



Opens in 2014:

A world unique
test facility for
active safety

ASTAZERO

ACTIVE SAFETY TEST AREA

Active safety is necessary

Every year some 1.3 million people die as a result of road traffic accidents. In addition, about 20 to 50 million people sustain non-fatal injuries. If no action is taken to address the current crisis, global road traffic fatalities are forecasted to double in 2030, becoming the fifth leading cause of death.

Today, most traffic accidents are due to human factors like distraction or tiredness. One way to increase traffic safety is therefore to find a way to let the vehicles support the drivers, making the human factor less influential. This is made possible by recent technological progress which has materialized into very advanced, "active" safety systems.

By combining sensor technology, vehicle communication and on-board computers, future vehicles will be able to communicate both with each other,* and with their surroundings.** These active safety functions are regarded as a key component to further increase safety on our roads, since fully developed and tested, they can make it possible to prevent traffic accidents before they occur.

In order to maintain and improve today's safety, cars will increasingly be required to have active safety systems, as a complement to already existing "passive" technology like airbags and safety belts.

Great need for new Test Facilities

Active safety systems are currently under further development and have to be adapted to different traffic scenarios. Many tests needed for these

novel active safety functions cannot be carried out in real traffic due to the risks of malfunctions. Therefore there is a great need for test facilities designed specifically for the development of these systems.

However, today there is not a single test facility in the world completely developed and dedicated to test every aspect of the new technology in one place. This is why in 2014, the AstaZero facility will be inaugurated in Sweden, a country that is world leading in many areas related to traffic safety.

The AstaZero facility is an open platform designed for developments in active traffic safety, and its unique test environments will allow the construction of all types of scenarios for research, development, testing and certification of future road safety systems.

The name AstaZero relates to the facility's connection to a vision of zero traffic fatalities; a vision that the developments of active safety might make possible in the future.

* V2V= Vehicle to Vehicle

** V2I= Vehicle to Infrastructure



ABOUT ACTIVE SAFETY SYSTEMS

Active safety systems are systems that: Help the driver avoid accidents or reduce the consequences of an accident by warning the driver or taking control of the vehicle. Active safety systems hence work in the opposite manner to passive safety systems, such as safety belts and airbags, as these have been developed to provide protection when a collision has already occurred.



Examples

- ABS = Antilock Braking System
- ESP = Electronic Stability Program
- LDWS = Lane Departure Warning Systems
- LKS = Lane Keeping System
- CMBB = Collision Mitigation By Braking
- AEB = Automatic Emergency Braking
- PDS = Pedestrian Detection System
- Drowsiness Detection Systems
- Distraction Detection Systems
- Night Vision Systems

This is AstaZero

AstaZero is the trademark of ASTA—Active Safety Test Area, a company that is currently building a state-of-the-art Proving Ground for development and testing of active safety systems.

The AstaZero facility has been specified to meet several different needs, ranging from commercial vehicle testing and certification to the examination of traffic infrastructure (like signs and railings), automotive communication systems as well as research and experimentation.

Built upon the collaboration between academia, the automotive industry and the authorities,

the AstaZero facility will operate as an open, international platform for all interested stakeholders like vehicle manufacturers, suppliers, legislators, road agents, universities, and technical institutes from around the world. SP Technical Research Institute of Sweden and Chalmers University of Technology are the owners and guarantee an independent operation of the facility.

Construction measures

Total surface:
About 2 000 000 square meters.

Paved surfaces:
About 250 000 square meters.

Excavation work:
1.3 million cubic meters.

Construction schedule

2011 Prospecting and design.
2012 Design and start of ground works.
2013 Construction
August, 2014 Inauguration

Quality

AstaZero will be certified for ISO 9001: 2000, ISO 14001 and ISO 17025.

BASIC INFORMATION

Core Services

- Unique environments to build any scenario in order to develop, test or certify new traffic safety solutions; making it possible to test literally all aspects of active safety in one place.
- Centre of Excellence in development of methods and test equipment.
- Proving Ground cooperation.
- Simulation of the entire facility to run pre-tests or for the early stages of research and development.
- Demonstration facility and assistance with product launches, conferences and corporate events.

Complementary services

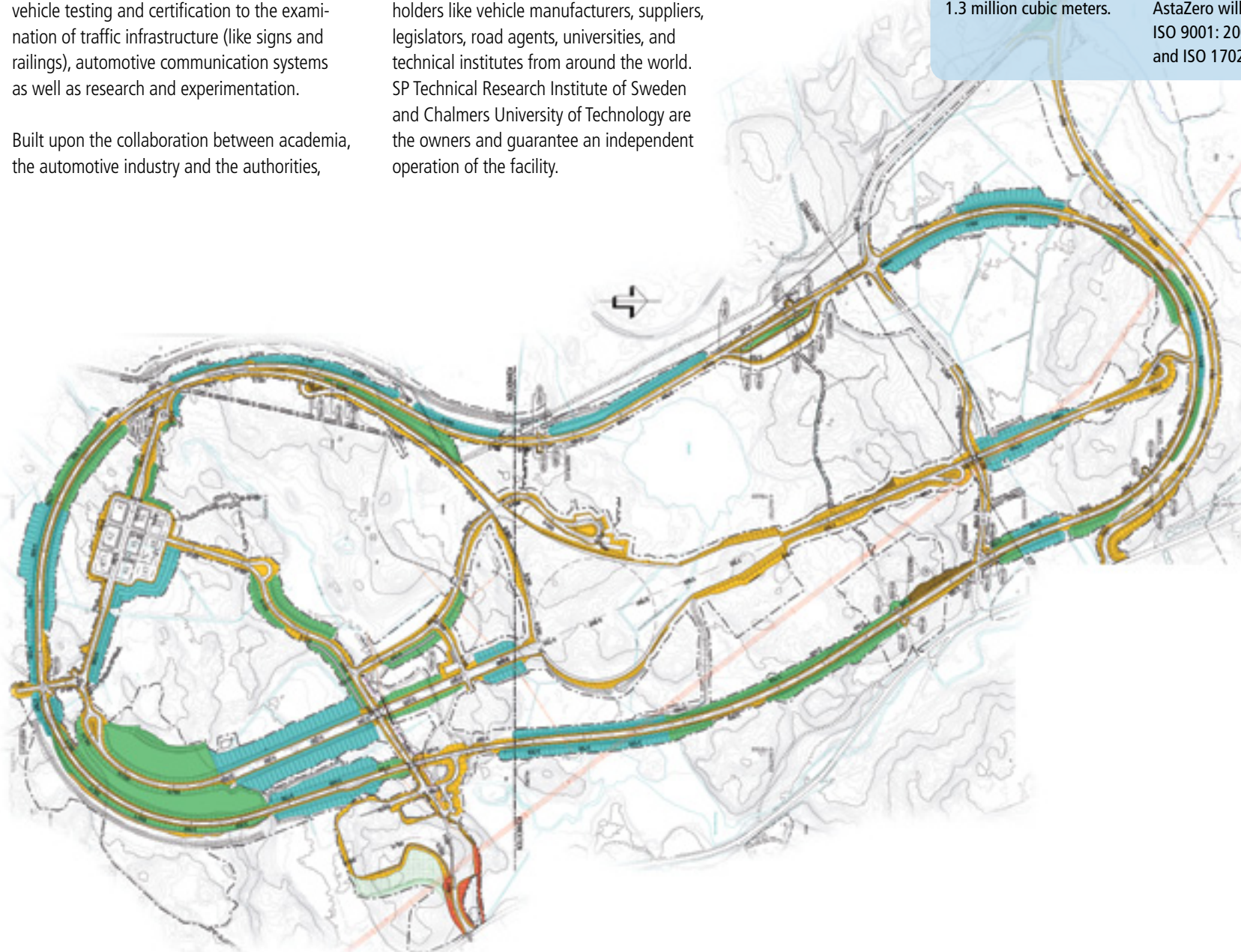
AstaZero will provide a range of services that clients may need during their stay, like:

- Hotel booking.
- Catering.
- Organisation of events.
- Shuttle traffic to and from the facility.
- Car rental.
- Shipments.
- Repairs.
- Loading and unloading client's materials.
- Special fuel purchasing.
- Weather information.



Location

The AstaZero facility is located close to Gothenburg in the south western part of Sweden, where the climate allows all-year-round testing with warm summers and cold winters. The facility is only half an hour drive from Landvetter International Airport, and accessible by motorway.



Offer

AstaZero will guarantee a world-class Proving Ground; offer a range of services that will lead to great customer satisfaction and a customer interface that is characterized by highest levels of service, efficiency and professionalism. The facility has been specified to meet industrial needs, and at the facility, customers individual challenges and their solutions are the focus of the entire operation.

Proving Ground offer

AstaZero will always adapt its offer based on the varying customer needs. Customers choose if they want their tests to be carried out in secret or not, and if they want to rent the entire facility or just one or a few of the different track sections:

- Simply hire the facility or parts/part of facility
- Hire the facility and available expertise (different options depending on requirements)
- Hire the facility, expertise and subsequent execution of test analysis.

Technician offer

Research engineers and other technicians employed by AstaZero will be available to provide support and assistance during testing and development work and participate in research projects by:

- Developing and contributing tests and testing methods and measurement equipment.
- Developing and maintaining equipment, devices and aids.
- Functioning as a resource for customer company's development and test projects.
- Contribute to the design/development and creation of prototypes for different functions as assigned by customers.

Open environment

AstaZeros open environment means that anyone is welcome to test different scenarios and functions at the facility. In addition to the opportunities for testing, research and development, AstaZero will also host demonstrations and assist with product launches, conferences and corporate events.

Under constant development

The AstaZero facility will be built in two stages. Stage 1, or the facility's basic offering, is planned for completion in August 2014. Extensive work is already underway in preparation for stage 2, by gathering information about future requirements within the automotive cluster; all to ensure that from an international perspective, AstaZero can provide a most comprehensive range of testing and research environments involving active safety.

However, the AstaZero facility will always be possible to develop in order to constantly be at the forefront of development, maintaining its unique customer offering. One part of this unique offer is to continuously give customers the opportunity to influence the facility's design for their individual requirements.

Bookings

Since the 1st of January 2013 it is possible to book AstaZeros facility from the 1th of October 2014. For booking inquiries, please contact us at: phone number **+46 703 435 945** or email address **bookings@astazero.com**.

RESEARCH AND DEVELOPMENT



The last few years research has brought about great technological progress in the field of active safety. Today, some of the basic functions of active safety systems, like autonomous emergency breakings, are already being installed in new car models.

In the years to come, several new autonomous functions are to be developed, and the academia and industry has identified several areas of research that are essential if the systems are to be reliable, always deploying at the right time and never otherwise. Some examples of these areas are: Active safety functions for the development of test targets, test methods for false positives (false alarms), research for test scenarios and driver behaviour, development of driver models, as well as development of support functions for the mobility of an ageing population and for the protection of vulnerable road users.

Great opportunities

AstaZero is located in Sweden where the automotive industry has for long been one of the recognized leaders among car companies when it comes to building safety into their products, the cars. Considerable expertise has been developed in sub-contractors and in related research institutions, such as SP Technical Research Institute of Sweden and Chalmers Technical University. This expertise makes it possible to offer a state-of-the-art Proving Ground, and thereby provide great opportunities for future developments, both for the single researcher and for major projects and collaborations within the field.

GENERAL DESIGN

All paved surfaces are designed for:

- 60 tons maximum vehicle weight. (tonne if 1000 kg = 1 tonne)
- 12 tons axel load. (tonne if 1000 kg = 1 tonne)
- Maximum vehicle length of 25.25 metres.



All internal roads are designed for:

- Bi-directional traffic.
- Right-hand traffic.
- Road width of 7 metres.

Areas for calibration:

- 3 by 15 metres.
- Made out of concrete.
- Flatness better than 0.1 degrees in all directions.

Roadside infrastructure:

- Conduit for electric power, fibre and communication/control. Installed along the full length of the accelerations roads, the Multi-Lane road and the Rural Road.
- Access points every 150 metres.
- Underpasses to the remote side at each access point.
- V2V and V2I.
- Conduit to appropriate control rooms for future installations.

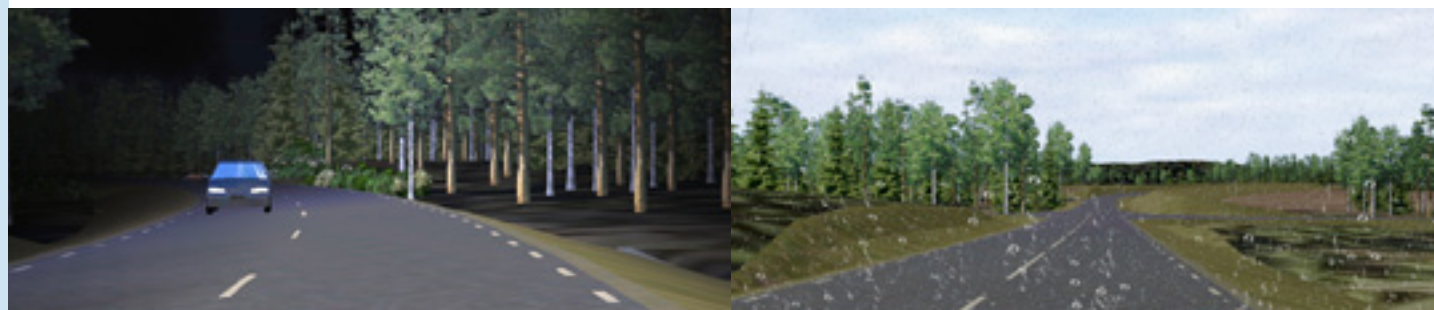
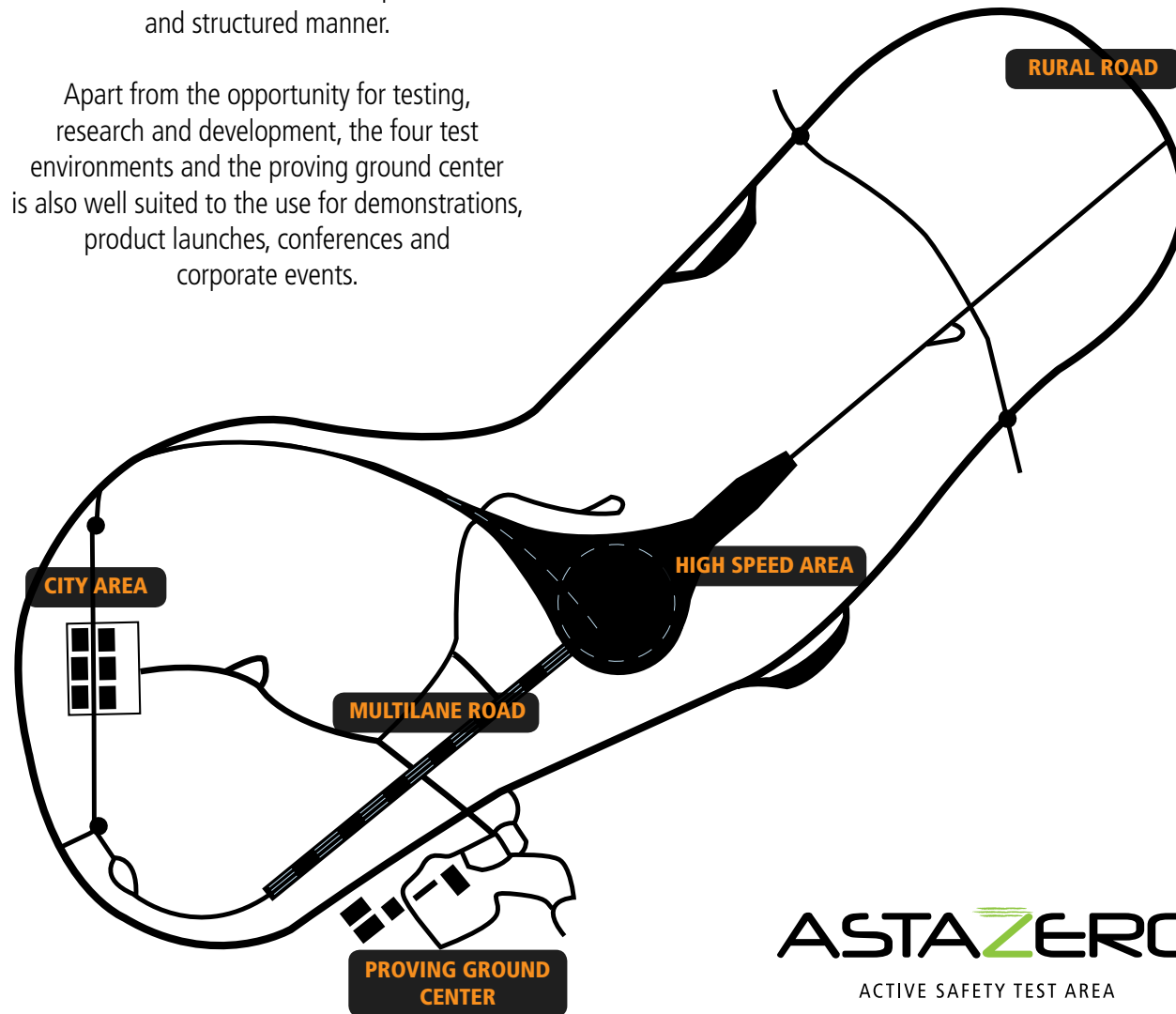
Differential GPS:

- Base station which covers the whole area.
- Target – Hunter systems with Real Time Kinematic (RTK).
- Video system synchronized to position.

The facility

The AstaZero facility consists of four test environments, where scenario based tests can be carried out in a repeatable and structured manner.

Apart from the opportunity for testing, research and development, the four test environments and the proving ground center is also well suited to the use for demonstrations, product launches, conferences and corporate events.



GENERAL DESIGN

Dummies:

- Pedestrians.
- Balloon cars.
- Animals.
- Material to make new targets.
- Remote control of balloon cars and test vehicles.



Garages

- Garages for passenger cars, 6x8 metres.
- Garages for trucks, 7,2x25 metres.
- Garages at control rooms, 5,8x10 metres.

Communication resources:

- Wi-Fi coverage for the area.
- High-speed Internet connection in all control rooms and garages.
- Mobile phone coverage in the area.
- Video conferences.
- V2V and V2I – installation prepared.

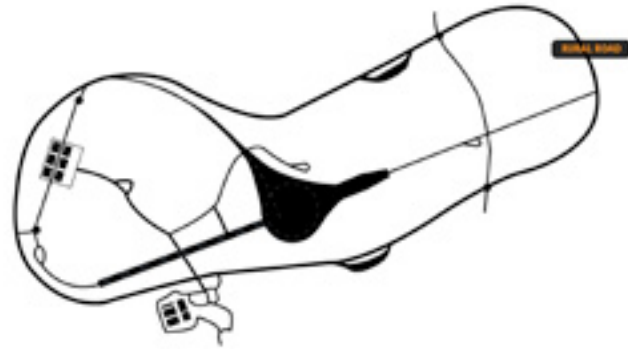
Communications technology (V2V and V2I)

An important aspect of active safety is based on new and advanced technologies which allows vehicles to communicate with each other (V2V) and with their surrounding environment (V2I). At the AstaZero facility, customers will be able to test the very latest in communications technology.

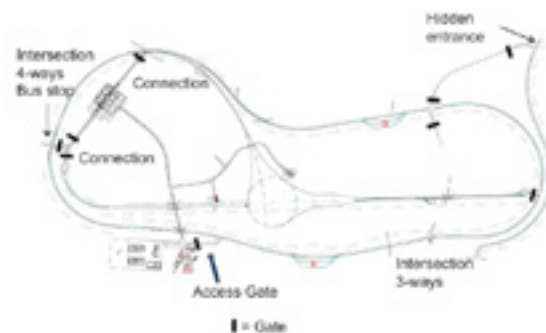


TEST ENVIRONMENTS

Rural road

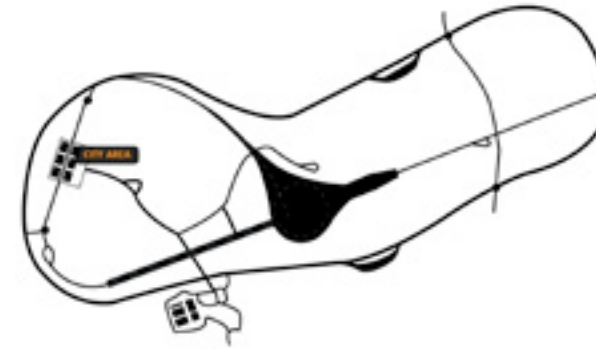


The Rural Road encircles the facility. It is approximately 5.7 km long, of which one half is adapted for 70 km/h and the other half for 90 km/h. The Rural Road is specially designed for different tests of driver behavior and is well-suited for the use of hidden or suddenly appearing obstacles. At the road, there will be two T-junctions and a crossroad with signage in the specified language and changeable to suit customer requirements. The Rural Road will also have bus stops/lay-bys at two locations.



TEST ENVIRONMENTS

City Area



The City Area is located in the southern part of the facility and is connected to the Rural Road in two places. It will initially consist of 4 blocks, but there are plans to supplement it with a further five. The City Area will primarily be used to test the vehicle's capacity to interact with the surrounding environment to avoid hitting buses, cyclists, pedestrians or other road users. The area therefore covers a number of different sub-areas, such as a town centre with varying street widths and lanes, bus stops, pavements, bike lanes, street lighting and building backdrops. The City Area also has a road system with different kinds of test environments such as roundabouts, T-junction, return-loop and lab-area.

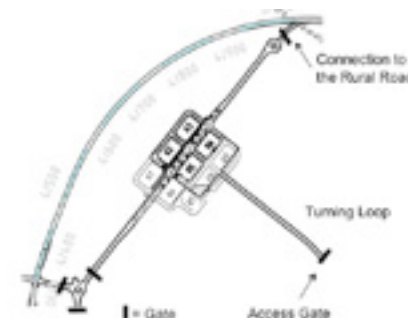


Image showing part of the City Area where all marshes has now been dugged out.



MISC.

- Each Block 40 by 25 metres, approx. 4 metres high. Streets have a 2.0% incline for good drainage into sewage drains.
- Acceleration roads, longer than 150 metres before the intersection.
- Lab area approx. 100 by 30 metres.
- Loading dock for trucks; 10 by 1.5 metres.
- Main street equipped with "Portals" with traffic signs.
- Pavements, bike lanes and lane markings.
- Crossing street, 7 metres wide plus pavements.
- Pedestrian crossing with signs.
- Prepared foundations for additional traffic signs.
- Outlets to charge electric vehicles and batteries.
- Simple garage for weather protection.
- Equipment to generate various scenarios.
- Refuge, traffic signs, curbs and traffic lights.
- Platform for visitors.

Almost the entire Rural Road has been filled up with rubble in preparation for asphaltting. March, 2013.



MISC.

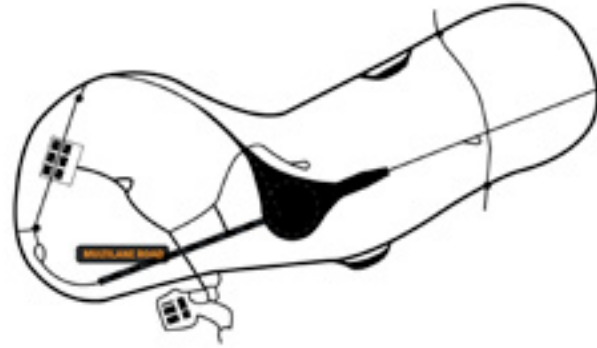
- Normal road standard/safety.
- NOT for advanced driving.
- Slightly hilly, max 4.5 % incline.
- For Bi-directional traffic.
- Normal setup = right-hand traffic and one-way traffic.
- Foundation for traffic signs.
- Hidden access to public roads.
- Traffic signs showing:
 - Distance.
 - Name of the place.
 - Curve radius.
- Electronically controlled signs, 4 pcs.
- Prepared places for testing with different targets like pedestrians, cyclists, crossing vehicles, bus stops etc.

Image showing part of the 700 metres long Multi-Lane Road.

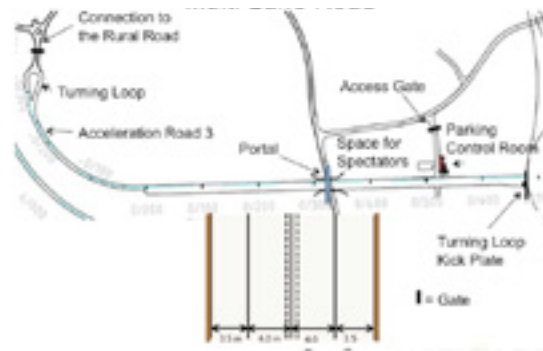


TEST ENVIRONMENTS

Multilane Road



The Multilane Road is 700 metres long and consists of four lanes. These are connected to the High-Speed Area, with an acceleration road that is approximately 300 metres long, 7 metres wide and with turning loop for long vehicles. Several different scenarios can be tested on the multilane road, such as lane changes, different collision scenarios and crossing scenarios. For example, it will be possible to change the direction of travel in different lanes, as well as to build a temporary central barrier and different types of traffic barrier railings.



TEST ENVIRONMENTS

High-Speed Area



The High-Speed Area is located at the centre of the facility. It consists of a circular area with drop ad-ons, 240 metres in diameter with two acceleration roads. Acceleration road one is approximately 1 kilometre long. In addition to the two acceleration roads, it is also possible to use the Multilane Road for acceleration, which means vehicles can enter the High-Speed Area from 3 different directions. In this area, focus will primarily be on vehicle dynamics like avoidance manoeuvres at very high speeds.



The High-Speed Area taking shape. March, 2013.



MISC.

- Slopes 1% laterally.
- Completely flat in the longitudinal direction, (flatness 1.0 acc. to IRI).
- Asphalt acc. to SN75-80.
- Basic illumination.
- Rigid fences around the whole area with cushions in front.
- Turning loop for long vehicles (25,25 m) at the end and halfway with a width of 7 metres.
- Separate control tower.
 - Two stories high for good visibility.
 - Platform on the roof for visitors and prepared space for 100 spectators.
- Parking space with outlets to charge electric vehicles and batteries.
- Space for 10 cars plus one bus.
- Warehouse for equipment, traffic signs and cones.
- Remote control of targets, balloon cars and driving robots.
- Calibration area at the first turning loop (for gyros).
- Conduit along the acceleration roads (for future needs).

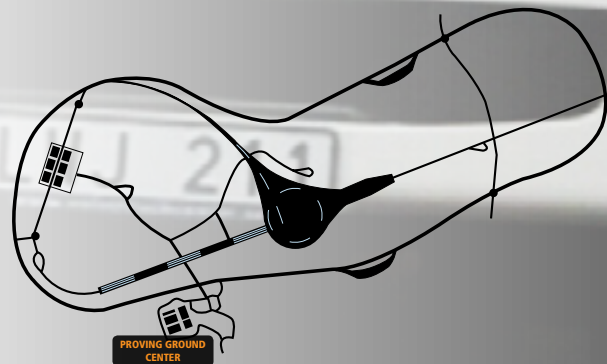
MISC.

- Four lanes with space for barriers.
- Acceleration road approx. 300 metres long, 7 metres wide with turning loop for long vehicles.
- 2 % lateral incline for good drainage, split between lane 1 and 2.
- Small intersection.
- "Portal" with road signs.
- Separate control tower.
 - Two stories high for good visibility.
 - Platform on the roof for visitors and prepared space for 100 spectators.
- Parking space with outlets to charge electric vehicles and batteries.
- Warehouse for equipment like traffic signs and cones.
- Remote control of targets, balloon cars and driving robots.



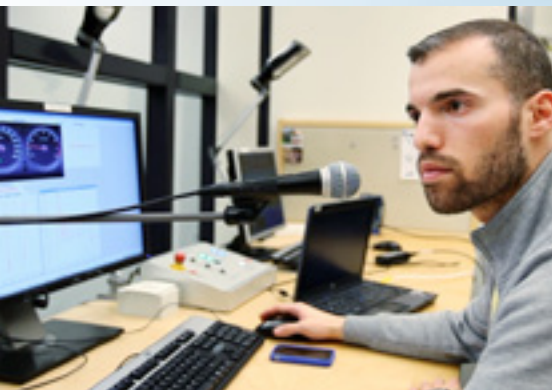
TEST ENVIRONMENTS

Proving Ground Centre



MISC.

- Garages for 10 cars (5 with lifts).
- Garages for 2 long vehicles, 25,25 metres long.
- Overhead crane for loading, capacity 2-3 tons.
- Fuel depot.
- Car wash.
- Calibration surface (for gyros).



The AstaZero Proving Ground Centre consists of several elements, including a guarded reception, traffic control, a visitor's centre, conference rooms, office space and separate research areas for visiting personnel, as well as garages and workshops.

Both office space and research areas will be available with the option of long as well as short term rental. These areas will also be adapted to each customer's requirements, and can be used for open as well as closed projects. Safety and privacy are of the highest priority.

A step towards zero traffic fatalities

AstaZero is constructed for the development, testing and certification of active safety systems, necessary if we are to limit future accident statistics.

Contact information

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Booking inquiries

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For more information about the test environments, please visit the AstaZero homepage at www.astazero.com

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