



HAZARD IDENTIFICATION & RISK ASSESSMENT



MANITOU MSI20 / MSI30 / MSI35 / MH25-4

2016-04-14 / revision B

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HAZARD IDENTIFICATION AND RISK ASSESSMENT OF PLANT

Organisation:	MANITOU GROUP / MANITOU AUSTRALIA Pty. Ltd. - 94-96 Euston Road, Alexandria, NSW, 2035 - ABN 42 114 388 591
Plant Make & Model:	MANITOU MSI20 / MSI30 / MSI35 / MH25-4
Risk Assessment Method Used:	SAFETY REVIEW
Ref Documents used:	AS4024.1301 – 2006, NSW WHS Regulation 2011 AS/NZS4360 – 2004 (risk management guidelines) & HB436:2004 (Handbook for AS/NZS4360) AS2359.1 – 2015, AS2359.2 – 2013 and all of the AS2359 group where relevant
Date / Version:	2016-04-14 / revision B

This Hazard Identification and Risk Assessment has been prepared to identify reasonably foreseeable hazards to health and safety arising from an end-user / owner operational point of view, including transport, operation and maintenance of the plant.

It is based on information available at the date of publication. It includes suggestions for supplementary risk control measures that can be implemented to avoid injuries and/or fatalities due to these hazards. These suggestions are not exhaustive and can be completed, adapted by the plant's owner and or any other stakeholder.

Although every attempt has been made to identify reasonably foreseeable circumstances, no guarantee as to the completeness of this assessment is implied or provided. It is the responsibility of the plant owner / end-user to carry-out their own risk assessment adapted to their specific work site, application, environment conditions and regulations. To assist, this document can be used as a base and guideline.

Manitou will not be responsible for the actions or inactions of the Plant Owner, Site Management, the Operator and or Other Personnel. It is also the plant owner's responsibility to maintain and use the plant adequately according to the manual's instructions and current laws and guidelines. The plant owner must ensure the operator is competent and holds all relevant qualifications and or licenses to operate the plant as required by Law and or WorkCover.

The assessment must be reviewed by all stakeholders and revised:

- (a) Having regard to the options and general arrangement of miscellaneous equipment/facilities that may be provided on the plant according to the end users requirements or specification;
- (b) According to the particular circumstances under which the plant is used and maintained;
- (c) As new hazards are identified or as risks are reassessed;
- (d) As new or revised control measures are implemented;
- (e) As and when work procedures are altered.

Any comment on this Risk Assessment, please contact Manitou Australia: info.mau@manitou-group.com

TECHNICAL DATA SHEET

MSI Range

Semi-industrial IC forklifts

Region 2



2500 - 3500 kg / stage 3A

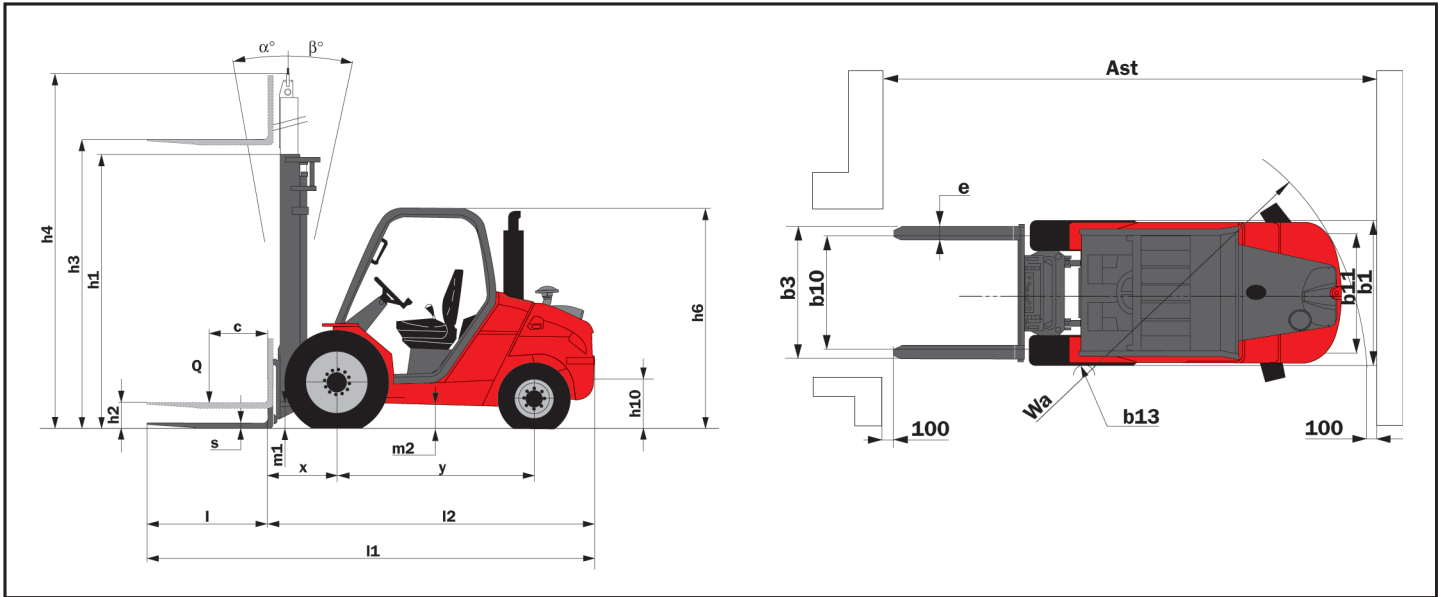
TECHNICAL SPECS

				MANITOU	MANITOU	MANITOU	
				MSI 25T	MSI 30T	MSI 35T	
Specifications	1.1	Manufacturer					
	1.2	Model					
	1.3	Power source			Diesel	Diesel	Diesel
	1.4	Driving position			Seated	Seated	Seated
	1.5	Nominal capacity	Q	t	2,5	3,0	3,5
	1.6	Load - centre of gravity	c	mm	500	500	500
	1.8	Distance from the load-bearing surface to centre of front axle	x	mm	625	630	630
1.9	Wheelbase	y	mm	1800	1800	1800	
Weight	2.1	Operating weight		kg	4070	4704	4845
	2.2	Axle load, with load, front / rear		kg	5695 / 875	6782 / 922	7430 / 915
	2.3	Axle load, without load, front / rear		kg	1630 / 2440	1900 / 2805	1730 / 3115
Tyres, frame	3.1	Tyre equipment: cushion (V), superelastic (SE), pneumatic (L)			L	L	L
	3.2	Size of front wheels			275/70 R22.5	275/70 R22,5	275/70 R22,5
	3.3	Size of rear wheels			7.00X12 14PR	7.00X12 14PR	7.00X12 14PR
	3.5	Number of front wheels (x = drive wheel) / rear wheels			2 x 2	2 x 2	2 x 2
	3.6	Front wheel gauge (middle of wheels)	b10	mm	1046	1046	1046
	3.7	Rear wheel gauge (middle of wheels)	b11	mm	1102	1102	1102
	Dimensions	4.1	Tilt of mast forwards / backwards (1)	α / β	deg	10 / 12	10/12
4.2		Height mast lowered	h1	mm	2300	2300	2300
4.3		Free lift	h2	mm	130	135	135
4.4		Lift height	h3	mm	3300	3300	3300
4.5		Height mast extended	h4	mm	4131	4193	4193
4.7		Height of overhead guard (cabin)	h6	mm	2105	2105	2105
4.8		Height of seat	h7	mm	1025	1025	1025
4.12		Height of towing bar	h10	mm	310	310	310
4.19		Overall length	l1	mm	4045	4080	4130
4.20		Length at fork heels	l2	mm	2945	2980	3030
4.21		Total width (overall)	b1	mm	1323	1323	1323
4.22		Fork dimensions	s / e / l	mm	40 / 100 / 1100	45 / 100 / 1100	45 / 125 / 1100
4.23		Fork carriage to DIN 15173 A/B			FEM2A	FEM3A	FEM3A
4.24		Width of fork carriage	b3	mm	1260	1260	1260
4.31		Ground clearance below mast	m1	mm	270	270	270
4.32		Ground clearance at centre of wheel-base	m2	mm	260	260	260
4.33		Width of aisle for pallet 1000 x 1200 crossways	Ast	mm	4525	4560	4595
4.34		Width of aisle for pallet 800 x 1200 lengthways	Ast	mm	4625	4660	4695
4.35		Turning radius	Wa	mm	2545	2580	2590
4.36		Inner turning radius	b13	mm	150	150	150
Performances	5.1	Speed of travel laden / unladen		km/h	20 / 20	20 / 20	20 / 20
	5.2	Speed of raise laden / unladen		m/s	0.4 / 0.5	0,4 / 0,5	0,4 / 0,5
	5.3	Speed of lowering laden / unladen		m/s	0.5 / 0.4	0,5 / 0,4	0,4 / 0,3
	5.5	Nominal towing power laden / unladen		daN	2280 / 1370	2460 / 1260	2640 / 1560
	5.7	Gradeability with / without load		%	31 / 32	24 / 29	29 / 29
	5.10	Service brake			Hydraulic	Hydraulic	Hydraulic
Motors	7.1	Manufacturer / Type of engine			Kubota V2403 M-E3B	Kubota V2403 M-E3B	Kubota V2403 M-E3B
	7.2	Power delivery		kW	36	36	36
	7.3	Régime nominal		tr/min	2700	2700	2700
	7.4	Number of pistons / Cubic capacity		cm ³	4/2434	4/2434	4/2434
Miscellan.	8.1	Power control			Hydraulic	Hydraulic	Hydraulic
	8.2	Operating pressure for attachments		bar	170	185	190
	8.3	Oil flow for attachments		l/min	77	77	77
	8.4	Average noise level for the driver (in motion) measured / guaranteed		db (A)			

1- 1- Values with duplex mast

Data is based on standard configurations (forks, mast).
 Performance data and dimensions are nominal and subject to tolerances.
 Manitou products and their specifications are subject to change without notice.

DIMENSIONAL DRAWINGS



MASTS AND RESIDUAL CAPACITIES

MSI 2,5 T			Total Visibility Duplex									
			DVT27	DVT30	DVT33	DVT35	DVT37	DVT40	DVT45	DVT50	DVT55	DVT60
h3	Lift height	mm	2700	3000	3300	3500	3700	4000	4500	5000	5500	6000
h1	Height mast lowered	mm	2000	2150	2300	2400	2560	2750	3000	3250	3500	3790
h2	Free lift	mm	130	130	130	130	130	130	130	130	130	130
h4	Height mast extended*	mm	3531	3831	4131	4331	4531	4831	5331	5831	6331	6831
	Residual capacity at max height MSI25 - c=500	kg	2500	2500	2500	2500	2500	2500	2200	1900	-	-
	Tilt of mast forwards / backwards	deg	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	6 / 6	6 / 6	6 / 6

MSI 2,5 T			Free Lift Triplex								
			TLL37	TLL40	TLL43	TLL47	TLL50	TLL55	TLL60	TLL65	TLL70
h3	Lift height	mm	3700	4000	4300	4700	5000	5500	6000	6600	7000
h1	Height mast lowered	mm	1950	2050	2150	2300	2400	2560	2750	3000	3250
h2	Free lift	mm	1221	1321	1421	1571	1671	1831	2021	2271	2521
h4	Height mast extended*	mm	4469	4769	5069	5469	5769	6269	6769	7269	7769
	Residual capacity at max height MSI25 - c=500	kg	2500	2500	2400	2100	1900	1500	1500	-	-
	Tilt of mast forwards / backwards	deg	10 / 12	10 / 12	10 / 12	10 / 12	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6

MSI 3,0 & 3,5 T			Total Visibility Duplex								
			DVT30	DVT33	DVT35	DVT37	DVT40	DVT45	DVT50	DVT55	DVT60
h3	Lift height	mm	3000	3300	3500	3700	4000	4500	5000	5500	6000
h1	Height mast lowered	mm	2150	2300	2400	2560	2750	3000	3250	3500	3790
h2	Free lift	mm	135	135	135	135	135	135	135	135	135
h4	Height mast extended*	mm	3893	4193	4393	4593	4893	5396	5863	6393	6893
	Residual capacity at max height MSI30 - c=500	kg	3000	3000	3000	3000	3000	2600	2400	1900	1500
	Residual capacity at max height MSI35 - c=500	kg	3500	3500	3500	3500	3400	2900	2700	-	-
	Tilt of mast forwards / backwards	deg	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	6 / 6	6 / 6	6 / 6

MSI 3,0 & 3,5 T			Free Lift Triplex								
			TLL37	TLL40	TLL43	TLL47	TLL50	TLL55	TLL60	TLL65	TLL70
h3	Lift height	mm	3700	4000	4300	4700	5000	5500	6000	6600	7000
h1	Height mast lowered	mm	2050	2150	2300	2400	2560	2750	3000	3250	3500
h2	Free lift	mm	1297	1397	1547	1647	1807	1997	2247	2497	2747
h4	Height mast extended*	mm	4500	4800	5100	5500	5800	6300	6800	7300	7800
	Residual capacity at max height MSI30 - c=500	kg	3000	3000	2800	2600	2400	1900	1500	-	-
	Residual capacity at max height MSI35 - c=500	kg	3400	3400	3000	2600	2700	2200	1800	1200	-
	Tilt of mast forwards / backwards	deg	10 / 12	10 / 12	10 / 12	10 / 12	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6

* Without backrest

4000 - 5000 kg / stage 3B

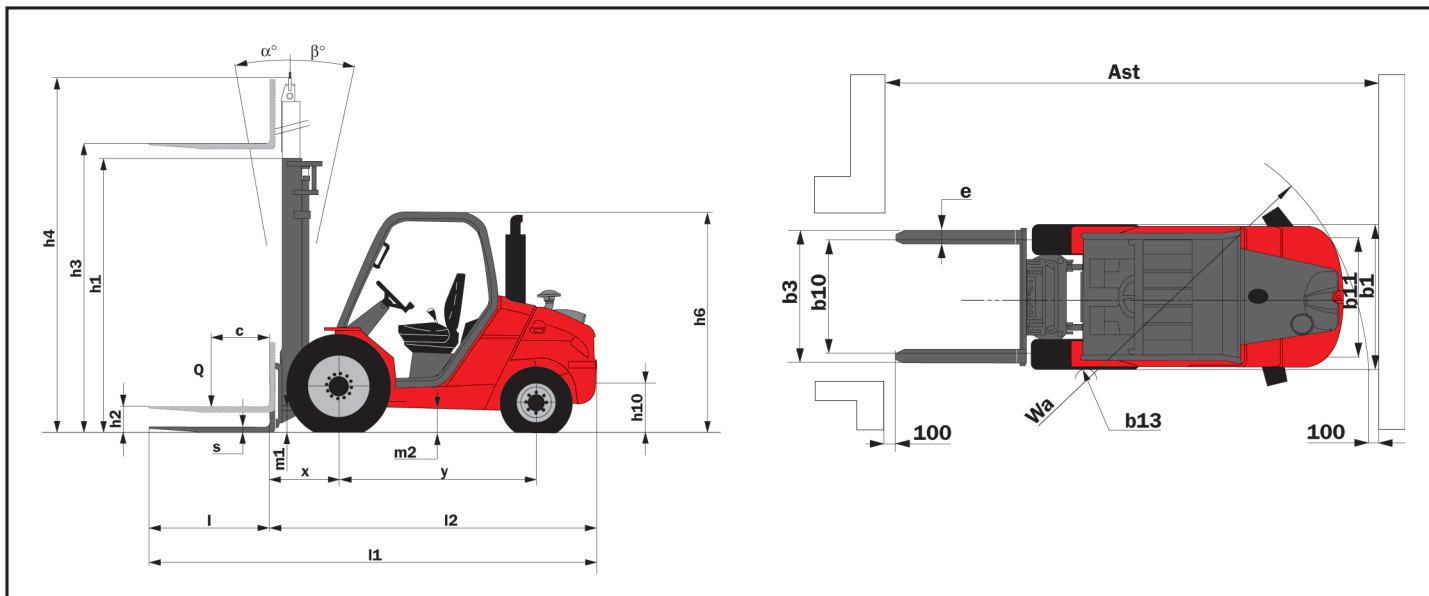
TECHNICAL SPECS

				MANITOU	MANITOU	
				MSI 40 T	MSI 50 T	
Specifications	1.1	Manufacturer				
	1.2	Model				
	1.3	Power source		Diesel	Diesel	
	1.4	Driving position		Seated	Seated	
	1.5	Nominal capacity	Q	t	4	5
	1.6	Load - centre of gravity	c	mm	500	600
	1.8	Distance from the load-bearing surface to centre of front axle	x	mm	691	701
1.9	Wheelbase	y	mm	2075	2075	
Weight	2.1	Operating weight		kg	6980	8420
	2.2	Axle load, with load, front / rear		kg	9245 / 1735	11467 / 1953
	2.3	Axle load, without load, front / rear		kg	3210 / 3770	3489 / 4931
Tyres, frame	3.1	Tyre equipment: cushion (V), superelastic (SE), pneumatic (L)			L	L
	3.2	Size of front wheels			315/70 R22,5	315/70 R22,5
	3.3	Size of rear wheels			225/75 R15	225/75 R15
	3.5	Number of front wheels (x = drive wheel) / rear wheels			2x 2	2x 2
	3.6	Front wheel gauge (middle of wheels)	b10	mm	1420	1420
	3.7	Rear wheel gauge (middle of wheels)	b11	mm	1142	1142
	Dimensions	4.1	Tilt of mast forwards / backwards (1)	α / β	deg	10 / 12
4.2		Height mast lowered	h1	mm	2775	2775
4.3		Free lift	h2	mm	-	-
4.4		Lift height	h3	mm	3700	3700
4.5		Height mast extended	h4	mm	4677	4672
4.7		Height of overhead guard (cabin)	h6	mm	2440	2440
4.8		Height of seat	h7	mm	1300	1300
4.12		Height of towing bar	h10	mm	540	540
4.19		Overall length	l1	mm	4494	4584
4.20		Length at fork heels	l2	mm	3294	3384
4.21		Total width (overall)	b1	mm	1732	1732
4.22		Fork dimensions	s / e / l	mm	50 / 150 / 1200	60 / 150 / 1200
4.23		Fork carriage to DIN 15173 A/B			FEM3A	FEM4A
4.24		Width of fork carriage	b3	mm	1670	1670
4.31		Ground clearance below mast	m1	mm	185	185
4.32		Ground clearance at centre of wheel-base	m2	mm	225	225
4.33		Width of aisle for pallet 1000 x 1200 crossways	Ast	mm	4756	5041
4.34		Width of aisle for pallet 800 x 1200 lengthways	Ast	mm	4956	5241
4.35		Turning radius	Wa	mm	2865	2950
4.36	Inner turning radius	b13	mm	125	125	
Performances	5.1	Speed of travel laden / unladen		km/h	22 / 22	22 / 22
	5.2	Speed of raise laden / unladen		m/s	0.6 / 0.6	0.5 / 0.5
	5.3	Speed of lowering laden / unladen		m/s	0.4 / 0.5	0.4 / 0.4
	5.5	Nominal towing power laden / unladen		daN	3180 / 2020	3350 / 2420
	5.7	Gradeability with / without load		%	24 / 29	24 / 26
	5.10	Service brake			Hydraulic	Hydraulic
Motors	7.1	Manufacturer / Type of engine			PERKINS (3B) 854 F 10794	PERKINS (3B) 854 F 10794
	7.2	Power delivery		kW	55	55
	7.3	Régime nominal		tr/min	2200	2200
	7.4	Number of pistons / Cubic capacity		cm ³	4/3400	4/3400
Miscellan.	8.1	Power control			Hydraulic	Hydraulic
	8.2	Operating pressure for attachments		bar	230	230
	8.3	Oil flow for attachments		l/min	103	103
	8.4	Average noise level for the driver (in motion) measured / guaranteed		db (A)	81	81

1- 1- Values with duplex mast

Data is based on standard configurations (forks, mast).
Performance data and dimensions are nominal and subject to tolerances.
Manitou products and their specifications are subject to change without notice.

DIMENSIONAL DRAWINGS



MASTS AND RESIDUAL CAPACITIES

MSI 40 T CDG 500 mm			Total Visibility Duplex						
			DVT30	DVT33	DVT35	DVT37	DVT40	DVT45	DVT50
h3	Lift height	mm	3000	3300	3500	3700	4000	4500	5000
h1	Height mast lowered	mm	2425	2575	2675	2775	2925	3175	3425
h2	Free lift	mm	-	-	-	-	-	-	-
h4	Height mast extended*	mm	3977	4277	4477	4677	4977	5477	5977
Residual capacity at max height MSI40 - c=500		kg	4000	4000	4000	4000	4000	4000	4000

MSI 40 T CDG 500 mm			Free Lift Triplex							
			TLL37	TLL40	TLL43	TLL45	TLL47	TLL50	TLL55	TLL60
h3	Lift height	mm	3700	4000	4300	4500	4700	5000	5500	6000
h1	Height mast lowered	mm	2175	2275	2375	2450	2510	2625	2775	2950
h2	Free lift	mm	1258	1358	1458	1533	1593	1708	1858	2033
h4	Height mast extended*	mm	4667	4967	5267	5467	5667	5967	6467	6967
Residual capacity at max height MSI40 - c=500		kg	40000	4000	4000	4000	3800	3700	3500	3400

* Without backrest

MSI 50 T CDG 600 mm			Total Visibility Duplex						
			DVT30	DVT33	DVT35	DVT37	DVT40	DVT45	DVT50
h3	Lift height	mm	3000	3300	3500	3700	4000	4500	5000
h1	Height mast lowered	mm	2425	2575	2675	2775	2925	3175	3425
h2	Free lift	mm	-	-	-	-	-	-	-
h4	Height mast extended*	mm	3972	4272	4472	4672	4972	5472	5972
Residual capacity at max height MSI50 - c=500		kg	5000	5000	5000	5000	5000	4800	4800

MSI 50 T CDG 600 mm			Free Lift Triplex							
			TLL37	TLL40	TLL43	TLL45	TLL47	TLL50	TLL55	TLL60
h3	Lift height	mm	3700	4000	4300	4500	4700	5000	5500	6000
h1	Height mast lowered	mm	2175	2275	2375	2450	2510	2625	2775	2950
h2	Free lift	mm	1263	1363	1463	1538	1598	1713	1863	2038
h4	Height mast extended*	mm	4662	4962	5262	5462	5662	5962	6462	6962
Residual capacity at max height MSI50 - c=500		kg	4900	4900	4900	4800	4600	4400	3800	3100

* Without backrest

TECHNICAL DATA SHEET

MH Range

Off-road IC forklifts

Region 2



2000 - 2500 kg

TECHNICAL SPECS

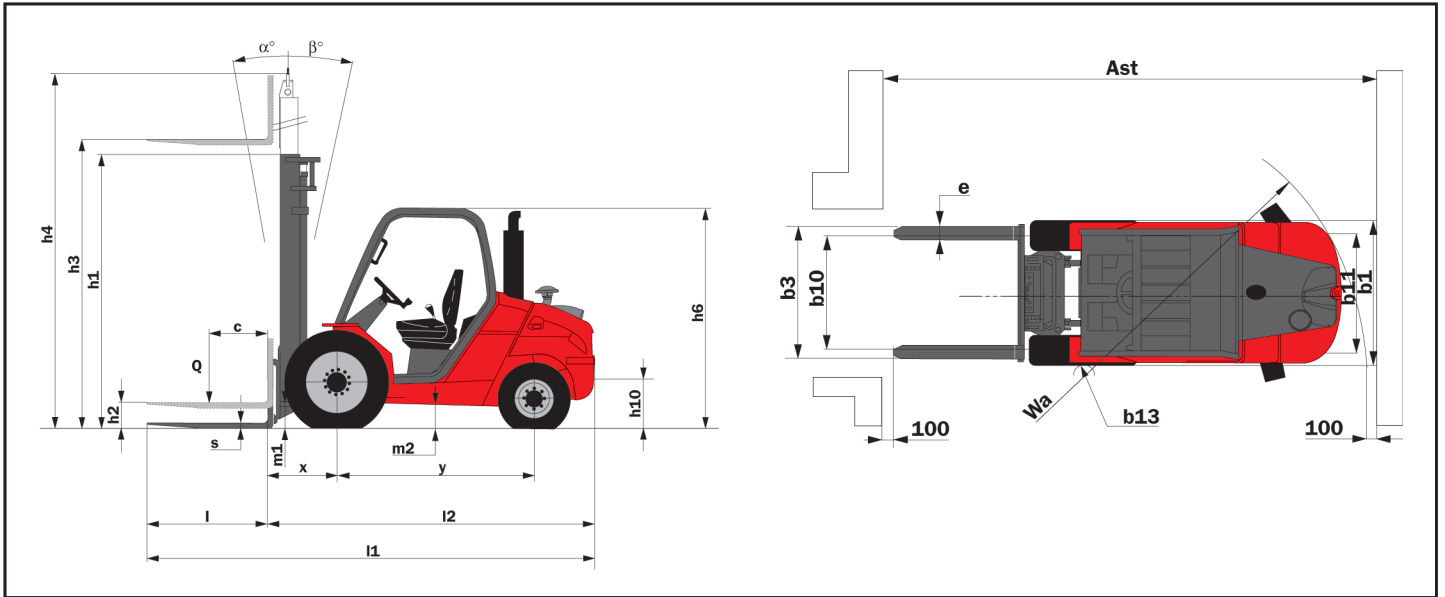
Stage 3A

Specifications	1.1	Manufacturer			MANITOU
	1.2	Model			MH 25
	1.3	Power source			Diesel
	1.4	Driving position			Seated
	1.5	Nominal capacity	Q	kg	2500
	1.6	Load - centre of gravity	c	mm	500
	1.8	Distance from the load-bearing surface to centre of front axle	x	mm	625
	1.9	Wheelbase	y	mm	1800
	Weight	2.1	Operating weight		kg
2.2		Axle load, with load, front / rear		kg	5812 / 948
2.3		Axle load, without load, front / rear		kg	1750 / 2510
Tyres, frame	3.1	Tyre equipment: cushion (V), superelastic (SE), pneumatic (L)			L
	3.2	Size of front wheels			280/80 R20 XMCL
	3.3	Size of rear wheels			27,10- 12 IC 30 14PR
	3.5	Number of front wheels (x = drive wheel) / rear wheels			2x / 2x
	3.6	Front wheel gauge (middle of wheels)	b10	mm	1160
	3.7	Rear wheel gauge (middle of wheels)	b11	mm	1164
	Dimensions	4.1	Tilt of mast forwards / backwards (1)	α / β	deg
4.2		Height mast lowered	h1	mm	1835
4.3		Free lift	h2	mm	130
4.4		Lift height	h3	mm	3300
4.5		Height mast extended	h4	mm	4070
4.7		Height of overhead guard (cabin)	h6	mm	2105
4.8		Height of seat	h7	mm	1025
4.12		Height of towing bar	h10	mm	310
4.19		Overall length	l1	mm	4045
4.20		Length at fork heels	l2	mm	2945
4.21		Total width (overall)	b1	mm	1450
4.22		Fork dimensions	s / e / l	mm	40 / 100 / 1100
4.23		Fork carriage to DIN 15173 A/B			FEM2A
4.24		Width of fork carriage	b3	mm	1260
4.31		Ground clearance below mast	m1	mm	266
4.32		Ground clearance at centre of wheel-base	m2	mm	260
4.33		Width of aisle for pallet 1000 x 1200 crossways	Ast	mm	5090
4.34		Width of aisle for pallet 800 x 1200 lengthways	Ast	mm	5290
4.35		Turning radius	Wa	mm	3265
4.36	Inner turning radius	b13	mm	1080	
Performances	5.1	Speed of travel laden / unladen		km/h	14
	5.2	Speed of raise laden / unladen		m/s	0,4 / 0,5
	5.3	Speed of lowering laden / unladen		m/s	0,5 / 0,4
	5.5	Nominal towing power laden / unladen		daN	3550
	5.7	Gradeability with / without load		%	50 / 48
	5.10	Service brake			Hydraulic
Motors	7.1	Manufacturer / Type of engine			Kubota V2403 M-E3B
	7.2	Power delivery		kW	36
	7.3	Regime nominal		tr/min	2700
	7.4	Number of pistons / Cubic capacity		cm ³	4/2434
Miscellan.	8.1	Power control			Hydraulic
	8.2	Operating pressure for attachments		bar	170
	8.3	Oil flow for attachments		l/min	77
	8.4	Average noise level for the driver (in motion) measured / guaranteed		db (A)	104

1- Values with duplex mast

Data is based on standard configurations (forks, mast).
Performance data and dimensions are nominal and subject to tolerances.
Manitou products and their specifications are subject to change without notice.

DIMENSIONAL DRAWINGS



MASTS AND RESIDUAL CAPACITIES

MH 25			Total Visibility Duplex									
			DVT27	DVT30	DVT33	DVT35	DVT37	DVT40	DVT45	DVT50	DVT55	DVT60
h3	Lift height	mm	2700	3000	3300	3500	3700	4000	4500	5000	5500	6000
h1	Height mast lowered	mm	1995	2145	2295	2395	2555	2745	2995	3245	3495	3785
h2	Free lift	mm	130	130	130	130	130	130	130	130	130	130
h4	Height mast extended*	mm	3531	3831	4070	4331	4531	4831	5331	5831	6331	6831
	Residual capacity at max height MH20 - c=500mm	kg	2500	2500	2500	1900	1900	1550	1100	-	-	-
	Tilt of mast forwards / backwards	deg	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	10 / 12	6 / 6	6 / 6	6 / 6

MH 25			Free Lift Triplex								
			TLL37	TLL40	TLL43	TLL47	TLL50	TLL55	TLL60	TLL65	TLL70
h3	Lift height	mm	3700	4000	4300	4700	5000	5500	6000	6500	7000
h1	Height mast lowered	mm	1945	2045	2145	2295	2395	2555	2745	2995	3245
h2	Free lift	mm	1221	1321	1421	1571	1671	1831	2021	2271	2521
h4	Height mast extended*	mm	4469	4769	5069	5469	5769	6269	6769	7269	7769
	Residual capacity at max height MH20 - c=500mm	kg	1900	1550	1250	1000	-	700	-	-	-
	Tilt of mast forwards / backwards	deg	10 / 12	10 / 12	10 / 12	10 / 12	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6

* Without backrest and Integrated sideshift

NOTES

DEFINITIONS

MGMT: Refers to the person legally responsible for the use of the unit; it generally means the employer, the company or the legal entity that has responsibility under the Health and Safety legislation in the State or Territory in which the unit is being used.

OP: Is the operator, authorized by management and responsible for the operation and preoperational inspection and use of the unit.

OWNER: Is the person or organisation that owns the unit and is responsible for its condition and state of repair.

MEWP: Mobile Elevating Work Platform

GENERAL NOTES

1. This Risk Assessment has been prepared by MANITOU for the subject plant and is not transferable to other plant or parties.
2. Item Numbers refer to hazards, which can exist if the unit is not adequately maintained – e.g. Guards not fitted, gauges fail to correctly display readings etc. The measures listed to control risks arising from this type of hazard can include reference to operating procedures. Operating Procedures cannot make the operator responsible for inadequate maintenance/repairs etc. but is only intended to ensure that the procedures include the need for the operator to report any faults detected.
3. This Hazard Identification and Risk Assessment document has been prepared based on information available at the date of publication. In order to ensure this Hazard Identification, Risk Assessment, Risk Control document is both accurate and complete; “Management of the Unit” must review it:
 - (a) According to the particular circumstances under which the plant and/or process is used and maintained,
 - (b) As new hazards are identified or as risks are re-assessed,
 - (c) As new or revised control measures are implemented,
 - (d) As and when work procedures are altered.Although every attempt has been made to identify reasonably foreseeable circumstances, no guarantee as to the completeness of this assessment is implied or provided.
4. “Preliminary” is placed in this document to indicate that the Controls listed in Columns C and E are a practicable way of controlling the risks arising out of the Hazards listed in Column B. “Preliminary” status remains in place until the “Management of the Unit” agrees that the assessment is complete and that the controls proposed are practicable.
5. Column Y has been provided on the document to allow the “Management of the Unit” to record that their Hazard Identification, Risk Assessment, and Risk Control process has been completed and that all controls are in place and operating. When Column Y is completed, the document becomes a record of the completeness of the process and the documentation (subject to any changes which need to be further reviewed in accordance with Item 3 above).
6. The determination of risk, column D, is a subjective assessment based on the following factors: exposure – the number of times humans are exposed to the risk, the probability of the hazard arising, and the consequence of the hazard – death or serious injury.

RISK MANAGEMENT

Risk management is a five-step process for controlling exposure to health and safety risks associated with hazards in the workplace. To properly manage exposure to risks, a person must:

- (a) Identify hazards;
- (b) Assess risks that may result because of the hazards;
- (c) Decide on appropriate control measures to prevent or minimise the level of the risks;
- (d) Implement control measures; and
- (e) Monitor and review the effectiveness of the measures.

Hazards and risks are NOT the same thing.

A **hazard** is something with the potential to cause harm. This can include substances, plant, work processes or other aspects of the work environment.

Risk is the likelihood that death, injury or illness might result because of the hazard.

As examples:

- The hazard is electricity—the risk is the likelihood that a worker might be electrocuted because of exposure to electrical wires that are inadequately insulated.
- The hazard is a 40 kg bag—the risk is the likelihood that a worker might suffer back strain from manually lifting 40 kg bags.
- The hazard is carbon monoxide—the risk is the likelihood that a worker might suffer carbon monoxide poisoning because they are using a petrol-operated pump in a well.

When undertaking risk management:

- (a) Involve workers in the process; (it is legal requirement that all stakeholders are consulted)
- (b) Don't use it to justify a decision that has already been made;
- (c) Consider good industry practice; and be aware of the current State of Knowledge in relation to the hazard
- (d) Record any risk management activities undertaken.

Under the relevant Workplace Health and Safety Acts, to properly manage exposure to risks, a person should consider the appropriateness of control measures in the following order (sometimes referred to as the 'Hierarchy of Control'):

- (a) Eliminating the hazard or preventing the risk; or
- (b) If eliminating the hazard or preventing the risk is not possible, minimising the risk by measures that must be considered in the following order:
 - (i) Substituting the hazard giving rise to the risk with a hazard giving rise to a lesser risk;
 - (ii) Isolating the hazard giving rise to the risk from anyone who may be at risk;
 - (iii) Minimising the risk by engineering means;
 - (iv) Applying administrative measures; and
 - (v) Using personal protective equipment.

Examples of subparagraph (iii)—re-designing work, plant, equipment, components or premises.

Examples of subparagraph (iv)—training, reasonable hours of work.

The higher in the hierarchy of control, the better and more reliable the control is. In practice, several control options are often used in combination. Personal protective equipment is usually used in conjunction with other control measures.

Control measures must be implemented before work commences.

RISK RANKING MATRIX

CONSEQUENCE TABLE

Level	Descriptor	Examples
1	Insignificant	No injuries, low financial loss
2	Minor	First aid treatment, on-site release immediately contained, medium financial loss
3	Moderate	Medical treatment required, on-site release contained without assistance, high financial loss
4	Major	Extensive injuries, loss of production capability, off-site release with no detrimental effects, major financial loss
5	Catastrophic	Death, toxic release off-site with detrimental effect, huge financial loss

NOTE: Measures used should reflect the needs and nature of the organisation & activity under study, e.g. in high risk industries multiple fatalities and fatalities may be separated into several levels.

LIKELIHOOD TABLE

Level	Descriptor	Examples
A	Very likely	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Moderate	Might occur at some time
D	Unlikely	Could occur at some time
E	Rare	May occur only in exceptional circumstances

NOTE: Measures used should reflect the needs and nature of the organisation and activity under study.

LIKELIHOOD	CONSEQUENCE				
	Catastrophic (5)	Major (4)	Moderate (3)	Minor (2)	Insignificant (1)
Almost certain (A)	Extreme	Extreme	Extreme	High	High
Likely (B)	Extreme	Extreme	High	High	Moderate
Moderate (C)	Extreme	Extreme	High	Moderate	Low
Unlikely (D)	Extreme	High	Moderate	Low	Low
Rare (E)	High	High	Moderate	Low	Low

The risk level read from the matrix defines the priority for action or the importance for review. Again the actions required for a particular risk level should be customized to the particular circumstances.

Possible actions are:

E= Extreme risk—consider stopping work (who decides which boxes contain E?)

H= High risk—should be reduced as soon as possible.

M= Moderate risk—management responsibility and action dates must be specified

L= Low risk—manage by routine procedures

The matrix suggests four different action levels but could equally be divided into a larger number of priority levels. There is merit in assigning all events that have the potential for a fatality priority 1 unless they are so unlikely that they are not expected ever to occur. This ensures that controls for preventing fatalities receive priority attention even where they are believed to be good.

Notes on using the matrix method

The strengths of this method are:

- The analysis provides a ranking of risk.
- The method encourages the risk analyst or team to understand the hazard in order to rank the significance of the risk.

The major problems involved in applying such a method are:

- People guess levels of likelihood and consequence without sufficient analysis of the hazard or existing controls.
- The analysis methodology is applied to a risk where the circumstances of occurrence are rare. For example, suppose a person was exposed to a hazard for a short period of time, once every 10 years. Suppose also that that hazard was almost certain to cause fatality upon each exposure. It would be incorrect to use a simple methodology whereby the likelihood of the consequences was ranked relatively low at once in 10 years. In that particular example the likelihood of fatality is certain once exposure occurs. An amended methodology will be required to deal with those circumstances such as the fine risk score calculator.
- Since judgements of consequences and likelihood are highly subjective the matrix does not work well as a decision tool, particularly concerning the need for action on high consequence low probability risks.

WARNING

The risk ratings used in this document are intended to stimulate discussion from the parties affected by the use of the subject machine; they shall not be adopted as the most appropriate risk rating without sufficient consideration by the designer, manufacturer, management or user of the plant.

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description -	Is there any risk?	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
	(the situation or parts of plant which could cause injury or illness)	Describe the risk control measures ALREADY implemented							

This risk assessment does not include hazards associated with the use of a man basket or platform. Use of Man basket or platform on this type of equipment is prohibited.

0	General – Device selection and use								
0.1	Persons could be injured when following a poor system of work in relation to the operation of this device.	Operating manual provided which includes maintenance instructions, detailing specifications, limitations and residual hazards associated with the operation of the machine. Warning in operator's manual [page number 1-6] stating that before operating the machine the operator must read and understand the safety instructions and operating instructions.	D	4	H	Prepare a documented system of work having regard to the operating specification and limitations as detailed in the owners operating manual; Verify that the procedure (including maintenance) covers all modes of operation of the machine and is a practicable solution; Instruct and train the operator in its use; Ensure operator's manual is with the machine at all times.			
0.2	Persons could be injured if the device is not suitable for the required task.	Machine specifications are included in operator's manual [section 2].	D	4	H	Ensure that the unit is adequately rated in terms of capacity, height and reach, rated inclination and mass; having regard to the required task, the site conditions and the environment; Source another machine if the specifications do not match the requirements for the task.			
0.3	Persons could be injured or injure others when operating the unit without sufficient information, instruction, training and supervision.	Operating and maintenance manuals provided detailing specifications, limitations and residual hazards associated with the operation of the machine. Warning in operator's manual [page number 1-6] that the machine is to only be used by personnel who are properly trained and qualified. Warning decal stating that only authorised drivers are permitted to operate lift truck. Warning in operator's manual [pager number 1-5] that the operator's manual is to be in good condition and in the place provided on the lift truck. High risk work license required to operate forklift.	D	4	H	Ensure that all standard work procedures (SWP's) are effectively implemented; Ensure that the operator(s) have read and understand the training and instructions (which must include Manufacturer's and local information); Ensure that only authorised and properly trained personnel operate the machine.			
0.4	Injury as a result of site specific hazards.	General requirements and general list of site-specific hazards located in manual [page number 1-4].	C	3	H	Ensure operators are able to identify particular hazards that may be encountered at the site and implement actions to ensure that they are addressed by appropriate means; Ensure operators conduct a site hazard assessment before use; Ensure operators implement appropriate systems to eliminate the hazards or adequately control the risks associated with the hazards identified; Ensure operators feedback information relating to new hazards identified so they may be reviewed and measures implemented in a training package; Ensure that if operators are uncertain how to address a particular site hazard that they seek advice from a competent person.			
0.5	Injury due to unauthorised use.	Ignition key switch is fitted. Shut down procedure in operator's manual [page number 1-11] includes instructions to remove the ignition key.	D	4	H	Ensure that the ignition key is removed before leaving unattended; Ensure that the machine is not lent or sub-hired to any unauthorized person; Ensure that only authorized personnel use the forklift.			

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description -	Is there any risk?	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
	(the situation or parts of plant which could cause injury or illness)	Describe the risk control measures ALREADY implemented							
0.6	Injuries exacerbated as a result of insufficient communication, procedures or equipment following or during an emergency.		D	4	H	<p>Ensure that operators are aware of the emergency procedures specified in the manual;</p> <p>Establish and audit routine emergency procedures;</p> <p>Ensure that all operators are equipped with portable communications equipment where necessary;</p> <p>Establish protocols and procedures to ensure a timely and appropriate response in emergencies;</p> <p>Ensure all operators report in when attending site and on a routine basis thereafter;</p> <p>Periodically verify emergency equipment and supplies.</p>			
0.7	Failure due to unauthorized alteration or interference.	Note provided in operator's manual [page number 1-6] prohibiting unauthorised modification of the machine.	E	4	H	<p>Seek advice for all modifications/repairs considered during life of machine;</p> <p>Ensure that no additions or alterations are performed on the machine without written approval from the manufacturer.</p>			
0.8	Injuries exacerbated as a result of working solo.		D	5	E	<p>Ensure that workers do not work solo;</p> <p>Establish protocols and procedures to ensure a timely and appropriate response in emergencies;</p> <p>Ensure all operators report in when attending site and on a routine basis thereafter.</p>			
0.9	Persons injured due to unrecognized hazard.	Preliminary hazard ID prepared and provided for review.	C	5	E	<p>Ensure that each party performs their own risk assessment and does not rely on a risk assessment prepared or intended for other parties;</p> <p>Update hazard ID as necessary;</p> <p>Implement risk control measures as necessary having regard to the hierarchy of control measures available.</p>			
0.10	Due to failure to observe or rectify safety upgrades from manufacturer.	Local importer keeps database of customers who purchased this model and attachments from them.	E	3	M	<p>Ensure that the owner of each machine is registered with the manufacturer;</p> <p>Periodically check the status in respect of safety bulletins or upgrades applying to the machine;</p> <p>Ensure that safety upgrades provided by the manufacturer are implemented;</p> <p>Ensure the manufacturer is advised when the machine is disposed of or sold.</p>			
0.11	Strains/sprains when performing certain maintenance activities with the unit.	Maintenance instructions provided in operating and maintenance manuals.	C	3	H	<p>Establish appropriate work procedures for all anticipated maintenance issues arising;</p> <p>Periodically review these SWP's.</p>			
0.12	Persons may be injured as the result of poor maintenance and/or adjustment procedures.	Maintenance instructions provided in operating and maintenance manuals.	D	4	H	<p>Ensure that the unit is tested by a competent person prior to being returned to normal service after repairs and/or adjustment of critical components or systems.</p>			
0.13	Persons injured handling heavy or unsupported items.		D	3	M	<p>Instruct personnel in respect of proper maintenance procedures including the necessity to support items during maintenance.</p>			
0.14	Persons could be injured if sunlight or bright lights in close proximity impair the operator's vision.		D	2	L	<p>Instruct the operator in relation to the sighting of lights;</p> <p>Ensure that operators wear appropriate PPE depending on the site conditions.</p>			

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description -	Is there any risk?	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
1	Mechanical hazards (due to events that may arise during normal operation)								
1.1	Crushing hazard								
1.1.1	Operator is crushed as a result of operation – due to the load being lifted.	Operator's seat located in cabin and fitted with a seat belt. The lifting mechanism cannot be reached from the normal operating position. Cabin affords operator protection from falling objects. FOPS is tested and certified by the cabin manufacturer. Load backrest installed on all carriage attachments. Warning decals fitted which warn of the danger due to crushing by a falling load and not to stand underneath raised forks.	E	4	H	Ensure that operators, observe the surroundings and move at appropriate speeds; Ensure that ground personnel are available to observe and take corrective action if necessary; Ensure they are familiar with emergency operation procedures detailed in the operators manual; Ensure that operators are trained with respect of load handling operations; Ensure operators wear the seat belt when operating machine; Ensure that the lifting mechanism is only operated from the operator's seat; Ensure that ground personnel keep clear while the forklift is in operation.			
1.1.2	Operator is crushed as a result of operation – in the lifting mechanism.	Operator's seat located in cabin and fitted with a seat belt. Interlocks provided on seat belt and seat so that operation is not possible unless the operator is seated in the normal operating position. The lifting mechanism cannot be reached from the normal operating position.	E	3	M	Ensure operators wear the seat belt when operating machine; Ensure that the lifting mechanism is only operated from the operator's seat.			
1.1.3	Operator is crushed as a result of operation – between forklift and obstacles.	The normal operating position is within the cabin seated in the operator's seat with the seat belt fastened. Warnings in operators manual that the seat belt must be worn and fastened [page number 1-10]. Interlocks provided on seat belt and seat so that operation is not possible unless the operator is seated in the normal operating position. Warning in manual [page number 1-11] that the operator is not to exit the forklift without following the proper shutdown procedures, which includes parking on a firm level surface, selecting neutral and applying the park brake.	E	1	L	Ensure that operators, observe the surroundings and move at appropriate speeds; Ensure that ground personnel are available to observe and take corrective action if necessary; Ensure that operators are trained with respect of load handling operations; Ensure operators wear the seat belt when operating machine; Ensure that if the operator must leave the cabin of the forklift that the load is lowered and the handbrake applied.			

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description -	Is there any risk?	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
	(the situation or parts of plant which could cause injury or illness)	Describe the risk control measures ALREADY implemented							
1.1.4	Operator is crushed as a result of operation – between forklift and wheels.	Controls comply with AS2359.5 Parking brake fitted. Travel selector automatically locks in the neutral position. Normal operating position in the cabin away from hazard. Warning in operator's manual [page number 1-10] that the seat belt must be worn while operating forklift. Warning decal fitted regarding wearing the seat belt. Safety switch fitted to operator's seat which automatically applies the handbrake if the operator gets out of the seat.	E	2	L	Ensure the controls are maintained as per the maintenance instructions in the manual; Ensure that the operator applies the parking brake when they leave the cabin.			
1.1.5	Ground personnel crushed whilst machine is operating – in lifting mechanism.	Warning signs fitted which warn personnel to keep clear of forklift when it is in use.	D	4	H	Ensure that personnel remain clear of the forklift when in use.			
1.1.6	Ground personnel crushed whilst machine is operating – between forklift and obstacles.	Flashing light fitted to the cabin roof to increase the visibility of the forklift to bystanders. Horn fitted to enable the operator to warn other personnel of impending collision. Warning signs fitted which warn personnel to keep clear of forklift when it is in use. Reverse beeper fitted. Warning in manual [page number 1-10] regarding precautions for driver to take.	D	4	H	Ensure personnel stand clear of the forklift when in operation; Ensure that the windows are maintained in a clean condition; Ensure a traffic management plan is developed in consultation with all stakeholders.			
1.1.7	Ground personnel crushed whilst machine is operating – run over.	Flashing light fitted to the cabin roof to increase the visibility of the forklift to bystanders. Horn fitted to enable the operator to warn other personnel of impending collision. Guards are fitted to the wheels.	D	4	H	Ensure personnel stand clear of the forklift when in operation; Ensure that the windows are maintained in a clean condition; Ensure a traffic management plan is developed in consultation with all stakeholders.			
1.1.8	Persons exposed to vehicular traffic while operating forklift.	See clause 14.6.1.							
1.1.9	Ground personnel crushed while lifting machine.	Tie down points are provided on the machine and are identified by labels. The unladen mass of the forklift is provided on the manufacturer's plate installed in the cabin. Instructions for lifting are provided in the operator's manual [page number 3-34].	E	4	H	Ensure that operators are aware of the precautions and operational requirements specified in the manual; Ensure persons abide by the instructions Ensure that the crane and lifting slings used to lift the machine has adequate capacity; Ensure that the persons slinging the forklift and operating the crane are competent and hold appropriate certificates of competency.			
1.1.10	Ground personnel crushed when machine is being loaded onto a truck or float via ramps.	Instructions for loading are provided in the operator's manual [page number 3-35].	D	4	H	Ensure that operators are aware of the precautions and operational requirements specified in the manual; Ensure persons abide by the instructions; Ensure that the ramps provided are suited to the vehicle and the gradient is not exceeded.			
1.1.11	Operator's fingers crushed by closing cabin door.	Door seals provide some cushioning effect.	C	1	L	Train operators with respect to this hazard.			
1.2	Shearing hazard								

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description - (the situation or parts of plant which could cause injury or illness)	Is there any risk? Describe the risk control measures ALREADY implemented	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
1.2.1	Shearing hazard at mast mechanism.	Warning decals fitted at shear hazard locations. Operator located away from hazard during normal operation.	E	3	M	Ensure personnel are trained and aware of this hazard and keep clear of the forklift when it is in operation.			
1.3	Cutting or severing hazard					NS			
1.4	Entanglement hazard								
1.4.1	Operator becomes entangled with components in the engine compartment.	All rotating parts are suitably enclosed and guarded against possible entanglement.	D	2	L	Ensure that covers are always in place prior to operation; Ensure that personnel are trained with respect to this hazard and take appropriate precautions.			
1.5	Drawing-in or trapping hazard					NS			
1.6	Impact hazard								
1.6.1	Operator suffers impact injury when the forklift is being driven.	Seat belt provided. Operator's seat provided which offers support to the operator when in the driving position. Fully enclosed operators cabin fitted which provides protection against impacts and collisions. Steering controls are fitted which enable the operator to control the steering direction precisely. Brakes are provided which comply with AS2359.6 with respect to stopping distances and performance. Mud guards are fitted to prevent rocks and debris from being thrown up by the wheels and striking the operator.	D	3	M	Ensure that the seat, seat belts, brakes, steering controls and other systems are maintained in accordance with the manufacturers recommendations; Ensure that the operator wears the seat belt whenever driving the forklift.			
1.6.2	Impact injuries from falling objects including load being handled.	Operator's seat located in cabin and fitted with a seat belt. Cabin affords operator protection from falling objects. Load backrest installed on all fork carriage attachments.	E	3	M	Ensure that loads are handled at speeds recommended by the manufacturer; Ensure that the load backrest is installed; Ensure that only properly balanced loads are handled; Ensure that the area is free of people before commencing operation.			
1.7	Stabbing or puncture hazard					NS			
1.8	Friction or abrasion hazard					NS			
1.9	High pressure fluid injection hazard								
1.9.1	Injury as a result of a high pressure hydraulic leak while operating the unit.	Operator is located in the cabin away from hydraulic components.	E	2	L	Ensure that personnel are properly trained and aware of the hazard; Ensure that hoses and pipes are replaced with suitably rated items when required; Ensure that the correct pressure setting is maintained as per the operation manual instructions.			
1.9.2	Injury as a result of a high pressure hydraulic/fuel leak while maintaining the unit.		D	2	L	Ensure that personnel are trained with respect to this hazard and do not place hands or other body parts in front of escaping hydraulic fluid.			
1.10	Ejection of parts					NS			
1.11	Loss of stability (of machinery and machine parts) See section 16.1.								
1.12	Slip, trip and fall hazards								

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description -	Is there any risk?	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
1.12.1	Operator slips and falls while entering or exiting the cabin.	Instructions provided in manual [page number 1-8] on how to properly access the driver's seat.	C	1	L	Ensure that access points and steps are maintained and free of obstacles, slick surfaces and slip resistant; Ensure that damaged steps are repaired or replaced as required; Ensure that operators use the correct procedure when entering or exiting the cabin.			
1.12.2	Falling whilst performing maintenance checks.	Pre-operational checks able to be performed at ground level.	E	1	L	Ensure that appropriate equipment is used during maintenance where access at height is required.			
2	Electrical hazards								
2.1	Electrical contact (direct or indirect)								
2.1.1	Persons could be injured due to contact or approach to live overhead electrical apparatus.	Warning in operator's manual [page number 1-9] regarding maintenance of clearance distances from energized power lines and/or apparatus. Warning decal fitted which lists the safe clearance distances from overhead lines.	E	4	H	Ensure persons observe the limits of approach as specified by regulation and as indicated on the signs attached.			
2.1.2	Due to improper procedures following contact with live conductors.		E	4	H	Ensure that all personnel are trained and aware of the necessary procedures required following the accidental contact with live overhead conductors; Ensure that the unit is withdrawn from service and appropriately assessed by a competent person; Immediately isolate the unit for 24 hours.			
2.1.3	Persons could be injured if struck by lightning		E	4	H	Ensure forklift is not used during storms.			
2.2	Electrostatic phenomena								
2.3	Thermal radiation								
2.4	External influences on electrical equipment								
2.4.1	Control malfunction as a result of external influences.		E	2	L	Ensure that the forklift is not used in environments which include strong electro-magnetic fields.			
3	Thermal hazards								
3.1	Burns and scalds by possible contact of persons with flames or explosions and also with radiation from heat sources								
3.1.1	During work in an explosive atmosphere.	Warning in the operator's manual [page number 1-4] that forklift is not to be used in an explosive environment unless it has been suitably modified by the manufacturer.	E	4	H	Ensure unit is not used in a hazardous environment unless it has been suitably modified by the manufacturer or a competent person.			
3.1.2	During refuelling.	Warning in operator's manual [page number 1-16] not to smoke and to keep sparks and open flames away while refuelling. Refuelling procedures are included in the manual [page number 1-16].	D	3	M	Ensure refuelling procedures listed in manual are followed when refuelling.			
3.1.3	Contact with hot engine components.	Engine is covered; exhaust pipe is out of reach of the operator's position.	C	2	M	Ensure properly trained personnel are the only personnel involved in checking engine components.			
3.1.4	Batteries explode due to sparks induced during maintenance.	Warning in manual [page number 3-31] regarding the dangers of sparks etc. near batteries. Battery isolation switch fitted.	E	3	M	Ensure that only trained personnel conduct maintenance on or near batteries.			
3.1.5	Maintenance personnel suffer burns as a result of exposure to hot fluids.	Warning in operator's manual for personnel not to remove the oil/water filler cap unless it is cool enough to touch with a bare hand [page number 3-10].	C	2	M	Ensure that personnel are trained and aware of this hazard.			
3.2	Health-damaging effects from hot or cold work environment								

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description - (the situation or parts of plant which could cause injury or illness)	Is there any risk? Describe the risk control measures ALREADY implemented	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
3.2.1	Operator injured due to extreme cold temperatures.	Controls are designed so that they may be operated while wearing gloves.	E	2	L	Ensure operators are provided the appropriate PPE for the working environment. Ensure that the period of exposure is kept within acceptable levels.			
3.2.2	Operator injured due to extreme hot temperatures.		C	2	M	Ensure operators are provided the appropriate PPE for the working environment. Ensure that the period of exposure is kept within acceptable levels.			
4	Hazards generated by noise								
4.1	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness, etc.)								
4.1.1	Noise generated by forklift causes hearing loss to operator.	The maximum continuous A-weighted sound pressure level measured inside the machine cabin is 82 dB and is measured in accordance with EN12053.	B	1	M	Ensure that if noise exposure exceeds acceptable levels that either ear protection is worn and/or the operators are removed from the noisy environment; Ensure that the exhaust muffler is maintained in good condition.			
4.1.2	Noise generated by forklift causes hearing loss to bystanders.	The maximum guaranteed sound power level is 82 dB (A).	B	1	M	Competent person to assess the noise impact on bystanders taking into consideration the environment and other machines operating nearby; Ensure that the exhaust muffler is maintained in good condition.			
4.2	Interference with speech communication, acoustic signals, etc.								
4.2.1	Injuries exacerbated as a result of insufficient communication procedures or equipment.	The maximum continuous A-weighted sound power level measured on the machine is less than 82 dB (A). This is not sufficient to block the acoustic signals on the machine nor is it sufficient to drown out a shouted warning. Since the Engine, the main source of noise is covered; verbal communication will not be hindered.	D	3	M	Establish and audit routine emergency procedures; Ensure that all operators are equipped with portable communications equipment where necessary; Establish protocols and procedures to ensure a timely and appropriate response in emergencies; Ensure all operators report in when attending site and on a routine basis thereafter.			
5	Hazards generated by vibration								
5.1	Vibration caused by machinery								
5.1.1	Vibration caused by engine leads to accelerated fatigue of the operator.	The vibration measured at the upper limbs does not exceed 2.5 m/s ² (RMS) and the vibration exerted on the operator's body does not exceed 0.5 m/s ² (RMS).	E	2	L	Ensure that use of the machine in continuous shifts is limited to prevent operator fatigue which may result from exposure to machine vibration.			
6	Hazards generated by radiation								
6.1	Electrical arcs								
6.2	Lasers								
6.3	Ionizing radiation sources								
6.4	Machines using high-frequency electromagnetic fields								
6.4.1	Uncontrolled motions in high-frequency electromagnetic fields.	See clause 2.4.1.							
7	Hazards generated by materials and substances processed, used or exhausted by machinery								
7.1	Hazards resulting from contact with or inhalation of harmful fluids, gases, mists, dusts and fumes								

A	B	C	D1	D2	D	E	F	X	Y
Hazard No.	Hazard Description -	Is there any risk?	Likelihood	Consequence	Risk Level	Proposed SUPPLEMENTARY risk control measure	Are the control measures practicable? Yes/No	For Action by Whom	Confirmation that the necessary action has been completed
	(the situation or parts of plant which could cause injury or illness)	Describe the risk control measures ALREADY implemented							
7.1.1	Persons could be injured if the unit is operated indoors without adequate ventilation.	Warning in operators manual regarding ventilation requirements [page number 1-4].	D	3	M	Ensure that the unit is operated only in well-ventilated areas; Ensure that ventilation filters are maintained as per the manufacturer's instructions.			
7.1.2	Persons could be injured by inhaling exhaust gases during normal operation.	Exhaust is directed away from the operator's positions.	E	3	M	Ensure exhaust system is maintained in accordance with manufacturer's requirements; Ensure that all personnel are aware of the hazard and take appropriate action.			
7.2	Fire or explosion hazard								
7.2.1	During refuelling.	See clause 3.1.2.							
7.2.2	During battery maintenance.	See clause 3.1.4.							
7.3	Biological and microbiological (viral or bacterial) hazards				NS				
8	Hazards generated by neglecting ergonomic principles in machine design (mismatch of machinery with human characteristics and abilities)								
8.1	Unhealthy postures or excessive efforts.								
8.1.1	Due to operating position.	Seat fitted which provides adequate adjustments to cater for different body dimensions. Controls are positioned to provide comfortable body positions during normal operation.	D	2	L	Ensure that shift durations are not too long.			
8.2	Inadequate consideration of human hand-arm or foot-leg anatomy.								
8.2.1	Due to pedal and control positions.	Cabin layout designed taking into account ergonomic principles. A variety of different seat options are available from the manufacturer.	D	2	L	Ensure that if an operator is uncomfortable using the standard operator's seat than an alternative is sourced from the manufacturer which provides better adjustment range.			
8.2.2	Due to effort required to activate loading controls.	Effort required to activate control functions is less than the limits listed in AS1418.1 – 2002 clause 11.4.1(c), i.e. 50N.	L			Ensure that shift durations are not too long.			
8.3	Neglected use of personal protection equipment								
8.3.1	Persons could be injured due to exposure to UV.		B	2	H	Develop and provide specification for appropriate UV protection and its use; Provide UV protective equipment; Instruct operators on the requirements for its use.			
8.3.2	Persons could be injured if equipment is operated while not wearing appropriate PPE.		B	3	H	Provide specification for appropriate PPE including gloves, safety glasses, hard hat and safety footwear as appropriate; Instruct operators on the requirements for its use. Ensure PPE is inspected and certified on a routine basis.			
8.4	Inadequate area lighting					See section 12.1.			
8.5	Mental overload or under load, stress, etc.								
8.5.1	Persons could be injured if the operator's performance was inhibited by excessive fatigue.		D	3	M	Implement a system to ensure that operators do not work excessive or continuous shifts and manage peak demands.			
8.6	Human error								
8.6.1	Injury due to "horse play" or inappropriate use.	Note in manual [page number 1-4] that the machine should be used by properly qualified and trained staff.	E	4	H	Ensure operators do not engage in horse play or stunt driving; Ensure that only properly trained personnel use the forklift.			
8.6.2	Persons could be injured if the unit is operated by persons under the influence of drugs and/or alcohol.		E	4	H	Ensure that operators do not use the unit while under the influence of alcohol or drugs.			
8.6.3	Persons could be injured if the operator's performance is inhibited by poor health or medication with side effects.		E	3	M	Instruct the operator that he/she must report to the supervisor if suffering poor health and safe operating performance could be affected.			

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	(the situation or parts of plant which could cause injury or illness)	Describe the risk control measures ALREADY implemented							
8.6.4	Persons could be injured from incorrect control selection.	The direction of movement resulting from each control is clearly marked beside the control and controls are arranged for logical operation as far as possible. Comprehensive instructions are provided in the operator's manual regarding the control functions [pages 1-6 to 1-15]. Note in manual [page number 1-4] that the machine should be used by properly qualified and trained staff.	D	2	L	Ensure that only properly trained personnel are permitted to operate the forklift; Ensure that only licensed operators are permitted to operate the forklift.			
8.6.5	Failure to apply parking brake when leaving the cabin.	Switch fitted to the operator's seat which automatically applies the handbrake if the operator gets out of the seat. Instructions provided in the operator's manual for shut down of the machine [page number 1-11]. Warning sign fitted which states that handbrake is to be applied before leaving the truck.	C	1	L	Ensure that the safety systems are maintained in accordance with the manufacturer's recommendations. Ensure operator always applies handbrake when leaving the truck.			
8.6.6	Persons could be injured if a machine that is known to be faulty is operated.		D	3	M	A "Danger – Don't Use" tag should be attached if the forklift or equipment thereon is faulty; Remove forklift from service; Execute repairs;			
9	Hazard combinations								
9.1		Risks are not increased by the combination of the hazards which are considered in isolation.			NS				
10	Hazards caused by failure of energy supply, breakdown of machinery parts, and other functional disorders								
10.1	Failure of energy supply (of energy and/or control circuits)								
10.1.1	Uncontrolled motions due to control system failure.		E	2	L	Ensure that the operators perform the pre-operational checks in accordance with the instructions contained within the operators manual; Ensure that all control system faults are logged and reported to service personnel; Ensure that the forklift is not operated if any faults exist.			
10.1.2	Uncontrolled travel movement in case of failure of energy supply.		E	1	L	Ensure that the machine is maintained in accordance with the manufacturer's instructions.			
10.1.3	Failure of control circuit due to poor design of electrical circuits.	Electrical circuits designed using well tried and tested principles by experienced manufacturer.	E	2	L	Ensure that all inspections and tests are carried out in accordance with the manual.			
10.2	Unexpected ejection of machine parts or fluids								
10.2.1	Mast lowering as a result of hose failure.	Flow restrictor valves fitted to the lift cylinder to slow the rate of descent under hose failure. Preoperational inspection includes a check of the hydraulic hoses.	D	3	M	Ensure that hydraulic system is maintained in accordance with manufacturer's instructions.			
10.2.2	Injury as a result of accumulated deterioration during long term storage.	A list of checks which should be performed after a long shut down is included in the service manual [page number 1-19].	E	2	L	Ensure that the procedures detailed in the manual are performed before returning the unit to service.			

A	B	C	D1	D2	D	E	F	X	Y
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10.3	Failure/malfunction of control system	Control systems designed in accordance with AS2359.5 & AS2359.6. Preoperational checks include functional testing of all controls.	E	2	L	Ensure that all pre-operational inspections are performed in accordance with the manufacturer's instructions prior to use; Ensure that all control system faults are logged and reported to service personnel; Ensure that the forklift is not operated if any faults exist.			
10.4	Errors of fitting								
10.4.1	Incorrect tyres fitted.	Machine specifications include tyre size and description [section 2].	D	4	H	Ensure that only tyres which are approved by the manufacturer are fitted.			
10.5	Overturn, unexpected loss of machine stability	See section 16.1.							
11	Hazards caused by (temporary) missing and/or incorrectly positioned safety- related measures/means								
11.1	All kinds of guards								
11.1.1	Guard on engine missing	Catches provided on engine cowl.	D	2	L	Ensure that guards are not removed, or altered without the written approval of the manufacturer.			
11.2	All kinds of safety-related (protection) devices								
11.2.1	Due to safety switches being overridden or missing.	Warning in manual not to modify the forklift in any way without written approval of the manufacturer [page number 1-5].	D	4	H	Ensure that safety devices are not tampered with and are in good condition before use of machine.			
11.3	Starting and stopping devices								
11.3.1	Hazard number not used.								
11.4	Safety signs and signals								
11.4.1	Personnel injured due to missing or illegible safety signs.		C	2	M	Maintain signs and replace as necessary.			
11.5	All kinds of information or warning devices								
11.5.1	Operations manual missing from machine.	Facility provided in cabin to enable storage for the operator's manual.	C	2	M	Ensure that the operators check that the operations manual is present before operating forklift.			
11.6	Energy supply disconnecting devices								
11.7	Emergency devices								
11.7.1	Hazard number not used.								
11.8	Feeding/removal means of work pieces								
					NA				
11.9	Essential equipment and accessories for safe adjusting and/or maintaining	Maintenance instructions provided in operators manual.	C	3	H	Ensure that the instructions included in the maintenance manual are followed; Ensure that only genuine spare parts are used for replacement.			
11.10	Equipment evacuating gases, etc.	Exhaust pipe is directed away from the operator cabin.	D	1	L	Ensure that the exhaust system is maintained in accordance with the maintenance instructions provided by the manufacturer.			
12	Inadequate lighting of moving/working area								
12.1	Collision with structures, objects or ground personnel due to inadequate lighting of work site.		C	3	H	Ensure that sufficient lighting is provided; Ensure that operators do not use the machine if the lighting is insufficient or becomes insufficient during the performance of the job.			
13	Hazards due to sudden movement/instability during handling								
13.1	Machine tips due to tyre failure.	Tyre inspection required as part of 50 hour inspection.	D	3	M	Ensure that operators perform checks of the tyres as listed in manual; Ensure that the machine is not operated if the tyres are in an unsuitable condition;			

A	B	C	D1	D2	D	E	F	X	Y
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14	Inadequate/non-ergonomic design of driving/operating position								
14.1	Hazards due to dangerous environments (contact with moving parts exhaust gases, etc.)	Control position located away from hot parts and exhaust gases. Exhaust outlet points away from operating position. Engine fitted with covers to prevent contact with moving parts and or hot exhaust system.	D	2	L	Ensure that covers are maintained in the original condition; Ensure the machine is not used if the covers are damaged or missing.			
14.2	Inadequate visibility from driver's/operator's position	Operator's position in cabin offers a good position to see all necessary parts of the forklift structure and load. Windscreen wipers provided to clear rain from the front window. Demister provided to clear the fogged front and rear windows. Window provided in roof to aid the visibility of the load in the raised position. Rear vision mirrors provided.	D	4	H	Ensure that wipers and demisters are maintained in accordance with the manufacturer's recommendations; Ensure the machine is kept in a clean condition.			
14.3	Inadequate seat/seating (seat index point)	See clause 8.1.1.							
14.4	Inadequate/non-ergonomic design/positioning of controls	See clause 8.2.1.							
14.5	Starting/moving of self-propelled machinery	Safety system fitted which applies handbrake when the operator leaves the normal driving position (seat). Engine cannot be started unless the gear selector is in neutral.	D	1	L	Ensure the work area is controlled at all times so that other ground personnel are not permitted to enter the area around the operation of the forklift unless under emergency conditions; Ensure that the forklift is not started unless the operator is seated in the normal operating position.			
14.6	Road traffic of self-propelled machinery								
14.6.1	Injury as a result of collision with other vehicular traffic while at work site.	A flashing light is fitted to the cabin roof to increase the visibility of the forklift to surrounding traffic.	B	3	H	Implement a traffic management system; Ensure a traffic management system is enforced.			
14.6.2	Injury when travelling on public roads.	A flashing light is fitted to the cabin roof to increase the visibility of the forklift to surrounding traffic.	C	4	E	Ensure that if the forklift is to be driven on public roads that a traffic management plan is developed and implemented.			
14.7	Movement of pedestrian-controlled machinery	Not pedestrian controlled.			NA				
15	Mechanical hazards (due to failure of systems or devices)								
15.1	Hazards to exposed persons due to uncontrolled movement								
15.1.1	Mast lower due to hose failure.	See clause 10.2.1.							
15.1.2	Personnel exposed to hazards as a result of brake system failure.		E	3	M	Ensure that the necessary checks are performed on the brake system as described in the manual.			
15.2	Hazards due to break-up and/or ejection of parts								
15.2.1	Structural failure due to inappropriate long term storage.	Instructions in service manual [page number 1-18] as to the requirements which must be completed for long term storage.	D	2	L	Ensure that the machine is stored in accordance with the manufacturer's instructions and the necessary checks are performed prior to the machine returning to service.			
15.3	Hazards due to rolling over (roll over protection – ROP)								
15.3.1	Operator injured as a result of forklift roll over.		D	4	H	Ensure that machine is not driven at high speeds.			
15.3.2	Operator unable to exit from the cabin as a result of damage caused by a roll over.	There are two separate emergency exits provided on the forklift.	E	2	L	Ensure the operator is trained with respect to the emergency exits available and the correct operation.			
15.4	Hazard due to falling objects (falling object protection – FOP)								

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15.4.1	Operator struck by falling objects.	The cabin is designed and tested to provide FOPS protection.	D	2	L	Ensure that the FOPS cabin is not altered in any way; Ensure that the FOPS is replaced if it is damaged.			
15.4.2	Ground crew or passerby being struck by falling objects.		D	4	H	Barricade area from public access; Ensure that materials do not exceed the confines of the forks or attachment and load backrest; Ensure personnel do not enter the area under a raised load.			
15.5	Inadequate means of access	See clause 8.1.1.							
15.6	Hazards caused due to towing, coupling, connecting, transmission								
15.6.1	Injury from unsecured vehicle whilst transporting.	Tie down lugs fitted to chassis and are marked. Instructions for transportation included in operator's manual [page number 3-34 to 3-35].	D	3	M	Ensure that the unit is secured in accordance with the requirements in the manual			
15.6.2	Injury from unsecured vehicle whilst towing.	Tow point fitted to chassis and is marked. Instructions for towing included in operators manual [page number 3-32].	D	3	M	Ensure that the instructions provided in the operator's manual are followed.			
15.7	Hazards due to batteries, fire, emissions, etc.								
15.7.1	During battery maintenance.	See section 3.1.4.							
16	Hazards due to lifting operation								
16.1	Lack of stability								
16.1.1	Lack of stability due to overload.	Stability testing conducted in accordance with AS2359.17. Maximum rated capacity stamped on ID plate.	C	3	H	Ensure that only trained personnel are permitted to operate the forklift; Ensure that only authorised attachments are used; Ensure that the forklift is not used to pull fixed loads which are stuck in the ground, e.g. stumps or posts;			
16.1.2	Lack of stability during travelling.	Stability testing conducted in accordance with AS2359.17. Maximum rated capacity stamped on ID plate.	C	3	H	Ensure that only trained personnel are permitted to operate the forklift; Ensure that the forklift is operated in accordance with the instructions provided in the manual.			
16.1.3	Lack of stability due to operation on excessive slope.	Slope bubble fitted to indicate the lateral chassis inclination. Instructions provided in the operators manual [page number 1-14] for operating on transverse slope.	B	4	E	Ensure the operator does not use the forklift to lift loads on slopes which exceed the maximum permitted slopes as indicated on the level bubble.			
16.1.4	Lack of stability due to incorrect tyres being fitted to forklift.	Machine specifications section of the operator's manual includes tyre information.	D	4	H	Ensure that only approved tyres are used on the forklift.			
16.1.5	Lack of stability due to low tyre pressure.	Tyre pressures listed in section 2 of the operator's manual. Tyre pressure to be checked every 50 hours of service as listed in the maintenance section of the operator's manual.	C	3	H	Ensure that the tyre pressures are checked as per the requirements listed in the operator's manual.			
16.1.6	Lack of stability due to use of incompatible or unauthorised load attachment.	A manufacturer's plate is fitted in the cabin which lists all of the approved attachments. A list of approved attachments is included in the operators manual [section 4].	D	4	H	Instruct operators to only used approved load attachments; To refer to applicable maximum capacity for the corresponding attachment; To ensure the attachment is properly attached to the boom at all times.			

A	B	C	D1	D2	D	E	F	X	Y
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16.1.7	Instability caused by poor ground conditions.	Note in manual [page number 1-9] that care must be taken on muddy, sandy or soft ground. The machine mass is listed on the manufacturers plate attached to the cabin. Tyre loads, laden & unladen, listed on page 2-20 of the operator's manual.	C	4	E	Ensure the forklift is not used on ground which is unable to support the mass when fully laden.			
16.1.8	Instability caused by movement of liquid loads.		E	4	H	Ensure when liquids are carried that they are in a container fitted with baffles or the fluid is otherwise constrained from shifting (by using a full container); Operate machine according to the load and its ability to shift in centre of gravity.			
16.2	Derailment of machinery	Hi-Rail gear not fitted.			NA				
16.3	Loss of mechanical strength of machinery and lifting accessories								
16.3.1	Structure could collapse as a result of poor structural/mechanical condition due to fatigue/wear.	Maintenance and inspection instructions provided in the maintenance section of the operator's manual.	C	3	H	Inspect the machine in accordance with the instructions outlined in the service manual; Ensure that the machine is taken to an authorized repair centre for repairs when it reached the end of its design life.			
16.3.2	Persons could be injured by the unit if operating in poor mechanical or hydraulic condition.	Service manuals provided which detail repair and inspection procedures.	C	3	H	Ensure that the unit is checked, repaired and maintained by a competent person in accordance with the checklists contained in the operation manual; Modify maintenance program according to use; Instruct the operator/competent person to report all faults to management; Ensure all inspections, servicing, replacement of parts and modifications are entered into logbook; Use genuine replacement parts; Log replacement.			
16.3.3	Persons could be injured as a result of fatigue failure – Road Transport.	Tie-down points are provided at the front and rear of the forklift. Instructions for tying down the forklift for road transport are provided in the operators manual [page number 3-35].	D	2	L	Ensure the operators are instructed to properly restrain unit prior to transportation.			
16.3.4	Structural failure due to collision between mast and buildings, vehicles etc.	Control position provides the operator with visual contact with the resulting travel and extending structure movements.	D	3	M	Use a spotter if required; Ensure that all collisions and/or damage are reported and any damage is rectified before further use.			
16.3.5	Structural failure due to corrosion.	All ferrous metal components are painted.	D	4	H	Ensure that the forklift and attachments are inspected on a regular basis for evidence of corrosion by a competent person.			
16.3.6	Structural failure of fork arms due to wear.	Fork arms are sourced from reputable manufacturer. Fork wear to be checked every 500 hours as detailed in the maintenance section of the manual.	D	3	M	Ensure that only approved fork arms are fitted to machine as listed on load charts. Ensure that wear is checked as per the instructions provided by the manufacturer.			
16.3.7	Structural failure of attachment.	All authorized attachments have been load tested to 2.5 times the maximum rated capacity in accordance with AS2359.1 clause 6.7.2.	D	3	M	Ensure that only authorised attachments are used with the forklift.			
16.3.8	Due to inadequate structural design	Forklift designed and manufactured by reputable company to meet all applicable design standards. Structural calculations have been prepared using load combinations specified in AS2359.1 to confirm compliance.	E	2	L	Ensure that all specified inspections are performed in accordance with the manual and any faults/defects are logged and those not attributable to normal wear and tear are reported to the manufacturer.			

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16.4	Uncontrolled movements								
16.4.1	Mast lowers as a result of hose failure.	See clause 10.2.1.							
17	Inadequate view of trajectories of the moving parts								
17.1	Ground personnel crushed by moving loads.	Control position provides the operator with visual contact with the resulting travel and mast structure movements. Warning signs fitted which warn personnel to keep clear of forklift when it is in use.	D	4	H	Ensure that personnel do not enter the area in which the forklift is operating unless in emergencies.			
18	Hazards caused by lightning								
18.1	Persons could be injured if the unit is operated during storms.	See clause 2.1.3.							
19	Hazards due to loading/overloading								
19.1	Maximum rated capacity is exceeded.	Maximum rated capacity stamped on ID plate fitted in cabin.	C	3	H	Verify expected loading and confirm it is less than rated capacity. Ensure that operator does not attempt to lift loads in excess of the rated capacity.			
20	Controls								
20.1	Safe travel control	Travel speeds listed in the specifications section of the operator's manual.	C	3	H	Ensure the system speeds are maintained as per the manufacturer's instructions.			
21	Markings								
21.1	Safety decals/labels are incomplete.		C	2	M	Ensure that the operator carries out the pre-operational check of safety decals before use and replaces any illegible or missing decals.			

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