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Manual

DELTABLOC®

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Permanent Safety Barriers

Installation and Maintenance Manual

Documentation for License Partners

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General

Installation

The choice of the DELTA BLOC® systems depends on the client's specifications on the basis of the performance classes according to EN 1317-2, with consideration to the installation circumstances. Available permanent safety barriers are the DELTA BLOC® systems DB 100S, DB 100 and DB 120S.

All systems feature the New Jersey profile and outwardly basically only differ in their dimensions of height and length.

All relevant guidelines as well as the technical terms of delivery and contract are to be adhered to.

Maintenance terminology

- **Maintenance** is the combination of all measures carried out to maintain the functionality of a system. It can be divided into the basic steps of *maintenance, inspection* and *repair work*.
- **Maintenance:** Maintenance is a periodically recurring measure to maintain the target state.
- **Inspection:** Inspection is a measure carried out to ascertain the current state. It generally refers to an inspection in the sense of a check carried out by an inspector or supervisor. The aim is to determine that an object is of sound condition. Repair measures are to be initiated wherever necessary.
- **Repair work:** Measures to restore the target state of an object via refurbishment or replacement of parts on the basis of the inspection results.

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Planning

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General

In order to achieve the effect stipulated in EN 1317-1 and -2, a system length of a least the tested length specified in the test report is necessary.

At the beginning and the end of each DELTA BLOC® chain the appropriate terminal elements have to be fixed with anchors in the base (foundation or pavement). For connecting other restraint systems, transition elements have to be used.

In a reasonable period before starting the construction works the construction site management has to visit the construction site together with the contracting body; the prepared foundation is to be formally accepted and this must be documented in writing.

The installation works are usually carried out based on existing site plans. Important points must be decided on jointly with the construction site management before the beginning of the installation. Continuous marking of the front edge of the system on the contact surface is to be carried out by the construction site supervisor.

Minimum installation length

The tested and approved minimum installation lengths (system length) for DELTA BLOC® safety barriers can be found in the data sheet of the respective products.

Foundation

The requirements for the foundation are as follows:

1. load-bearing capacity: min. 200kN/m²
2. evenness of the ground: ± 1cm deviation over a chord length of 6m
3. frost protection: in compliance with national standards and guidelines

Contact area

The base area is a road pavement of either asphalt or concrete, or an unbounded, frost-proof base course. Any unevenness resulting in a height offset of more than ± 1cm at the butt joints is to be compensated by means of elastomer strips or 5/8 chippings or equally suitable material.

All other contact areas which comply with the requirements for the foundation (load-bearing capacity, evenness, frost resistance), such as compacted graded material, are also suitable and have no significant influence on the impact performance.

Curvature of the longitudinal axis

If the longitudinal axis of an element chain becomes curved, the following minimum radii must be applied for curves, crests and sags.

The minimum radii result from the use of the standard elements with a length of 6m.

Curve radii

The following minimal radii are to be applied for curves:

System families	Element length	Outside radius
DB 50SL	3m	18m
	6m	36m
DB 65S	3m	19m
	6m	38m
DB 80	2m	40m
	4m	80m
	6m	120m

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Crests and sags

For crests and sags the following minimal radii are to be provided:

System families	Element length	Sag radius	Crest radius
DB 80	2m	25m	87m
	4m	48m	174m
	6m	72m	261m
DB 100S	2m	33m	112m
	4m	66m	224m
	6m	98m	336m
DB 100	2m	41m	112m
	4m	81m	224m
	6m	120m	336m
DB 120S	2m	34m	140m
	4m	66m	281m

Installation position

The elements are installed perpendicularly to the subsoil and at the height of the upper edge of the road surface. Deviations from this installation position are possible on a limited scale.

When deviating from the installation position, care must be taken that the height and angle of the elements in relation to the base area are still guaranteed. In this way, DELTA BLOC® elements can also be used on lower-lying verges and on roads with a tonnage profile or a horizontal incline.

Strong horizontal inclines or alternating inclines of the base area may be compensated by using horizontal-incline compensation sets.

Backfill material

For the DB 80AS in double-rowed installation the filling of the interspace is carried out in two steps with pepple gravel up to the height of about 70cm. The gravel should be compacted by steps, using a vibrator.

Water drainage

DELTA BLOC® restraint systems feature tested drainage openings.

Planning for drain shafts

Where possible, planning should be such that drain shafts are bypassed. For this purpose short elements with a length of two or four metres may be used to construct small bends.

Where this is not possible, a 90cm expansion element may be used, which has a gap up to 90cm wide under a cover and the hydraulic tension and shock buffer.

Where necessary, shafts can also be covered with DELTA BLOC® standard elements, which will have to be removed to open the shaft using suitable lifting device.

Climbing aids

Climbing aids can be easily realised for all DELTA BLOC® systems.

Climbing aid on the lane side

Climbing aid at the back side

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Installation

General

All national regulations must be adhered to during installation. Where proof of the suitability of the installation company is required (tests or permits), these must be submitted to the customer and the site management.

Transport

The elements are supplied to the construction site by suitable transport vehicles.

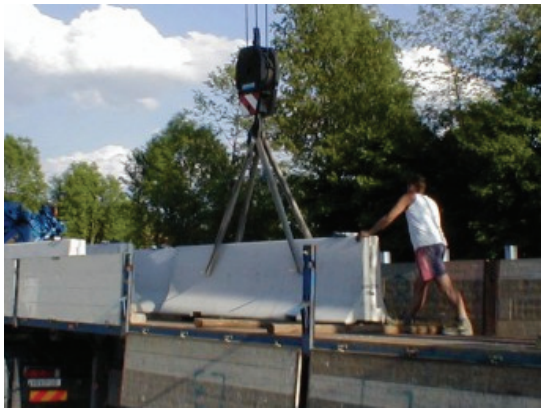
Unloading process

Hoising equipment

DELTA BLOC® elements are installed most effeciently with a concrete safety barrier grab that is operated with a transport crane.

Installation with a concrete safety barrier grab

The elements can also be moved with straps instead of a concrete barrier grab. Steel bolts are inserted through the lifting holes, with the looped straps being attached to the ends of the bolts.



Moving the elements using straps

Concrete spalling around the lifting holes can be avoided by ensuring that the bolts fit tightly into the holes.

A list of the necessary tools can be found in the chapter *Tools and equipment*.

Installation

The DELTA BLOC® elements are individually lifted from the transport vehicle. The DELTA BLOC® coupling is already inserted while lowering an element. The element is aligned, using a suitable tool such as a crowbar, just above the base area. It is then put in its final position, with care being taken that the element chain is tensed by pulling the last element in a longitudinal direction.

Fast connecting of the elements by using the patented coupling

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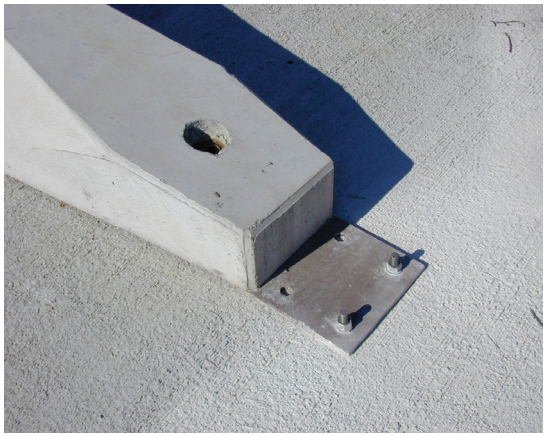
For DELTA BLOC® systems that are to be installed with butt joint inserts, care must be taken as to exactly position the butt joint inserts into the joints between the elements. The elastomer strap that keeps the butt joint inserts together can be pulled to the other side using a hook.

Mounting of a butt joint insert

There is a worker on each side. Pulling the elastomer strap using a metal hook

The terminal elements have to be anchored in the soil according to plan no. V6255 or V632769T. See chapter *Technical Drawings*.



Anchorage of a terminal element

Fitting elements

Fitting elements are short elements used to close gaps. Installation takes place from both terminals until the gap left in the centre determines the size of the necessary fitting element. The gap is accurately measured and the fitting element will then be made to measure. The gap will be temporarily bridged with a steel cover or a temporary safety barrier. The road can only be opened for limited traffic until the fit element has been installed.

Deviating element lengths

DELTA BLOC® recommends using only tested element lengths. Other element lengths may however be used after clarification with the technical division of DELTA BLOC®.

Tolerances

DELTA BLOC® restraint systems are combined to form an element chain. The DELTA BLOC® coupling system is used for linking. The gap size between two elements is 1.4cm (+0.0/-1.4).

Installation temperatures

Installation can take place at any environmental temperature. The elements are not temperature-sensitive and are not subject to any significant changes in length when temperatures fluctuate. As the foundations are frost-resistant, there will not be any problems with installation at low temperatures.

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Maintenance and inspection

General

According to the requirements of the EN 1317, the DELTA BLOC® restraint system is maintenance-free with regard to its function as a traffic restraint system.

Drainage openings

To guarantee unhindered drainage of water (rain water or melt water), the drainage channels must be inspected once a year and if necessary cleaned using high-pressure cleaning equipment.

Reflectors

To ensure proper functioning, the fitted reflectors have to be regularly cleaned, depending on the environmental conditions at the site. This can also be done with the aid of high-pressure cleaning equipment.

Inspection

An inspection of the entire system will be required in the event of an impact (accident). Depending on the intensity of the collision, repair measures may have to be initiated *(see chapter Procedure after an impact)*.

Inspection activities

The inspection of DELTA BLOC® restraint systems has to take place in two steps:

1. Inspection of total system: *see table 1*
2. Inspection of individual components: *see Table 2*

Completeness of the restraint system

When inspecting the DELTA BLOC® restraint system as to completeness, the presence of the following individual components must be verified:

- couplings between consecutive elements
- elastomer inserts on both sides at the butt joint between elements
- elastomer ring to fix the elastomer inserts
- screw connections of anchors for terminals

Table 1: Inspection activities for the entire system

Component	Inspection activity	Measure
entire system	▶ inspection of couplings for evident damage ▶ check for any displacement of elements following each collision within the range 50m before and after the point of impact	where necessary, initiate repair mesures

Table 2: Inspection activities for individual components

Component	Inspection activity	Measure
restraint element	▶ visual inspection for cracks or spalling ▶ check for correct positioning of elements	where necessary, initiate repair mesures
coupling element	check for completeness and damage	where necessary, replace elements
butt joint inserts	check for completeness and damage	where necessary, replace elements
elastomer ring	check for completeness and functionality	where necessary, replace elements

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Installationsanleitung - Rückstrahler

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Procedure after an impact

To ensure durable effectiveness of the DELTA BLOC® system after a crash, please read the recommendations below. In case of doubt, the system supplier should be asked for an expert evaluation!

The condition of the safety barrier elements, after a crash, is described as follows:

No displacement of the safety barrier

Damage pattern: The concrete elements do not show visible cracks or spalling. Moreover, no deformation of the soil anchorages or coupling elements occurs. Tyre abrasion as well as scratch and lacquer marks are the only signs for a vehicle contact.

Measure: There is no need for action.

Slight displacement of the safety barrier

Displacement < 6cm

Damage pattern: The concrete elements show little visible damage like cracks, concrete breakings etc. and noticeable impact marks. Soil anchorages and coupling elements are not affected by deformation.

Measures: Little damage which does not occur in the area of coupling elements can be repaired on the spot with refurbishment mortar. The affected DELTA BLOC® elements are to be lifted according to the installation instructions by suitable hoisting equipment. In case of cracks in the coupling area or if the coupling elements are deformed, the affected elements have to be replaced.

Considerable displacement of the safety barrier

Displacement ≥ 6cm

Damage pattern: Elements show clearly visible damage like cracks, concrete breakings etc. and clearly visible deformation of the soil anchors and/or coupling elements.

Measures: If there is only little visible damage, the refurbishment of elements takes place on the spot by using refurbishment mortar. If it comes to a clearly visible damage and deformation, the affected DELTA BLOC® elements and their connecting parts have to be replaced. The displacement and the alignment have to take place in accordance with *chap. Installation*.

Remark on the repair mortar to be used

Commercial repair mortar is to be used to repair minor damage. The type of mortar to be used is hydraulically setting, polymer-modified dry mortar. Preparation of the surface and processing of the mortar must be done in accordance with the processing instructions of the mortar manufacturer.

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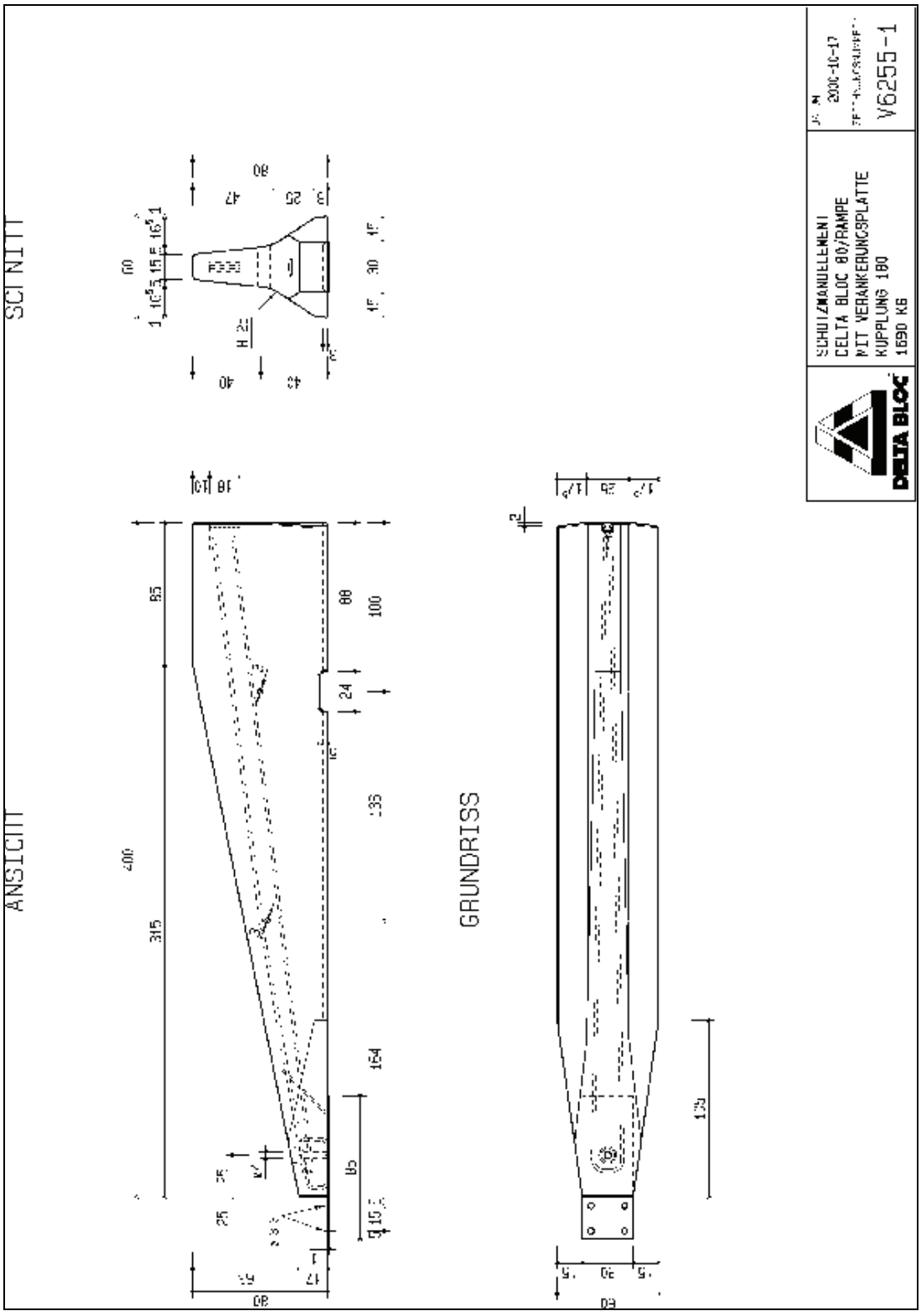
Technical drawings

V6255



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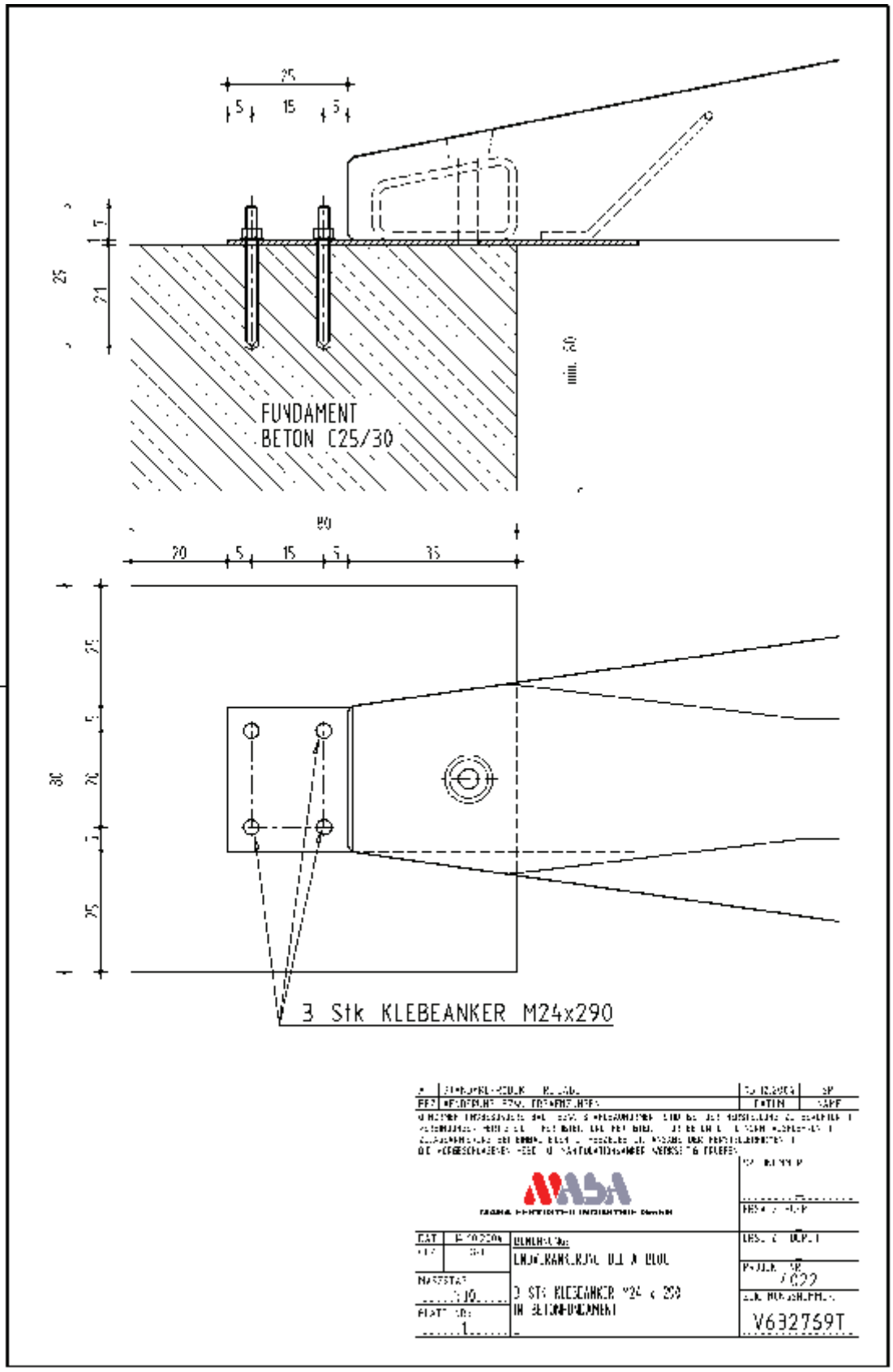

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Operational safety

General

Please refer to all the relevant national regulations regarding occupational safety. The information below should be regarded as an addition to these national regulations.

Material, tools and equipment

Care must be taken that all materials, tools and equipment correspond to the safety regulations and are suitable for the purpose they are used for.

Securing the construction site

Safe access to the construction site must be guaranteed.

The construction site must be secured against unauthorised access by third parties by putting up the corresponding signs and barriers. Care must be taken that the general traffic can safely pass the construction site. Sources of danger should be identified while setting up the construction site, with suitable measures being taken.

A suitable traffic control plan is to be developed in good time and implemented at the site. All site employees should be constantly aware of the risks posed by the traffic flow and must wear high-visibility vests.

Loading and unloading

The driver is responsible for securing the load! Before loosening the straps that are securing the load, it must be ensured that the load is still stable.

Lifting equipment such as cranes, concrete barrier grabs, straps, ropes, chains etc. must be maintained in a good condition. It must be ensured that all lifting equipment has been tested and certified.

There may be no people in the danger zone of the hoisting equipment.

It must be ensured that all employees are wearing suitable work clothing, including their personal protective equipment (safety shoes, helmet, high-visibility jackets, gloves).

Crane

Cranes may only be operated by suitably trained staff.

The crane must be set up in accordance with the requirements. Special care must be taken that there are no power cables within the operating range of the crane. All overhead cables should be regarded as high-voltage cables and both the crane and the load should be kept at a safe distance. In the event of problems with overhead cables, work must be discontinued and the responsible authorities are to be contacted.

Cleaning

Protective goggles and a dust mask are to be worn when cleaning DELTA BLOC® elements, thus avoiding injuries caused by small airborne particles.

Clearing the construction site

High-visibility vests must also be worn when leaving or clearing the construction site. When removing traffic lights and signs, corresponding precautionary measures must be taken in order to avoid accidents with passing traffic. Any waste and dirt on the construction site must be removed.

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Tools and equipment

Equipment required

1. Lorry with loading crane or mobile crane, excavator or forklift
2. Concrete safety barrier grab
3. Crowbars and lifting rods
4. 24mm spanner
5. Drill (with drill head)
6. Electricity supply
7. Tape measure or distance meter

Material

1. Elements, terminals, transitions
2. Bolts and nuts M16 for terminal anchoring
3. Couplings
4. Reflectors (if required)
5. Mechanical anchor for terminals or resin-bedded anchors

Transport

1. Suitable lorries
2. Load-securing straps

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Additional information

Documents to apply

- Product Information DB 80
- Product Information DB 100S
- Product Information DB 100

Internet

- For detailed information, photos and videos of crash tests please visit **www.deltabloc.com**

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