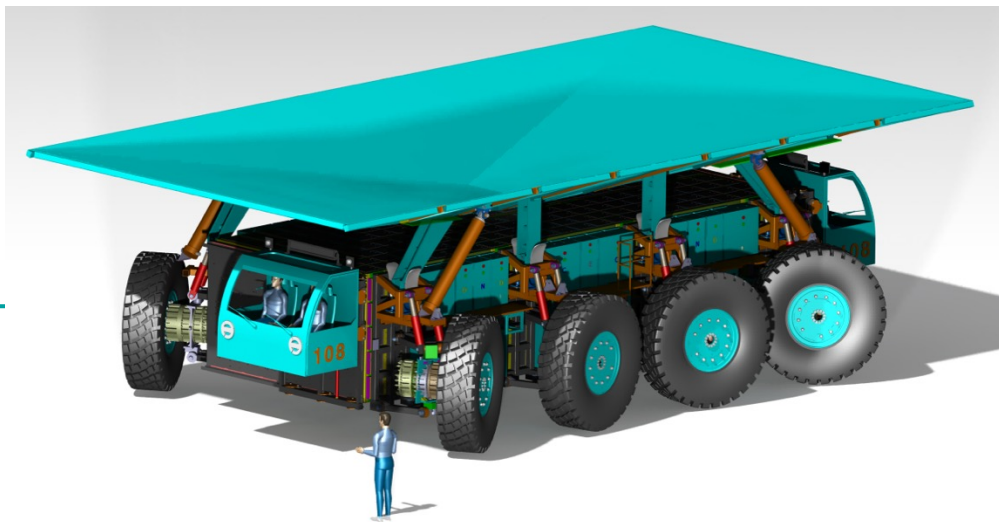


Mining Truck

Tiro

Technical Spec.
81-283 tons



Agenda



- Specifications Page 03
- Operation Page 13
- Maintenance Page 20



Specifications, Story



- Purchaser:
- Min Diversity
 - Lower Price
 - Low Import

- Driver:
- Less Mistake
 - Comfort Cabin
 - Great View

- Manufacturer:
- Simple Staff
 - General Material
 - Few Tool



- Servicer:
- Simple Staff
 - Few Tool
 - Lower Time



- Manager:
- Cheaper Price
 - Longer Life
 - Cheaper Service



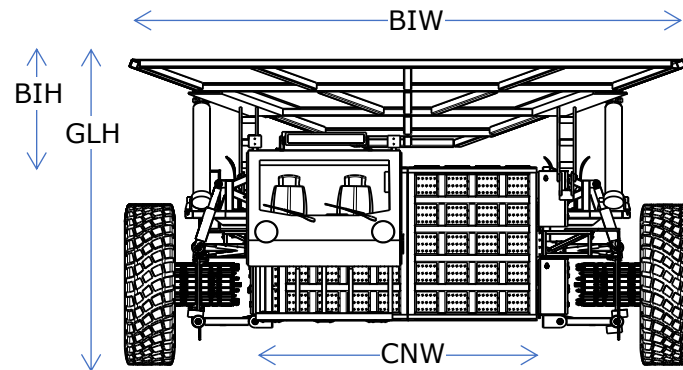
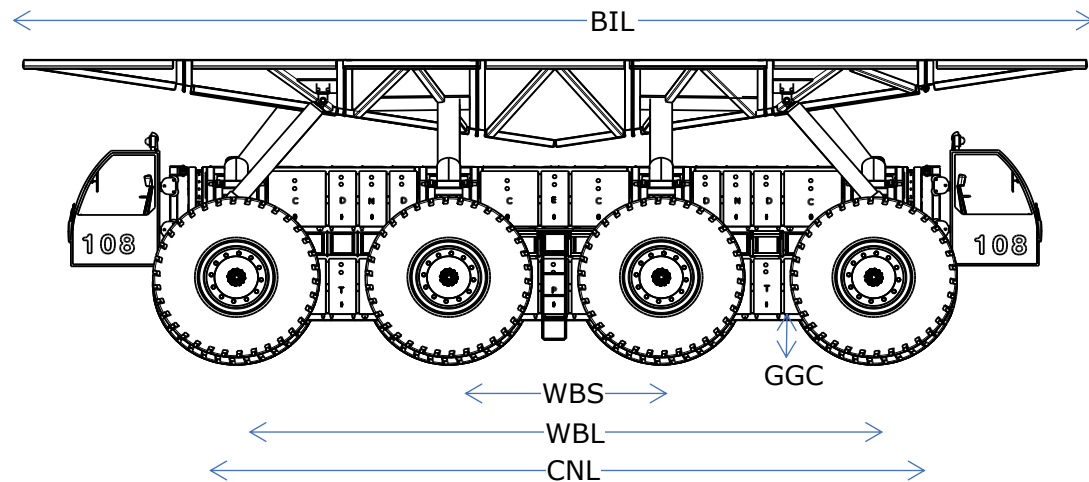
Specifications, General



Mining Trucks Spec.						Power		
Code	Max. Payload Tonne	Max. Weight Tonne	Heaped Volume m3	Wheel x Power #x#	Max. Speed km/h	Rated Power #xkW	Rated Power kW	Speed @15% km/h
MT081	74	111	53	06x06	48	06x143	858	18
MT108	99	148	67	08x08	48	08x143	1 144	18
MT135	123	185	80	10x10	48	10x143	1 430	18
MT170	155	232	104	06x06	43	06x310	1 860	18
MT226	206	310	133	08x08	43	08x310	2 480	18
MT283	258	387	162	10x10	43	10x310	3 100	18

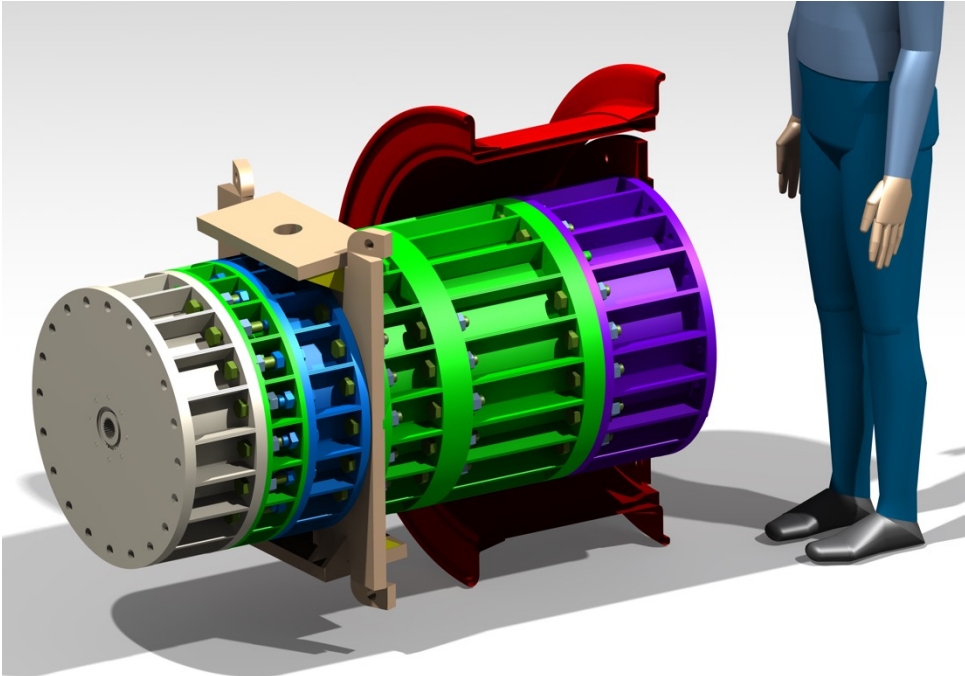
Struck volume is 66% of heaped volume.

Specifications, Dimensions

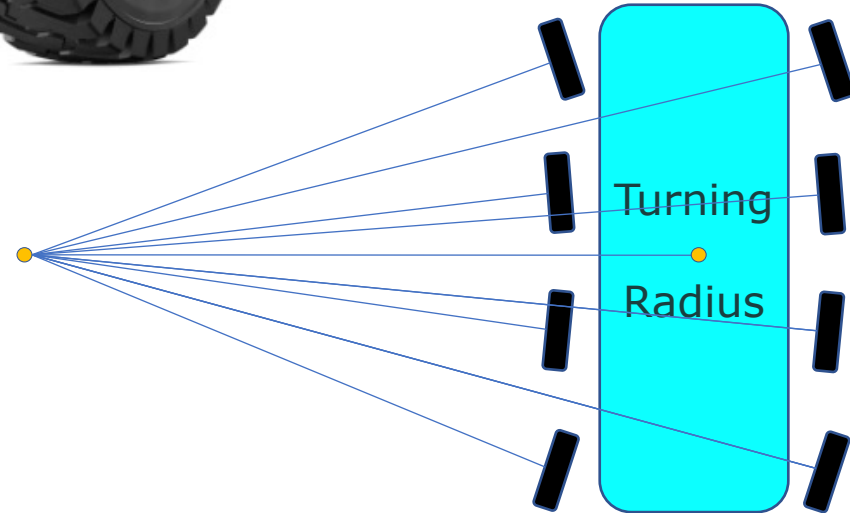


Mining Trucks Dimensions				Wheel			Chassis			Wheel			Bucket					General		
Code	Max. Payload Tonne	Number of Axles #	Chassis Profile mm	Suspen. Length mm	Steering Space mm	Steering Angle Deg.	Nominal Height mm	Nominal Width mm	Nominal Length mm	Base Long mm	Base Short mm	Base Mid mm	Internal Width mm	Internal Length mm	Internal Height mm	Struck Volume m3	Heaped Volume m3	Turning Radius mm	Ground Clearance mm	Loading Height mm
MT081	74	3	100	1830	2800	30	2000	3200	6400	5600	-	✓	7460	11200	1100	36	53	7700	500	3900
MT108	99	4	100	1830	2800	30	2000	3200	9200	8400	2800	-	7460	14000	1100	44	67	10100	500	3900
MT135	123	5	100	1830	2800	30	2000	3200	12000	11200	5600	✓	7460	16800	1100	53	80	12600	500	3900
MT170	155	3	140	2090	3600	30	2400	3200	8000	7200	-	✓	8220	12800	1700	69	104	9300	600	5120
MT226	206	4	140	2090	3600	30	2400	3200	11600	10800	3600	-	8220	16400	1700	89	133	12400	600	5120
MT283	258	5	140	2090	3600	30	2400	3200	15200	14400	7200	✓	8220	20000	1700	108	162	15500	600	5120

Specifications, eAxle



Chassis Size	Chassis Profile	Tire Size	Tire Code	Load Tonnes	Roll Dia. mm	Width mm
2	□100x8	2	24.00R35	18.5	1958	655
3	□140x8	3	33.00R51	38.7	2727	920



Specifications, Downhill



Specifications, Traction Dynamics



Mining Trucks Traction Dynamics						Motor				Vehicle			Speed vs Grade, 30s				
Code	Max Weight Tonne	Motor Code #	Motor Number #	Gearbox Ratio #	Rolling Diameter mm	Rated Torque Nm	Rated Speed RPM	Peak Torque Nm	Peak Speed RPM	Peak Traction kN	Continu. Power kW	Peak Acc @0% m/s2	Grade, %	0.0%	5.0%	10.0%	15.0%
MT081	111	2	06	42.00	1958	620	2200	1080	5500	278	857	2.5	Roll, %	1.4%	1.3%	1.2%	1.1%
MT108	148	2	08	42.00	1958	620	2200	1080	5500	371	1143	2.5	Drag, %	1.2%	0.6%	0.3%	0.2%
MT135	185	2	10	42.00	1958	620	2200	1080	5500	463	1428	2.5	V, km/h	48	41	25	18
MT170	232	3	06	42.00	2727	1560	1900	3000	3500	554	1862	2.4	V, km/h	48	41	25	18
MT226	310	3	08	42.00	2727	1560	1900	3000	3500	739	2483	2.4	V, km/h	48	41	25	18
MT283	387	3	10	42.00	2727	1560	1900	3000	3500	924	3104	2.4	V, km/h	48	41	25	18





Specifications, Brake Dynamics

Mining Trucks Brake Dynamics							Brake			Brake Distance vs Grade				Continuous Speed vs Grade at 40°C			
	Max Weight	Brake Code	Brake Number	Gearbox Ratio	60 kW Cooling	Rolling Diameter	Wheel Torque	Axial Force	Max Dece @0%	Grade, %	0.0%	-10.0%	-20.0%	Grade, %	-10.0%	-15.0%	-20.0%
Code	Tonne	#	#	#	#	mm	kNm	kN	m/s2	Roll, %	1.2%	1.2%	1.2%	Roll, %	1.4%	1.2%	1.0%
MT081	111	2	06	1.00	8	1958	168	1028	9.3	Vi, km/h	48	48	48	Drag, %	1.0%	0.3%	0.1%
MT108	148	2	08	1.00	11	1958	168	1371	9.3	X, m	10	11	12	V, km/h	21	12	9
MT135	185	2	10	1.00	14	1958	168	1713	9.3	X, m	10	11	12	V, km/h	22	12	9
MT170	232	3	06	0.60	18	2727	691	1824	7.9	X, m	10	11	12	V, km/h	22	12	9
MT226	310	3	08	0.60	24	2727	691	2432	7.9	X, m	11	13	15	V, km/h	23	13	9
MT283	387	3	10	0.60	30	2727	691	3040	7.9	X, m	11	13	15	V, km/h	23	13	9



Specifications, Advantages



	Technology	Performance	Maintenance
1	Only One Central Software	No Driver Cabin	Quick Connection Ele. & Hyd.
2	LIDAR Obstacles Detection	4 Way Dumping	Modular Electronic Panels
3	New Tech Planetary Drive	Low Loading Height	Remote Software Update
4	Axial Flux PMSM eMotor	Battery/Diesel Capable	40ft Container Shipment
5	GPS based RouteDrive	Hydraulic Heavy Brakes	General Spare Parts
6	FOC Motor Controller	Swappable Battery/Diesel	Fast Replace Boxes
7	Similar zone ECUs	All Data in Control Room	Maintenance Aisle
8	X by wire	Pantograph Charging Capable	Low Overall Cost
9	Linux OS	Route/Tele/Human Drive Ability	Low Sleep Time

Specifications, Special



Battery EV vs Other Diesels:

- 80% Less Accidents for Driver
- 50% Less Vibration vs Diesels
- 80% Less Maintenance Offtime
- 20% Less Maintenance Costs
- 80% Less Noise vs Diesels
- No Fuel Supply problems

Hybrid Diesel vs Other Diesels:

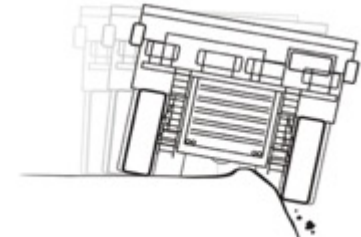
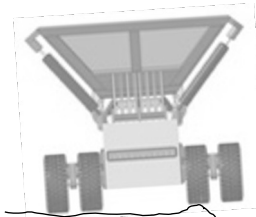
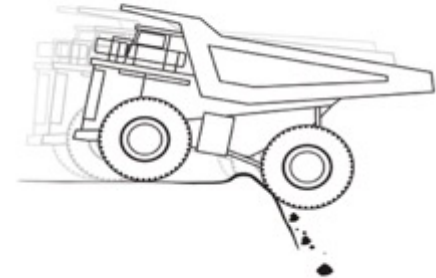
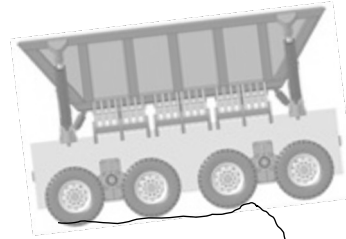
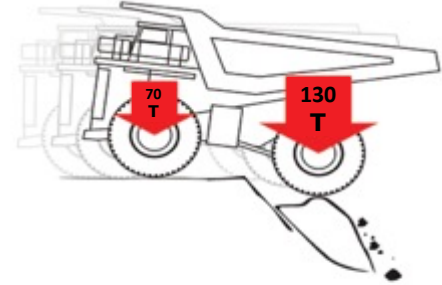
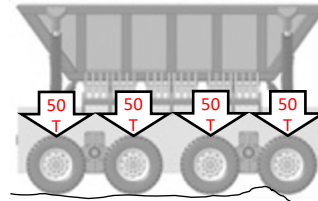
- 80% Less Accidents for Driver
- 80% Less Maintenance Off time
- 20% Less Maintenance Costs



Specifications, Unloading



Operation, Challenges



Operation, Level of Automation



LEVELS OF DRIVING AUTOMATION



0

NO AUTOMATION

Manual control. The human performs all driving tasks (steering, acceleration, braking, etc.).



1

DRIVER ASSISTANCE

The vehicle features a single automated system (e.g. it monitors speed through cruise control).



2

PARTIAL AUTOMATION

ADAS. The vehicle can perform steering and acceleration. The human still monitors all tasks and can take control at any time.



3

CONDITIONAL AUTOMATION

Environmental detection capabilities. The vehicle can perform most driving tasks, but human override is still required.



4

HIGH AUTOMATION

The vehicle performs all driving tasks under specific circumstances. Geofencing is required. Human override is still an option.



5

FULL AUTOMATION

The vehicle performs all driving tasks under all conditions. Zero human attention or interaction is required.

THE HUMAN MONITORS THE DRIVING ENVIRONMENT

THE AUTOMATED SYSTEM MONITORS THE DRIVING ENVIRONMENT

Operation, 4 Options



ManDrive:

- Level 1
- Base on driver
- Seat in truck
- Cameras for assist
- Real Feel
- Reroute on obstacle
- Man load/Unload

TeleDrive:

- Level 2
- Base on tele driver
- Seat in building
- Cameras are major
- Sound feel
- Reroute on obstacle
- Man load/Unload

RouteDrive:

- Level 4
- Base on route
- Driver learn route
- Cameras for record
- Sensors feel
- Stop on obstacle
- Man load/Unload

AutoDrive:

- Level 5
- Base on AI
- AI decide on route
- Cameras for record
- Sensors feel
- Reroute on obstacle
- AI load/Unload



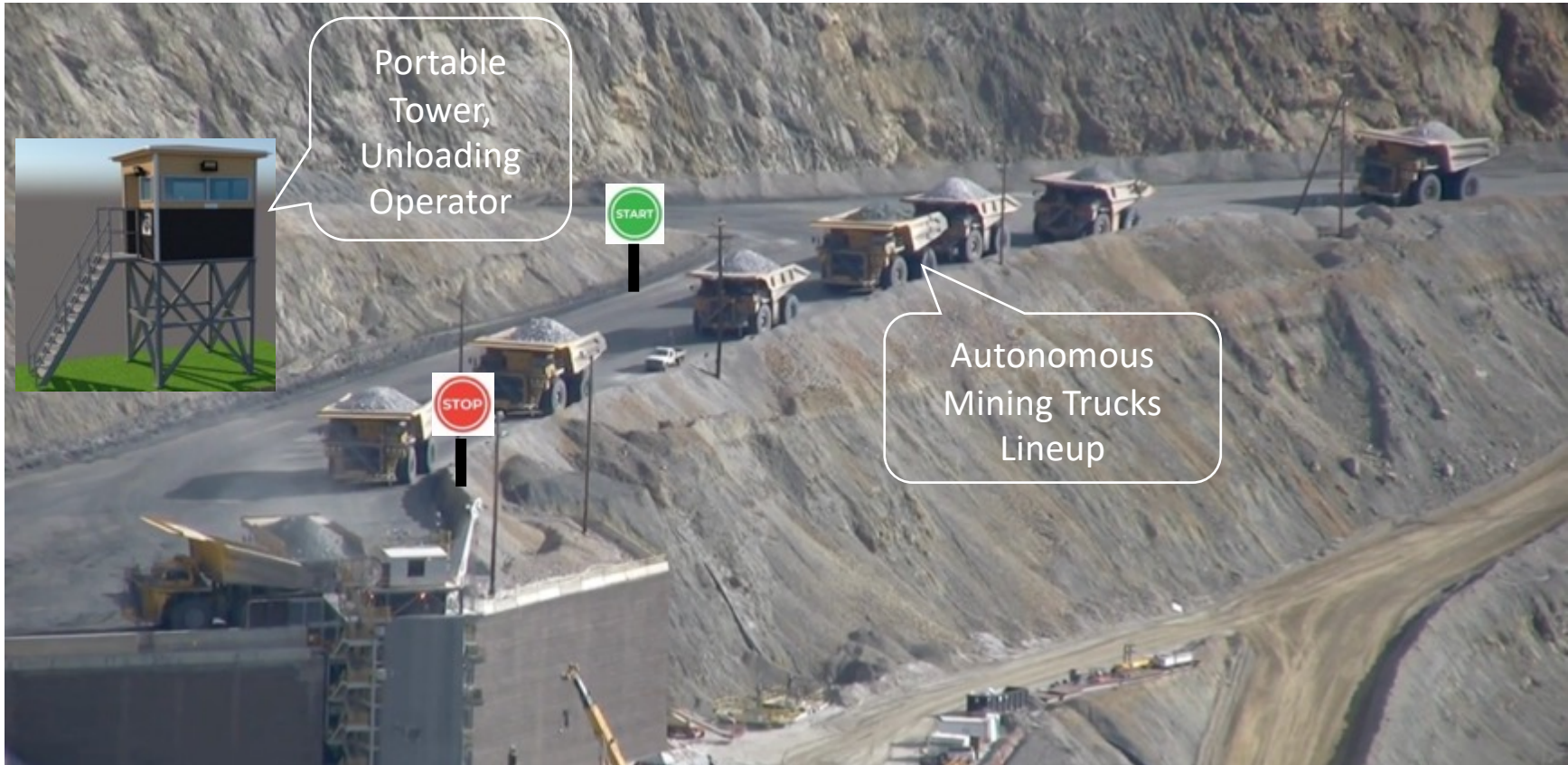
Operation, Mine Routes



Operation, Loading



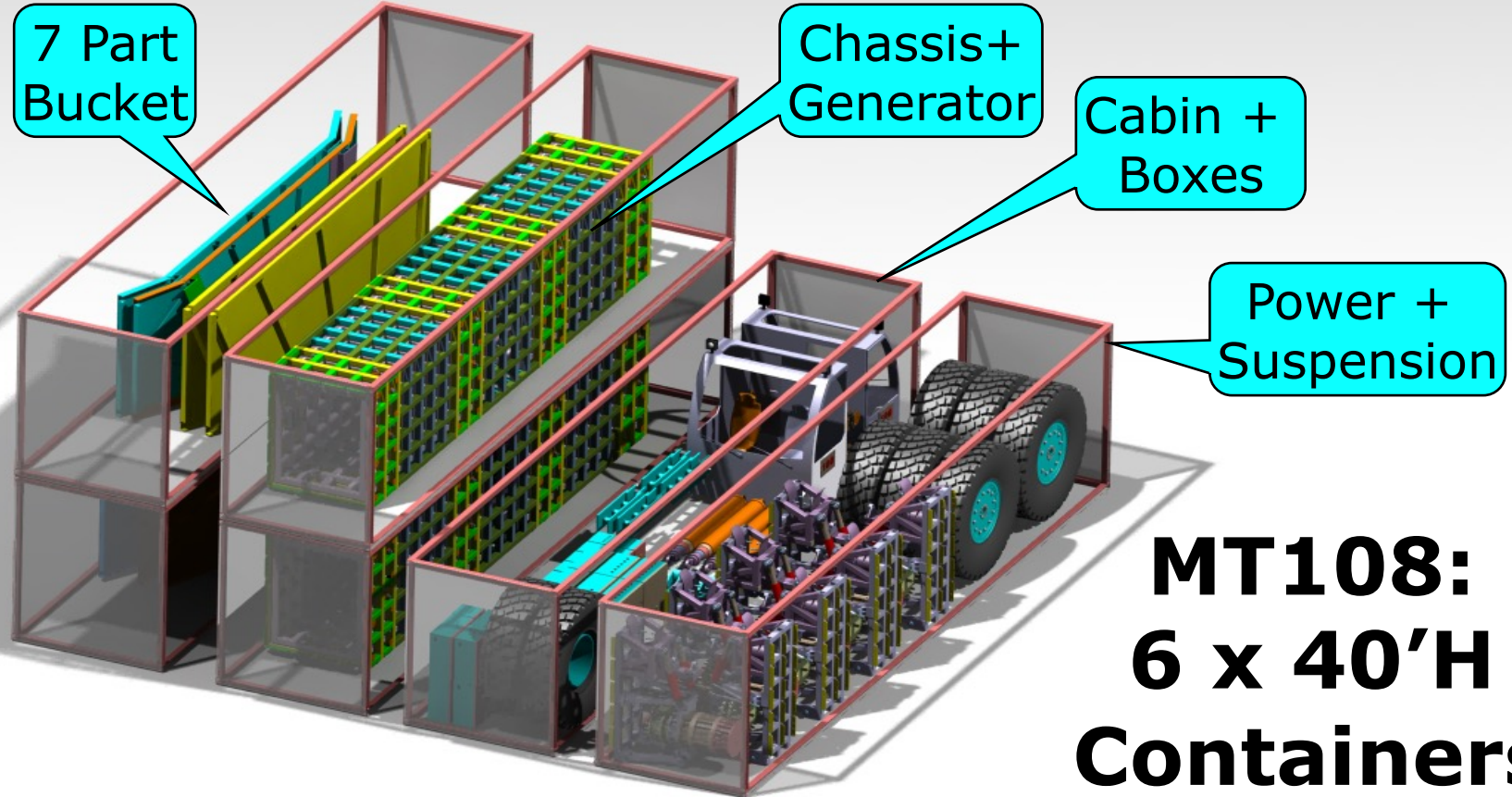
Operation, Unloading Zone



Operation, Control Center



Maintenance, Shipment

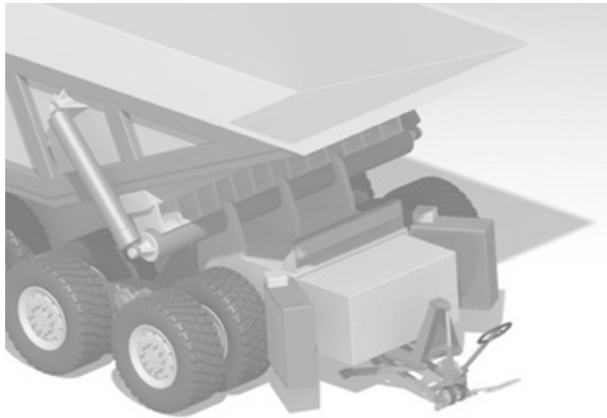


**MT108:
6 x 40'H
Containers**

Maintenance, Change



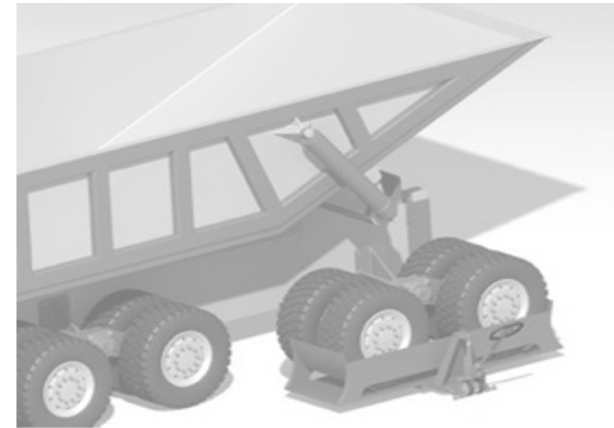
Generator Change
15 min.



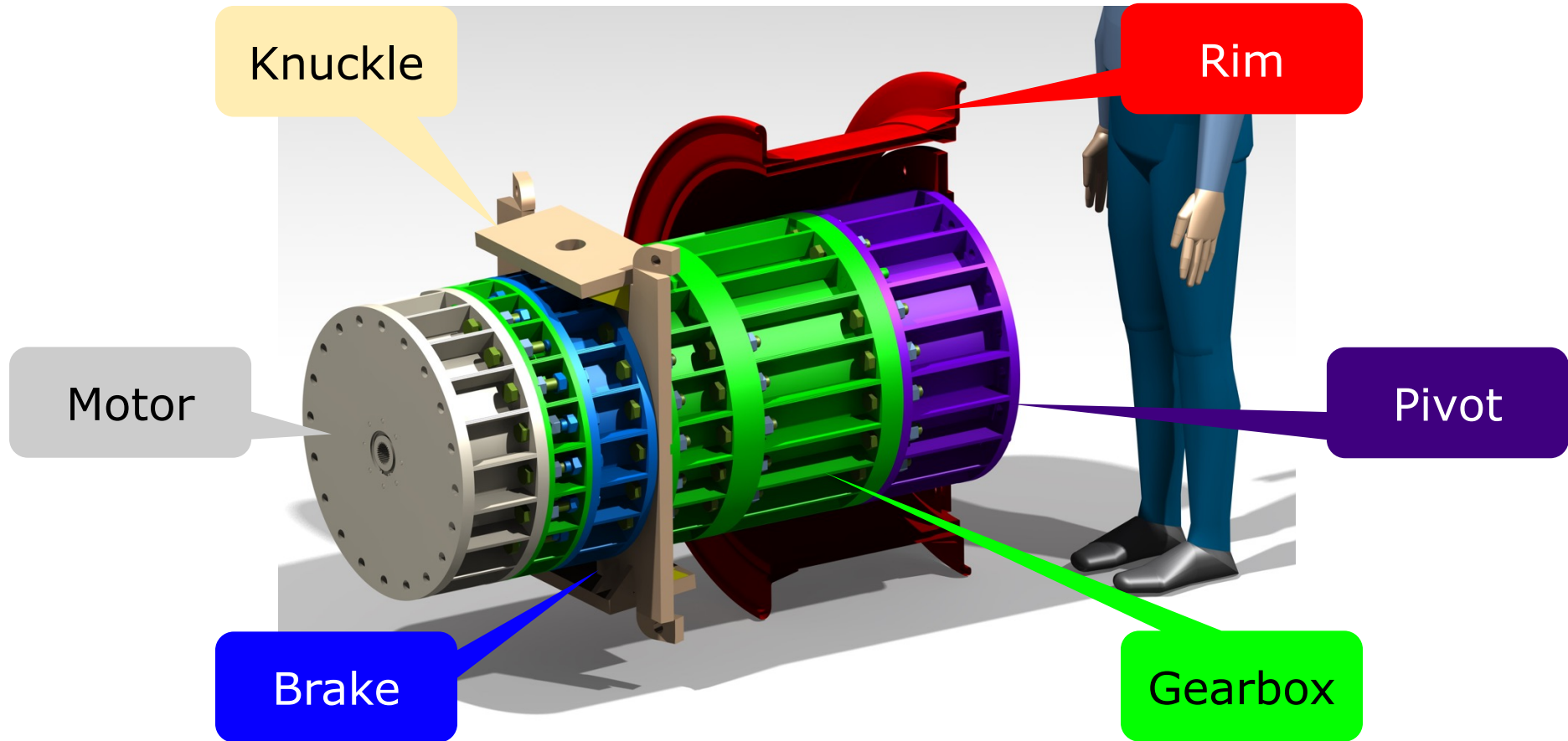
Tire Change
20 min.



Power Change
30 min.



Maintenance, eAxle

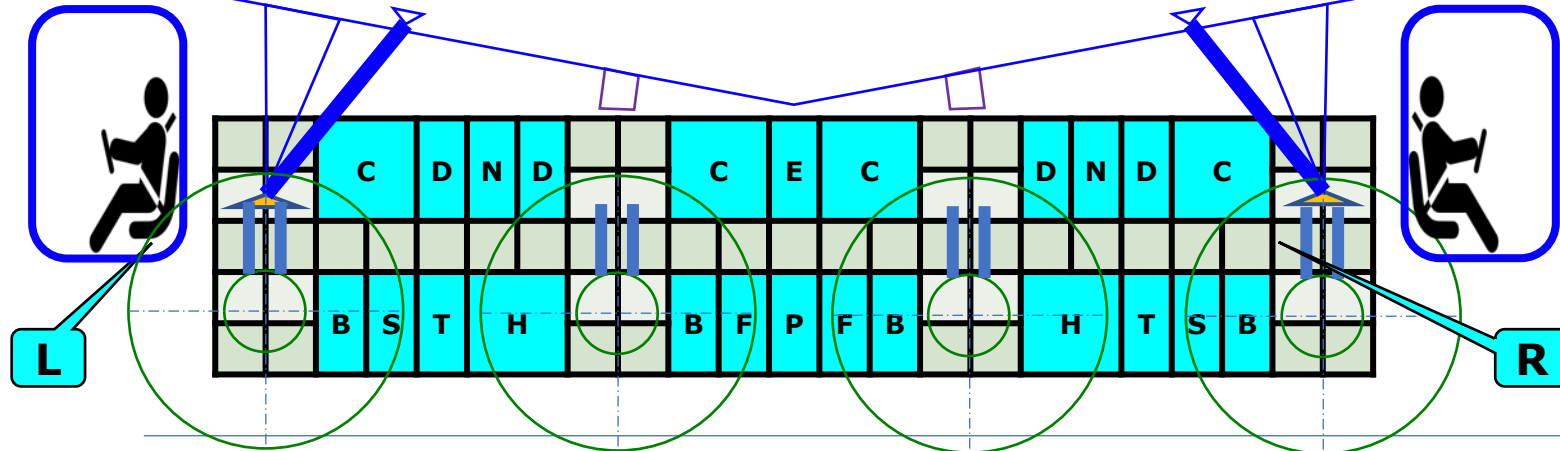


Maintenance, Boxes



Boxes in MT108						
#	Group	Box	Size	W, kg	#	Descr.
1	21	Leader	B1	54	2	4 DModule
2	22	Environment	B1	44	2	4 DModule
3	31	Drive	B1	50	8	140 kW
4	36	Brake	B1	60	8	1/2"
5	42	Suspension	B1	70	8	1/2"
6	43	Navigation	B1	70	4	1/2"
7	53	Rectifier	B1	56	4	260 kW
8	54	Cooling	B2	130	8	30+60kW
9	55	Hydraulic	B2	160	4	15 kW
10	56	Pneumatic	B1	120	2	5 kW
11	72	Tub	B1	140	4	1/2" & 1"
12	-	Free	B1	B4	2	-
Total				4 620	56	-

1:60
+



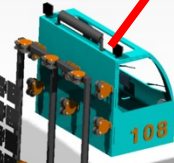


Maintenance, Suppliers

Sensors



RENESAS



nurmek



Maintenance, Servicing





Warranty:

2 years or 5,000 Hours

Whichever ends first

Parts Supply: 10 Years