Articulated Boom Risk and Hazard Management

Models	TZ34	Safe Working Load (kg)	200	Maximum Platform Drive Height (m)	NA	Maximum Working Height (m)	12.4
	TZ50		200		NA		17
	Z30/20NRJ		227		8.9		10.9
	Z33/18		200		10		12
	Z34/22		227		10.52		12.52
	Z40/23		227		12.2		14.2
	Z45/25		227		13.7		15.7
	Z51/30		227		15.5		17.5
	Z60/34		227		18.3		20.3
	Z60/37FE		227		18.6		20.6
	Z62/40		227		18.8		20.8
	Z80/60		227		24		26
	Z135/70		272		41.2		43.2
	ZX135/70		272		41.2		43.2

Contents

Introduction/Scope

In accordance with the relevant Occupational Health and Safety Legislation for the region you are working in (reference to state legislation is listed below), this report serves as confirmation that each model type Genie Boom referenced above, has undergone a risk assessment and conforms to the applicable market standard (i.e. AS 1418.10). This risk assessment investigates the potential hazards associated with operation, maintenance, servicing, inspection, transportation and storage of the above referenced plants.

Our aim is to help 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 the use of the plant on any job site and control measures need to be incorporated prior to the plants use to maximise safety. For each identified risk, the designed control measures have been implemented to reduce these risks as far as practicable. Any residual risks and their required control measures, can be found on the plant safety decals and in the operator's, service and safety manuals.

Each model type receives a 'Certificate of Test and Compliance' through a third party consulting firm that confirms the conformity to the applicable standard. Both of these documents can be provided to the purchaser/user at their request.

In accordance with the listed legislation, the information required to be supplied to the purchaser/user of the plant by the designer, manufacturer, supplier and importer can be found in the operator's and service manuals.

The listed legislation provides information for employees, employers, plant installers etc.; regarding providing a safe working environment. To assist in this effort, Genie also provides both operator's and service manuals for their products which provides information regarding residual risks and their control measures. In addition to these manuals there may be industry safe use standards for the products that can also be used to help with identifying potential hazards on the job site (e.g. AS 2550.10).

Hazard Type Checklist

The table below provides a summary of some potential hazards associated with the use of the plant. Genie evaluates each of these potential hazards during the risk assessment process in an effort to select specific control measures, (e.g. designs, guarding, warnings) that will reduce the likelihood that the operator, platform occupants, maintenance personnel or bystanders will be exposed to the hazard.

Many of these hazards can be identified in the relevant States Plant Hazard Guidance document and AS1418.10 Appendix A, which is the governing design standard for these plant.

Table 1
Hazard Type Checklist

CRUSHING, ENTANGLEMENT, CUTTING, SEVERING, STABBING, PUNCTURING, SHEARING, FRICTION, IMPACT, TRAPPING	– Can anyone's hair, clothing, gloves, cleaning apparatus or any other materials become entangled in moving parts, or objects in motion. – Can anyone be crushed due to: ○ material falling from plant ○ uncontrolled motion or unexpected movement of plant ○ the plant tipping or rolling over ○ inadequate slowing or stopping devices of plant to control movement ○ support structure collapse ○ being thrown from or under the plant ○ coming in contact with moving parts of the plant during testing, inspection, operation, maintenance, cleaning or repair ○ being trapped between the plant and materials or fixed structures – Cutting, stabbing & puncturing due to: ○ contact with sharp or flying objects ○ coming in contact with moving parts of the plant during testing, inspection, operation, maintenance, cleaning or repair of the plant ○ 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 work pieces (i.e. failure of the control system)
ERGONOMIC, SLIPPING, TRIPPING, FALLING,	– Can anyone be injured due to: ○ uneven or slippery work surfaces ○ poor housekeeping in the vicinity of or in the plant ○ obstacles being placed in the vicinity of the plant ○ 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 IN THE WORKING AREA ○ lack of failsafe measures against human error or human behaviour

	○ mismatch of plant with natural human limitations ○ unhealthy posture or excessive efforts ○ lack of personal fall protective equipment ○ inadequate design/positioning of controls
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, vapors, liquids, dusts or other substances triggered by the operation of the plant or material handled by the plant.
SUFFOCATION	– Can anyone be suffocated due to lack of oxygen, or atmospheric contamination.

Table 1 Hazard Type Checklist Continued…	
ELECTRICAL	– Can anyone be injured by due to: ○ the plant coming into contact with live conductors ○ plant being too close to high tension power lines ○ overload of electrical circuits ○ damaged or poorly maintained electrical leads and cables ○ damaged electrical switches ○ water near electrical equipment ○ lack of insulation against water contact shorting ○ thermal radiation ○ electrostatic radiation ○ magnetic interference from workplace affecting electrical components
STABILITY	– Can machine tip or roll over due to stabiliser not extending. – Stabilisers failing structurally, mechanically, or retract unintentionally. – Control valve or interlock failure. – Setting up on soft ground, unlevelled or uneven ground, excessive slope. – Driving on rough surfaces, over potholes, hitting fixed objects, excessive side loads, operation in excessive climatic conditions e.g. wind.
HYDRAULIC FAILURE	– Hydraulic system failure. – Check valve or relief valve failure. – Hose or cylinder failure - mechanical or fatigue.
STRUCTURAL FAILURE	– Structural failure due to fatigue, corrosion, or overloading. – Pin, cable or linkage failure. – General overload, lifting excessive load, loading platform/ basket in an unintended way.
MAINTENANCE	– Can anyone be injured: ○ while carrying out routine, preventative or corrective maintenance ○ explosion due to an ignition source near charging battery ○ adjusting equipment for essential components faulty or seized ○ operating a machine that has been damaged or modified ○ operating a malfunctioning machine ○ if the machines guards/covers are missing
TRANSPORT	– Can injury occur due to: ○ machine instability while loading/unloading, transporting ○ plant or objects falling from transport truck
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. – Lack of personal fall protective equipment. – Use of the plant as a crane.

OTHER HAZARDS, EJECTION OF PARTS VIBRATION	– Can injury or ill-health occur from exposure to: ○ chemicals, toxic gases or vapours, fumes, dust, noise, vibration, radiation ○ neurological and cardiovascular disorders from excessive vibration ○ inadequate visibility ○ road traffic ○ inadequate means of access ○ safe use of controls (speed of movement) ○ failure of controls ○ safety signs or decals removed ○ energy supply failure (electrical or mechanical)

Hazard Control Measures

Table 2 provides a summary of potential hazards associated with the plant and the relevant control measures Genie has implemented to minimize those potential hazards to the operator, platform occupants, maintenance personnel and bystanders.

Table 2
Hazard Control Measures

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
1	OCCUPATIONAL HAZARDS	General operation by a trained, or untrained, operator leads to an accident.	• Comply with employer, job site and governmental rules. • Read, understand and follow the instructions in the operators and safety manuals supplied with the plant. • Use good safe work practices in a common-sense way. • Only have trained/certified operators, directed by informed and knowledgeable supervision, running the machine.
2	WORKSITE HAZARDS	Failure to perform a jobsite risk assessment	A complete jobsite risk assessment should be performed prior to using the plant. To assist with this effort, Genie provides operators and service manuals which identifies some of the common residual risks for the plant. Every employer, user and operator should review these residual risks and implement the necessary control measures to avoid them. Users and employers should also research other supplemental information regarding the safe use of the plant, to support this effort (i.e. AS2550.10).
3	STRUCTURAL FAILURE	Failure of any structure	The plants have undergone detailed structural analysis. These calculations take into consideration the machines expected operating configuration, envelope and approved conditions (i.e. slope).
4	STRUCTURAL FAILURE	Failure of any structure	Structural analysis takes into consideration a number of foreseeable forces including gravitational (based on rated capacity), dynamic, wind and manual forces.
5	STRUCTURAL FAILURE	Failure of any structure	Structural analysis is verified by physically testing the structural soundness through both static and dynamic loading.
6	STRUCTURAL FAILURE	Failure of any structure	All calculations and verification, meets or exceeds the required structural safety factors of AS1418.10.
7	STABILITY	Tip-over	All plants have undergone detailed stability analysis. These calculations take into consideration the machines expected operating configuration, envelope and approved operating

			conditions (i.e. slope).
8	STABILITY	Tip-over	Stability analysis takes into consideration a number of foreseeable forces including gravitational (based on rated capacity), dynamic , wind and manual forces.
9	STABILITY	Tip-over	Stability analysis not only evaluates the machines static condition, but also potential effects of dynamic conditions (i.e. braking and depressions).
10	STABILITY	Tip-over	Stability analysis is verified by physically testing the static and dynamic stability of the design.
11	STABILITY	Tip-over	All calculations and verification, meets or exceeds the required stability safety factors of AS1418.10.

Table 2
Hazard Control Measures Continued…

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
12	STABILITY	Plant drives onto terrain that exceeds allowable limits.	All plants are equipped with a chassis inclination device which sounds an alarm when the terrain slope is approaching the allowable limits.
13	STABILITY	Z135 & ZX135 series only – trying to retract extended axles when platform is elevated	Plants equipped with extending axles prevent the boom from being elevated until the axles have been fully extended. The design will not allow the retraction of the extending axles until the boom has been stowed/retracted.
14	STABILITY, HYDRAULIC FAILURE	Z135 & ZX135 series only - Platform elevated and hydraulics fail	Extending axles are protected from unintentionally retracting.
15	STABILITY	Driving too fast for the terrain conditions	When the boom on the plant is elevated or extended, the drive speed is reduced. Proportional drive is provided.
16	STABILITY, COLLISION	Loss of braking while traveling	Brakes on all boom plants automatically engage when the power to them has stopped or failed. Brakes are capable of holding the plant on approved slopes.
17	STABILITY, COLLISION	Plant does not stop quickly enough	The plants stopping distance at maximum speed meets or exceeds the requirements of AS 1418.10. Control positions on the plant are located and designed to allow excellent visibility and to allow slow, deliberate movements to prevent contact with adjacent objects. The plant can be fitted with secondary guarding for overhead protection based on risk assessment of work in tight overhead areas.
18	OCCUPATIONAL HAZARDS	Unauthorised use	All plants are equipped with a key switch to prevent unauthorised use. Additionally only one control panel can be operated at any given time.
19	CRUSHING, ENTANGLEMENT, CUTTING, SEVERING, STABBING, PUNCTURING, SHEARING, IMPACT,	General operation	Guards are provided on the plant to protect persons at control positions, or standing adjacent to the plant at ground level, against thermal or mechanical hazards. Control positions on the plant are located and designed to allow excellent visibility and to allow slow, deliberate movements to prevent contact with adjacent objects. The plant can be fitted with secondary guarding for overhead protection based on risk assessment of work in tight overhead areas.

	HIGH TEMPERATURES,		
20	FIRE/EXPLOSION	General maintenance	The filling points for flammable fluids are positioned to minimise the risk of fire from spillage onto hot parts.
21	HIGH TEMPERATURES	General operation	The engine exhaust is directed away from control positions and from all electrical insulation.
22	CHEMICAL BURN, FIRE/EXPLOSION, EJECTION OF PARTS	General operation	The battery, or batteries, are constrained to prevent unintentional displacement, or ejection of electrolyte, even in an overturning event.

Table 2
Hazard Control Measures Continued…

HAZARD NUMBER	HAZARD TYPE	LOCATION/SCENARIO	CONTROL MEASURES TO REDUCE RISK
23	FIRE/EXPLOSION	General operation	Each battery is positioned and designed such that dangerous accumulations of gases do not occur in places occupied by operators.
24	STABILITY, STRUCTURAL FAILURE	Overloading platform	The plant is equipped with a load-sensing system which protects the plant and operator from reaching a point where the platform can be operated when the platform has been severely overloaded.
25	STABILITY, STRUCTURAL FAILURE	Tip-over	To help avoid overturning of the plant the boom structure for the plant is equipped with both mechanical and non-mechanical limiting devices (i.e. limit switches) to limit the operating envelope.
26	TRAPPING, CUTTING, SEVERING, SHEARING	General operation	Trapping and shearing points between moving parts which are within reach of persons on the work platform or standing adjacent to the plant at ground level are avoided by providing safe clearances in accordance with AS 4024.1801, AS 1802 or AS 1803 or guarding in accordance with AS 4024.1601 as applicable.
27	MAINTENANCE, CRUSHING, SEVERING, SHEARING	General maintenance	When the work platform of a plant needs to be raised for routine servicing purposes, the hydraulic system allows the extending structure to be held in the required position.
28	STABILITY, COLLISION	Plant moves to quickly when platform is elevated	The speeds of the plant, extending/ retracting/ raising/ lowering/ slewing, are reduced and restricted, once the boom is elevated, in accordance with AS1418.10.
29	COLLISION	Unintended platform movement	The plant extending drive system is designed and constructed to prevent any inadvertent movements of the extending structure.
30	HYDRAULIC FAILURE	Overloading the structure and boom extending drive system.	Pressure limiting devices are provided to protect the extending structure and drive system, to prevent structural damage.
31	HYDRAULIC FAILURE	Unintended platform movement	A hydraulic braking system is provided to prevent the platform from unintentionally lowering. When power to the controls stop or fails, this system automatically locks the plants boom and work platform movements, in any position in the working envelope. The system design is protected against inadvertent release.

Product Safety

The information provided in this document is only a small example of the activities which have been undertaken by Genie Industries to ensure the safety of the plants. These include:

- Performing computer simulation/modeling of product and internal design calculations.
- 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 design is finalised.
- Conducting an extensive Product Development Process, on each plant design, which incorporates risk assessment and field testing to prove the plant design is safe to use, by a trained and authorised operator, for its intended purpose.

Occupational Health & Safety Legislation

The below legislation has been used to produce this document.

ACT, NSW, QLD:	Work Health and Safety Act 2011
NT:	Work Health and Safety (National Uniform Legislation) Act 2011
SA, TAS:	Work Health and Safety Act 2012
VIC:	Occupational Health and Safety Act 2004
WA:	Occupational Safety and Health Act 1984