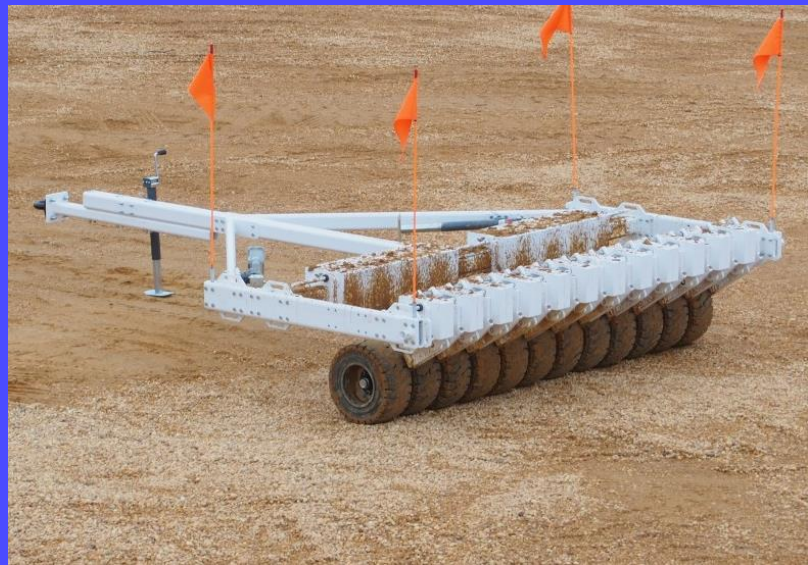


HRI

Humanistic Robotics Inc.

Mine & IED Roller Solutions

Route Verification, Vehicle Protection, Dismounted, Area Proofing



Mine & IED Rollers

- RCR-A - Route Clearance Roller - Advanced
- RCR-B - Route Clearance Roller - Basic
- Dismounted Protection Roller
- ACR - Area Clearance Roller

High Accuracy = Safety

Modularity = Cost Effective

Customized for Mission Requirements

All HRI rollers can be tuned for specific missions, threats, clearance widths, and prime movers

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HRI

Proprietary - Patents Pending

- Increased **safety** through consistent ground coverage and terrain mapping
- **Modular Design** minimized down time for simple repairs and routine maintenance using COTS parts
- Simplicity of design **improves survivability** and **lowers total cost of ownership**
- **Quick assembly** and breakdown to optimize logistics footprint
- Utilizes HRI common swing arm which has been thoroughly analyzed, tested in real world environments, and fielded
- Improved **handling** over HRI RCR-Basic, ideal for missions requiring **higher op-tempo**
- Optional steering with hydraulic cylinders to improve turning radius is available



Tunable Design

The Route Clearance Roller - Advanced from HRI is able to be tuned to target specific threats. This allows one roller to be used as a route verification tool for any threat from light trigger IEDs to Anti-Tank mines

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Humanistic Robotics Inc.

Route Clearance Roller - Advanced

Vehicle Protection and Route Verification

Design

Each HRI roller is custom configured for specific user mission requirements, while simplifying maintenance and reducing costs.

The RCR-Advanced roller evolved from previous HRI efforts in the mine clearance field to increase accuracy of rollers through consistent ground coverage, maneuverability and leverage more common prime movers.

The RCR-A was designed as a route clearance and route verification roller to be used in conjunction with higher speed mine and IED clearance. The independently-rotating roller banks improve handling for vehicles that require higher-speed capability



Performance

The RCR-A is built on years of extensive testing and experience in the explosive hazard industry. The Advanced roller uses the common swing arm design seen in many HRI products that has been thoroughly tested during explosive tests, endurance testing, and successful real world fielding.

Load cell laboratory tests are run to confirm the roller is meeting its objective ground pressure targets set by the requirements.



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Proprietary - Patents Pending

Route Clearance Roller - Advanced

Vehicle Protection and Route Verification



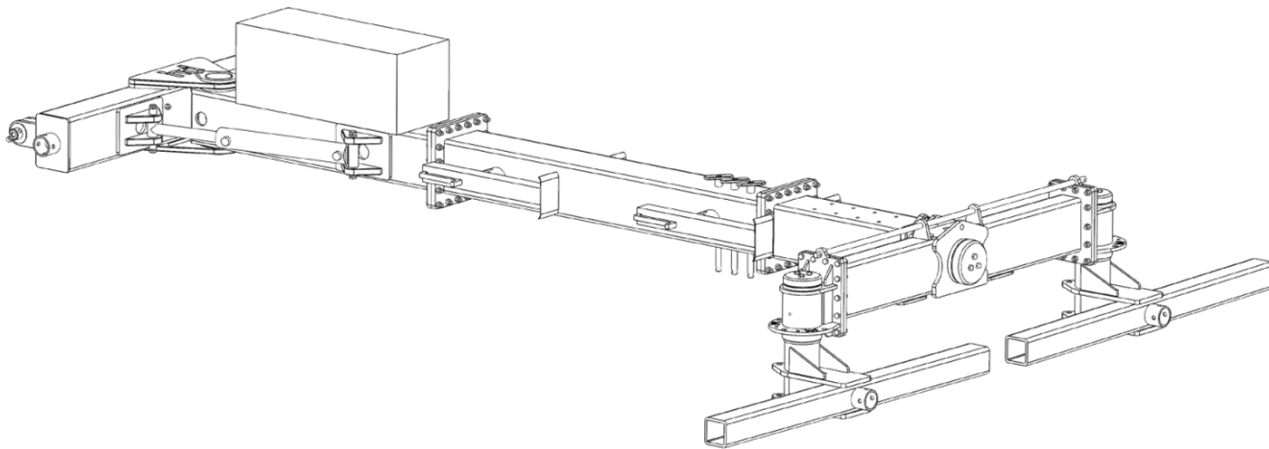
Swing Arm Assembly

- Welded steel asymmetrical swing arm
- Easily removable modular clamp collar attachment to reduce down time for maintenance and replacement
- COTS hubs, bearings, and wheel for quick replacement



Frame Assembly

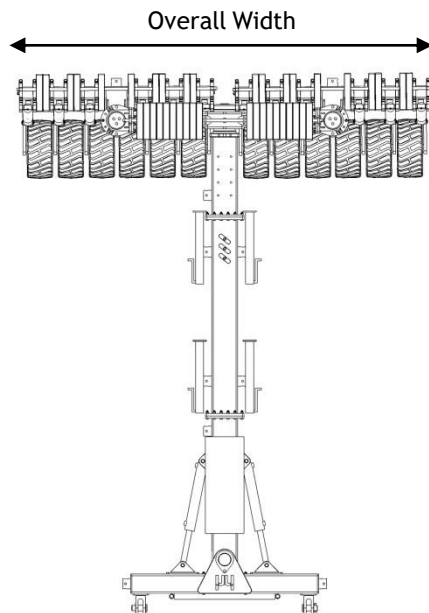
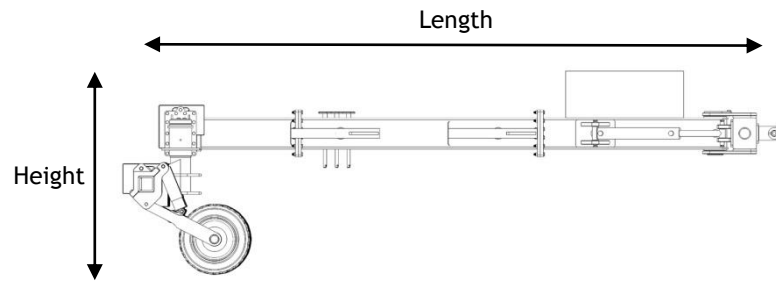
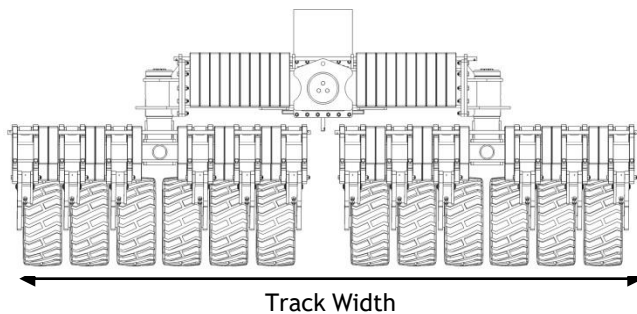
- Welded steel box tube construction
- Available steering with hydraulic cylinders
- Frame can be broken down into parts for transportation
- Large diameter pivots with incorporated grease fitting for simple maintenance



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Specifications



Weight

- 3500 lbs (1600 kgs) no ballast weight
- 5500 lbs (2500 kgs) with ballast weight
- The RCR-Advanced can be custom tailored for specific missions and targets by adding or removing ballast weights. Additionally, the roller can be tuned with custom springs for specific applications.

Depending on roller specification and configuration, the above weights are subject to change.

Dimensions

- Length: 166 in (4.2 m)
- Height: 76 in (1.9 m)
- Overall Width: 128 in (3.25 m)
- Track Width: 122 in (3.1 m)
- 18 in (0.45 m) wheel diameter
- 8 in (0.2 m) wheel width

Depending on roller specification and configuration, the above dimensions are subject to change.

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Route Clearance Roller - Basic

Route Verification and Proofing

- Increased **safety** through consistent ground coverage and terrain mapping
- **Modular Design** minimizes down time for simple repairs and routine maintenance using COTS parts
- Simplicity of design **lowers total cost of ownership**
- **Quick assembly** and breakdown to reduce logistics requirement
- Utilizes HRI common swing arm which has been thoroughly analyzed, tested in real world environments, and fielded
- Heavyweight design able to **trigger Anti-Tank mines**
- Universal tow point for use with wheeled or tracked vehicles



Tunable Design

As with all HRI rollers, the Route Clearance Roller - Basic is able to be tuned to target specific threats. By adding or removing small ballast plates, the roller can target light weight trigger IEDs or larger Anti-Tank mines.

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Route Clearance Roller - Basic

Route Verification and Proofing

Design

The Route Clearance Roller - Basic was designed as a heavy weight roller capable of hitting anti-tank targets in a route proofing and vehicle protection mission.

The roller utilizes similar construction techniques pioneered from earlier Area Clearance Roller designs which allow for easy maintenance and simple assembly.



Performance and Testing

The RCR-B has been thoroughly tested through explosive tests, a simulated endurance test in a representative environment, and is currently fielded in successful route proofing operations.

The roller is able to closely track undulations of the ground thanks to its independent swing arms. Large rubber tires improve obstacle clearance while reducing rolling resistance in soft soils.



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Route Clearance Roller - Basic

Route Verification and Proofing



Swing Arm Assembly

- Welded steel asymmetrical swing arm
- Easily removable modular clamp collar attachment to reduce down time for maintenance and replacement
- COTS hubs, bearings, and wheel for quick replacement



Frame Assembly

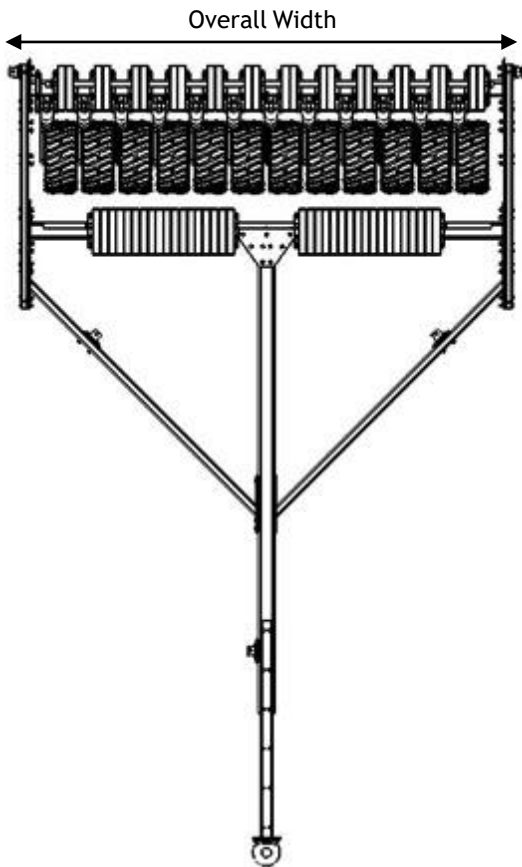
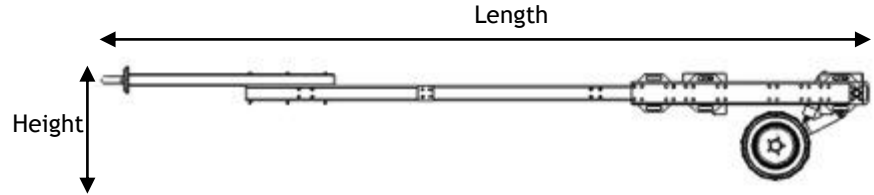
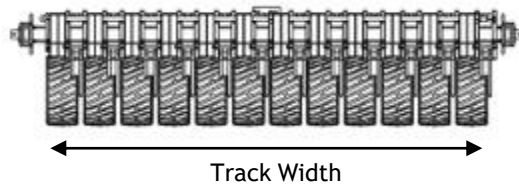
- Welded steel box tube construction
- Symmetrical parts to aid in assembly
- Easily adjustable vehicle offset distance
- Bolted frame assembly to break down for transportation
- Simple frame design requires no maintenance



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Specifications



Weight

- 2800 lbs (1270 kgs) no ballast weight
- 5500 lbs (2500 kgs) with ballast weight
- The RCR-Basic can be customized for specific missions or prime movers. Widths can be adjusted as well as custom springs with additional ballast plates to meet ground force requirements.

Depending on roller specification and configuration, the above weights are subject to change.

Dimensions

- Length: 200 in (5 m)
- Height: 32 in (0.8 m)
- Overall Width: 130.5 in (3.3 m)
- Track Width: 112 in (2.8 m)
- 18 in (0.45m) wheel diameter
- 8 in (0.2 m) wheel width

Depending on roller specification and configuration, the above dimensions are subject to change.

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Dismounted Protection Roller

Dismounted Personnel Protection

- Personnel protection roller intended for dismounted troop missions
- Increased **safety** through consistent ground coverage and terrain mapping
- **Modular Design** minimized down time for simple repairs and routine maintenance using COTS parts
- Simplicity of design **lowers total cost of ownership**
- **Quick assembly** and breakdown to minimize logistics requirements
- Utilizes HRI common swing arm which has been thoroughly analyzed, tested in real world environments and fielded
- Low weight, highly mobile and easy to transport with limited track width for use with small robotic movers



Tunable Design

As with all HRI rollers, the Dismounted Protection Roller is able to be tuned to target specific threats and host vehicles. By adding or removing small ballast plates, the roller can meet a variety of trigger thresholds. By varying the number of swing arms, the roller can accommodate different prime movers.

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Dismounted Protection Roller

Dismounted Personnel Protection

Design

Each HRI roller is custom configured for specific user mission requirements, while simplifying maintenance and reducing costs.

The Dismounted Protection Roller evolved from previous HRI efforts in the mine clearance field to increase accuracy of rollers through consistent ground coverage, maneuverability and leverage more common prime movers.

Built to protect dismounted personnel, the roller is small and light weight. The ground force achieved is best suited to Anti-Personnel mines and light trigger IEDs, although ground force can be adjusted.



Performance

The Dismounted Protection Roller uses many of the same base components as all HRI roller products. As such, many of the performance characteristics are similar depending on fit out and mission requirements. The common swing arm design used has been thoroughly tested during explosive tests, endurance testing, and fielding in route clearance operations.

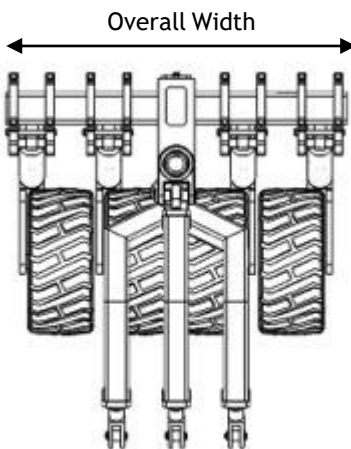
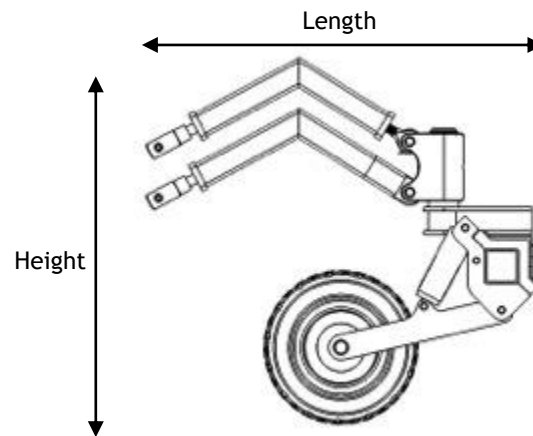
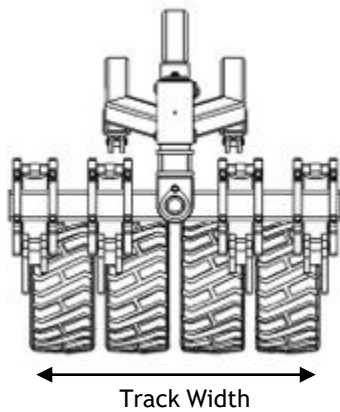
Load cell laboratory tests are run to confirm the roller is meeting its objective ground pressure targets depending on threat type.



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Specifications



Weight

- 815 lbs (370 kgs) base configuration
- 200 lbs (90 kgs) additional optional ballast
- The Dismounted Protection Roller can be custom tuned for specific missions and targets by adding or removing ballast weights. Additionally, the roller can be tuned with custom springs or extra swing arms for added clearance width.

Depending on roller specification and configuration, the above weights are subject to change.

Dimensions

- Length: 46 in (1.2 m)
- Height: 43 in (1.1 m)
- Overall Width: 42 in (1 m)
- Track Width: 36 in (0.9 m)
- 18 in (0.45 m) wheel diameter
- 8 in (0.2 m) wheel width

Depending on roller specification and configuration, the above dimensions are subject to change.

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Anti-Personnel Roller

Anti-Personnel Mine Area Clearance

- Increased performance through consistent ground coverage
- Can be used for technical survey, area reduction, QA/QC, proofing, confidence building
- Over 99% accuracy in third party tests
- Quick assembly and breakdown to minimize logistics requirements
- Simple repairs and maintenance using COTS parts and modular design increases operational efficiency
- Highly survivable against explosive targets, continued use after detonation
- Available in towed or pushed configurations



Tunable Design

The Anti-Personnel Roller (APR) from HRI is able to be tuned to target specific threats and operating conditions. This allows one roller to be used for a variety of missions targeting different threats.

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Humanistic Robotics Inc.

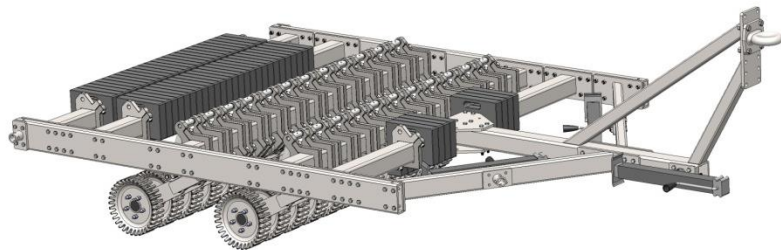
Anti-Personnel Roller

Anti-Personnel Mine Area Clearance

Design

In designing the Anti-Personnel Roller, HRI first looked under the surface of the soil to see what it would take to trigger mines with a roller. In simulated minefields, HRI engineers measured mine roller ground force in different soils, compaction levels, speed, weight, and depth, and used the data to set technical specifications for the roller. With these specifications, the Roller was designed literally from the ground up to deliver more than the minimum ground force levels required to hit AP mines.

The roller's suspended swing arm array allows the user to vary the weight and width according to conditions and vehicle requirements. Swing arm and roller wheel replacement can be done in minutes, meaning field maintenance and shipping are cheap, fast, and easy.



Testing and Performance

HRI performed extensive testing over the course of four generations of roller development to evaluate the Roller's mine and IED clearing performance. Independent tests of the Roller Gen IV have also been completed by the Keweenaw Research Center (KRC) at Michigan Technological University and the Swedish EOD and Demining Centre (SWEDEC). Over the course of the two tests, numerous mine simulant types were evaluated at burial depths ranging from 0-10 cm. Test results from KRC and SWEDEC indicated the Roller successfully cleared more than 99% of the more than 1200 mine simulants targeted.



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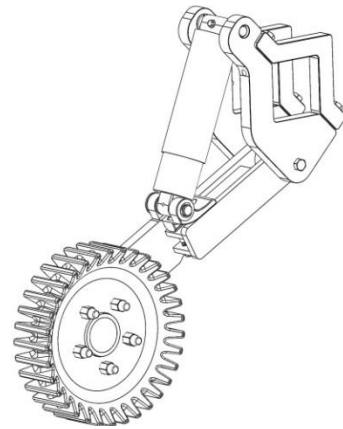
Anti-Personnel Roller

Anti-Personnel Mine Area Clearance



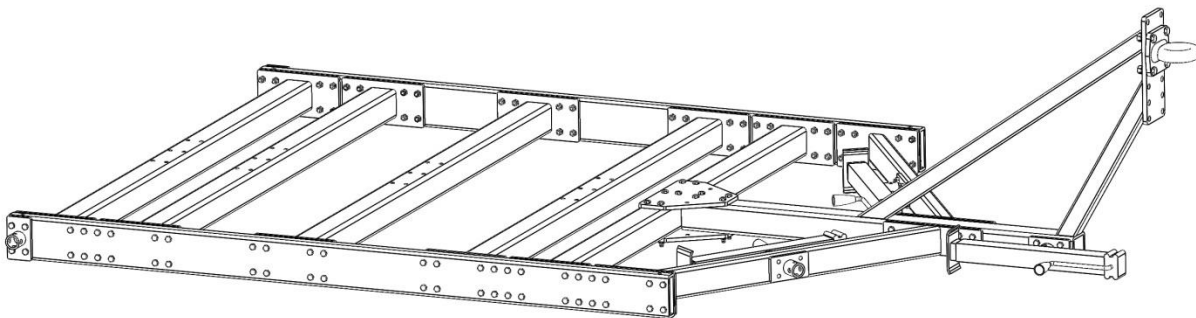
Swing Arm Assembly

- Welded steel asymmetrical swing arm, derived from extensive scale testing
- Easily removable modular clamp collar attachment to reduce down time for maintenance and replacement
- Simple pivot bushings for reduced maintenance and easy replacement



Frame Assembly

- Welded steel box tube construction
- Simple towed design
- Optional anti-dive attachment kit for better handling in soft soils
- Frame can be easily broken down into parts for transportation



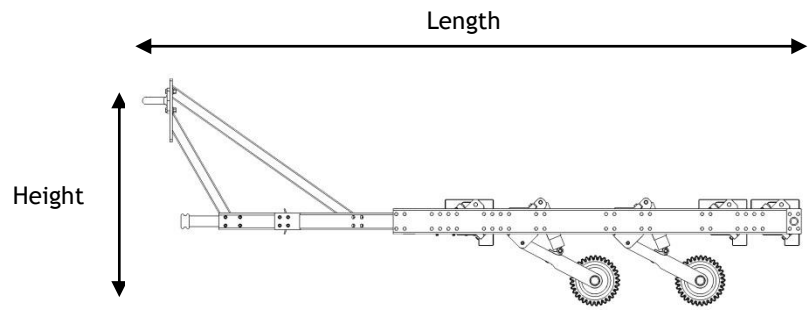
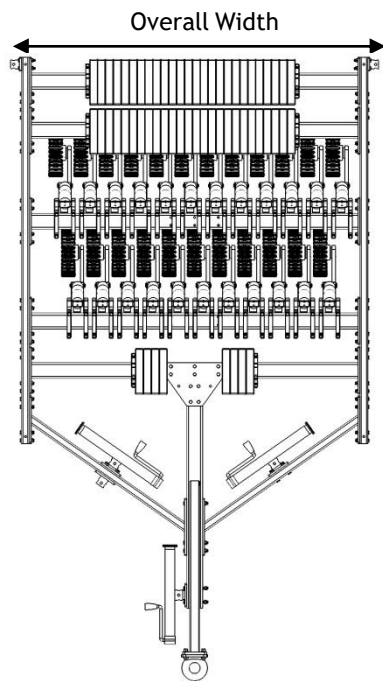
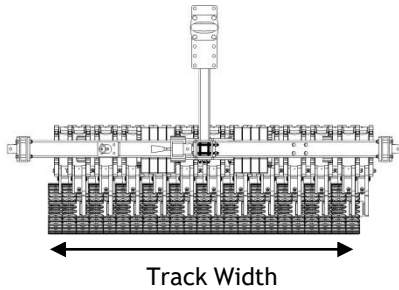
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Anti-Personnel Roller

Anti-Personnel Mine Area Clearance

Specifications



Weight

- 6700 lbs (3050 kgs) base configuration
- The APR can be custom tailored for specific missions and targets by adding or removing ballast weights and widths. Additionally, the roller can be tuned with custom springs for specific applications.

Depending on roller specification and configuration, the above weights are subject to change.

Dimensions

- Length: 152 in (3.9 m)
- Height: 54 in (1.4 m)
- Overall Width (base configuration): 93 in (2.4 m)
- Track Width: 72 in (1.8 m)
- 12 in (0.3 m) wheel diameter
- 3.5 in (0.09 m) wheel width

Depending on roller specification and configuration, the above dimensions are subject to change.

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