood - The probability of a hazard occurring, and the probable consequence associated with that hazard occurring.

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 LIKELIHOOD

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 refer to 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 Metro-LED Lighting Tower.

[3] JLG considers that "reducing the risk as far as practicable" to be an undertaking of our 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 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 short-circuits. -lack of insulation against water contact causing electrical short-circuits. -magnetic interference from workplace corrupting electrical components. -electro-mechanical actuator electro-magnetic interference.
F. STABILITY.	-can machine tip or roll over due to outriggers not fully extended. -outriggers arms fail caused by structural overload, or retract with unintentional sliding movement. -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. -system check/holding valve or relief valve failure. -hose or hydraulic actuator failure - mechanical or fatigue induced. -improper or insufficient maintenance and inspection during machine service life.
H. STRUCTURAL FAILURE.	-mast member failure due to the simultaneous effects of fatigue, corrosion and/or overloading. -trailer frame/mast plinth failure due to the simultaneous effects fatigue, corrosion and/or overloading. -drawbar failure due to simultaneous effects fatigue, corrosion and/or overloading. -pivot/anchor pin, wire-rope, cable or linkage failure/permanent deformation. -mechanical/structural overload- lifting excessive load, loading lighthead in an unintended way. -improper or insufficient maintenance and inspection during machine service life.
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. -adverse behaviour when towed.
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 3: METRO-LED RISK ASSESSMENT AND CONTROL MEASURES

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	REVISED SCORE
A-01	crushing, collision/striking	operating unit in an area where obstacles and other people/plant are present.	3+3	Visually prominent warning decals are affixed to the trailer /unit. Safe operating procedures are placed in the operators' manual.	1+3
A-02	crushing, collision.	machine falling sliding off forklift tynes during transport.	3+6	Designated forklift pockets located at the rear of the machine should be used. Correct forklifting procedures are described within the machine operators' and safety manual.	1+6
A-03	crushing.	lifting machine incorrectly.	4+5	There is a single designated lifting point from which the machine can be suspended. The machine's lifting point is identified by decals. Correct lifting procedure is prescribed within the safety manual.	2+5
A-04	crushing, shearing	mast – telescopic movement	3+3	Crushing hazards have been marked with warning decals. Correct maintenance and operating procedures and safety instructions are placed in the service manual.	1+3
A-05	entanglement, friction, cutting	machine maintenance	2+4	Guarding provided can only be removed with tools. Correct maintenance procedures are prescribed in the service manual.	1+2
A-06	entanglement, friction, cutting	high-speed components	3+3	Components moving at high speeds are enclosed/guarded. External engine drive-belts are guarded and radiator fan is shrouded. Maintenance to be carried out by trained personnel.	1+1
A-07	crushing, striking	sudden or unintended mast or lighthead movement.	3+4	Mast rotation is not powered. An enable button is in place to prevent inadvertent movements of the mast. Correct inspection and maintenance procedures are placed in the service manual.	1+3
A-08	crushing, striking	sudden or unintended trailer movement.	3+4	The lighting tower trailer is not self-propelled. Decals & manual instructs operator to apply the trailer hand brake and to position wheel chocks. The manual states the drawbar mounted jockey wheel is not to be used as an outrigger and details correct mast usage procedure.	1+3
A-09	crushing, shearing	mast retraction	2+4	This mechanical arrangement reduces the chance of crushing. Warning decals are affixed adjacent those machine members subject to relative movement.	1+2
A10	friction	mechanical failure	2+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 and rollers. Engine lubrication points are easily accessible by the lift-up hinged canopy. A lubrication schedule is provided along with oil/grease types to be used.	1+1
A-11	cutting, stabbing, puncturing	general operation	2+2	Contact surfaces such as handles, doors and access covers have no sharp edges.	1+1
B-01	falling	general operation	2+5	Machine operation and scheduled maintenance are performed at ground level and so falling from height is not a cause for concern. An emergency stop button is positioned at the ground controls. Correct inspection and maintenance procedures are placed in the service manual.	1+1
B-02	excessive manual effort	general operation	2+1	Machine controls are operated by panel mounted toggle or push button switches. Non-assisted controls are minimised using electrical actuation. Where controls are mechanical in nature operating effort is reduced as far as practicable.	1+1
B-03	excessive manual effort	general operation	2+2	The jockey wheel fitted to the trailer drawbar reduces the physical effort required to reposition the trailer by manual means.	1+1
B-04	operator fatigue	general operation	2+1	Controls are simple buttons and toggle switches. Functions of controls are clearly marked. Warning decals are used to warn of incorrect operating procedures.	1+1
C-01	high temperature components.	burns from coming in to contact with components.	3+3	High temperature components are positioned away from operator. Exhaust outlet through bottom of trailer. Hot surfaces are covered using guards or shrouds. Maintenance to be carried out by trained personnel deemed competent.	1+2
C-02	high pressure components	high pressure fluid jets can puncture the skin or eyes.	3+4	The hydraulic hoses have bursting pressures well in excess of the working pressure. 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

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	REVISED SCORE
C-03	suffocation	inhalation of gases.	2+1	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.	1+1
E-01	electrical	electric shock from machines electrical system.	2+5	Cables are insulated per wiring code rating requirements & secured to plant. Decal stating maximum voltage within the trailer. Correct inspection and maintenance procedures are placed in the manual. Manuals state that service and testing should only be carried out by trained personnel.	1+3
E-02	electrical	loose wire shorts.	3+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. Correct inspection and maintenance procedures are placed in the manual.	2+1
E-03	electrical	working too close to power lines.	4+6	Warning decals are placed on the machine electrical system components. Warnings in manual and on decal, instruct operators' to contact relevant local authorities. Recommended safe operating procedures and minimum approach distances are placed in the manual.	3+3
E-04	electrical	electromagnetic interference.	1+1	The electrical system design is intrinsically sufficient for normal use.	1+1
E-05	electrical	water bridging.	3+1	The electrical wiring looms tied together to prevent vibration damage.. Correct operating, inspection & maintenance procedures are listed in the the manuals.	2+1
E-06	electrical	pump and motor failure	3+1	Ground controls are in trailer to prevent damage from being hit inadvertently. Correct operating, inspection and maintenance are placed in the manuals.	1+1
F-01	stability.	unit is exposed to high-wind levels.	4+5	Designed to remain stable when subject to the nominated AS1170.2 wind loading. Correct set up procedures and wind rating stated in the operator's manual. Manual states that jockey wheel is not to be used as an outrigger.	1+5
F-02	stability	outrigger failure	4+5	Standard units are fitted with manually operated outriggers and as such are not subject to problems such as hydraulic failure. The jacks are rated to take the required load. Units with optional hydraulic outriggers have holding valves in case of hydraulic failure. Manual states that jockey wheel is not to be used as an outrigger. Decal instructs not to operate functions until the outriggers are down.	1+5
F-03	stability.	uneven, soft or sloping ground.	4+5	Outriggers jacks and a bubble level gauge are provided to set the machine up level. Safe operating procedures are placed in the manuals.	2+5
F-04	stability.	travelling hazards	3+5	Machine is towed to the required site then is stationary while in use. A permanent type specification plate is stamped with trailer weight, tyre specifications, maximum towing speed, etc.	2+4
F-05	stability.	control valve or interlock failure.	3+5	A hydraulic system holding valve prevents uncontrolled decent due to hydraulic system failure. Correct operating, inspection and maintenance procedures are placed in the manuals.	1+5
F-06	stability	towing stability (yaw)	4+5	The trailer mounted lighting tower's tendency to yaw when towed has been assessed by physical testing ISO/TR3888 and calculations per Appendix D of the trailer code NZS 5467. The maximum towing speed of trailer is 80 km/hr. This speed limit is clearly shown on drawbar decals and explicitly stated in the lighting tower operation and safety manual.	1+2
F-07	stability	towing stability (braking)	4+5	The trailer mounted lighting tower remains "stable" when towed with the brakes applied. Assessed by physical testing per requirements of Section 9.6.2 of AS/NZS 5467.	1+2

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	REVISED SCORE
G-01	hydraulic failure.	excessive pressure build-up.	3+5	A relief valve limits excessive hydraulic system pressure. A holding valve prevents unsafe mast descent in the advent of hydraulic system failure. Correct system operating and relief pressures are listed in the service manual. Hydraulic components are tested at pressures well in excess of the system operating pressure. Maintenance procedures are placed in the manuals.	1+5
G-02	hydraulic failure.	pump or engine failure.	3+5	Hydraulic components are tested at pressures well in excess of the system operating pressure. Maintenance schedule provided in the manuals.	2+1
H-01	structural failure	trailer frame and mast overload	4+5	Designed to withstand the nominated AS 1170.2 wind loading. Field tests used to verify structural soundness before introduction to the workplace.	2+5
H-02	structural failure	trailer frame and mast fatigue	4+5	Correct operating, inspection and maintenance procedures are listed in the manuals. Maintenance and inspection to be carried out by trained personnel.	1+5
H-03	structural failure	trailer frame and mast wear and corrosion.	4+5	Surfaces susceptible to corrosion are painted. Components subject to wear have provisions to minimise wear by using sacrificial components or lubrication. Components which are not self-lubricating have grease nipples provided. Correct operating, inspection and maintenance procedures (including a maintenance schedule) are placed in the manuals. Maintenance to be carried out by trained personnel.	2+4
H-04	structural failure	lighting tower mast mechanical overload.	4+5	Hydraulic system pressure relief valve prevent excessive mast loads being lifted. Tools are required to alter pressure settings. Correct relief valve pressure settings are listed in the manual. Safe operating procedures are prescribed in manual. The operators' safety manual explicitly states the mast is not to be used as lifting device.	1+4
I-01	excessive effort	maintenance-hydraulics	2+1	Adjustment points require tools to change. Correct inspection and maintenance procedures are described in the service manual. Hydraulic (and other) specifications are listed to enable adjustment.	1+1
I-02	excessive effort	maintenance-general	2+1	Historical records are used in design to reduce maintenance (and thus risk) as far as practicable. Components which require regular maintenance such as filters are placed in an easily accessed location. Correct inspection and maintenance procedures (including a maintenance schedule) are listed in the service manual. Illustrated parts manual is available for ordering replacement parts.	1+1
I-03	entanglement, friction, cutting	maintenance.	4+4	The guarding provided is fixed by bolting or permanently fixed by welding and can only be removed with tools. Correct maintenance procedures are placed in the service manual.	2+4
I-04	crushing, collision	general operation	3+6	Trailer is road registrable and can be towed by another vehicle. Decals are placed on the plant to clearly label any lifting/tie down points. Safe transportation procedures are placed in the manual.	2+6
J-01	crushing, collision	objects falling from plant	2+4	Components are designed to withstand vibration, and are tested under service conditions. Correct inspection and maintenance procedures (including a maintenance schedule) are placed in the manuals.	1+2
K-01	noise (sound)	general operation	4+4	Motors use baffled mufflers and are within acceptable sound limits. Noise testing per AS 2012.	3+4
K-02	various	decal/label removal.	4+6	Decals have permanent type marking & weatherproof backing. Specification plate is stamped for longevity. Recommended inspections require that decals be checked for readability and are in place. Safety warnings are in manual.	1+6

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	REVISED SCORE
K-03	various	manual lost or illegible.	4+6	A weatherproof container is provided to store and protect the manual. The container is physically attached to the trailer. Replacement copies of manuals are available on request.	1+6
K-04	various	lack of maintenance.	4+5	A maintenance schedule is tabled in the service manual. Recommended spare parts are listed in the illustrated spare parts manual.	1+5
K-05	various	use by unauthorised personnel/persons	4+4	There is one control panel situated behind a lockable access door. A clearly visible emergency stop button must be released to operate the hydraulic controls. Correct operating procedures are placed in the manual. Safety warnings are also listed and defined in the manual. An operational shutdown timer is available.	1+4
K-06	various	machine controls failure	1+2	Correct operating and shut-down procedures are prescribed in the operator's manual.	1+1
K-07	explosion/fire	battery charging	2+4	The 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. Service instructions are placed in the manual.	1+4

TABLE 4: METRO-LED WITH AUTO START OPTION - RISK ASSESSMENT AND CONTROL MEASURES

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	RISK SCORE	CONTROL MEASURES TO REDUCE RISK	REVISED SCORE
A-01	entanglement, friction, cutting	working on mechanical component when machine starts automatically	2+5	Auto Start controls are active only when the trailer canopy (hood) is closed (normally open / held closed limit switch), emergency stop button is off (pulled-out), battery isolator (optional) is switch to the "ON" position and Auto start is set to "ON". Safe operating procedures are placed in the manuals. Correct inspection and maintenance procedures are placed in the service manual. Maintenance to be carried out by trained personnel.	1+3
E-02	electrical	electric shock from electrical system due to auto start.	4+5	Auto Start controls are active only when the trailer canopy is closed (normally open / held closed limit switch), emergency stop button is pulled, battery isolator (optional) is on and Auto start is set to "ON". Safe operating procedures are placed in the manuals.	3