R1 10 51 01 Technical Directive

General and Technical Regulations for Hoisting Equipment (ATVH2010)

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Information and modifications:

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1. GENERAL

1.1. Objective

The objective of the General Technical Regulations for Hoisting Equipment (ATVH) is to provide guidelines, based on the legal requirements, and supplemented with the experience that Corus has gained over the years, to the manufacturer of detachable hoisting equipment for the manufacture of specific hoisting equipment for Corus.

1.2. Application area

The stipulations in this ATVH are applicable when designing, calculating, constructing and manufacturing and supplying operational:

- new hoisting equipment;
- modifications to existing hoisting equipment.

For chain fittings, please see Corus Standard S1790002.
For laminated hooks, please see the Corus Standard for crane hooks (presently in preparation).

Hoisting equipment is defined as an implement or aid that is not permanently attached to hoisting or lifting machinery for hoisting or lifting loads, which implement or aid is attached between the machine and the load, or to the load itself, or that is designed as an integral part of the load, and which is sold on the market as an individual part.

The design standard for all detachable hoisting equipment is NEN-EN 13155. This standard describes the fundamental health and safety requirements of the EC Machinery Directive that the hoisting equipment must meet. Additional requirements for situations not covered by the above-mentioned directive are described in this ATVH.

1.3. General stipulations

All hoisting equipment must be supplied with documentation in accordance with the Machinery Directive. Modifications or reparations to hoisting equipment as a result of damage and/or defects may only be carried out in consultation with the CSPIJ-PTC-MCE-KBT department and the supplier.

1.4. Standards, Corus Standards and Directives

The stipulations contained in the Labour Inspectorate's information sheets must be observed at all times. The Corus Standards must always be observed.
NEN sheets, EN sheets and, among others, DIN sheets are to be used as a basis for all designs.
Corus Directives must be observed if these are in the specifications.

AI sheet: 17
NEN sheets: 1010, 1713, 2017 to 2024, 2063, 3140, 3318, 3320, 3508
NPR: 1967
EN sheets: 818, 13155
DIN sheets: 15400 to 15418
ISO sheets: 2328, 2330, 13284

The Corus Standards and Directives listed below must be observed.
These Corus Standards and Directives can be found at the website www.corusveiligheid.nl under the tab: Corus IJmuiden > Standardisation > (in Dutch)

1 Corus Standards (NL) > 1 Mechanical Engineering > 4 Cranes and transportation applications
- S1790001 Hoisting hooks
- S1790002 Chain fittings

1 Corus Standards (NL) > 1 Mechanical Engineering > 5 Other
- S1450401 Steel welding execution and inspection
- S1917301 Use of safety colours

1 Corus Standards (NL) > 2 Electrical Engineering
- S2173202 Electrical installation

1 Corus Standards (NL) > 3 Civil Engineering
- S3105601 Preserving and coating

2 Technical Directives (NL) > General
- R1058001 Corus drawing rules
- R1058002 Corus CAD drawing rules
- R1058003 Corus E-plan drawing rules

2 Technical Directives (NL) > 1 Mechanical Engineering > 1 Hydraulics
- S1420100 Parts 1 to 10

2 Technical Directives (NL) > 1 Mechanical Engineering > 2 Pneumatics
- S1410100 Parts 1 to 9

2 Technical Directives (NL) > 1 Mechanical Engineering > 7 Other
- R1783301 Material designations of ferrous metals

2 Technical Directives (NL) > 2 Electrical Engineering
- R2173201 Control voltages

If the supplier is of the opinion that, in order to improve reliability and/or the design, the directive should be deviated from, this must be specifically mentioned in the quotations whilst stating the reasons.

1.5. Conditions of Supply and Delivery

The following conditions apply to all orders:

- Unless stated otherwise, it is assumed that the supplier accepts our ATVH unconditionally.
- In principle, the supplier will not subcontract the manufacture or modification.
- If the supplier intends to subcontract the manufacture in its entirety or in part, then this must be stated in the quotation, stating the name and address of the sub-supplier.
- The sub-supplier can only be changed during the course of the contract in consultation with and with the approval of Corus.
- If commodities are involved, the make, type, material and details of the spare parts, etc. must have the prior approval of Corus.
- A copy in duplicate of all orders to sub-suppliers must be sent to our inspection department, stating our order number.

1.6. Technical information to be provided with the quotation

In order to be able to evaluate the quotation properly, the quotation must at least list the following information:

- an outline diagram;
- a description listing the main details and other equipment;
- the weight of the operational equipment delivered;
- price for:
  - supply ex works, having been subjected to dynamic testing and loaded onto the means of transport;
  - transport to Corus IJmuiden;
  - complete assembly at Corus IJmuiden;
  - adjusting and testing at Corus IJmuiden;
  - spare parts with delivery times;
- declarations concerning any outsourcing, stating the preferred sub-supplier;
- deviations from the specifications of the order;
- engineering and manufacturing planning.

Corus reserves the right to disregard quotations that do not contain the required details.

1.7. Technical information to be submitted when the order has been issued

Within 3 weeks after the order has been issued, the supplier must submit a schedule stating when the data listed below will become available, at our discretion:

- time schedule for delivery of operational equipment;
- quality assurance plan;
- circuit diagrams;
- preliminary layout drawings;
- calculations;
- welding plan outlining the method to be used;
- set-up of electrical and other equipment;
- orders to suppliers, including documentation;
- workshop drawings, including the appropriate item lists;
- assembly details including drawings;
- list of drawings;
- as-built drawings;
- instructions for commissioning the equipment;
- operating instructions;
- maintenance instructions;
- lubrication diagram, indicating the points to be lubricated, the frequency and the oil and/or grease products to be used.

After receipt of the schedule, Corus requires 2 weeks to formulate its approval and/or comments.

Any remarks on our part must be accommodated forthwith, and the relevant drawings /calculations must be resubmitted for inspection.
Clear copies of all new and amended drawings must be submitted for inspection and approval before and during manufacture.

2. CALCULATION PRINCIPLES

2.1. General

Hoisting equipment designs can be divided into two groups:

- hoisting equipment designed for less than 20,000 load events, in which the design must meet the requirements of NEN-EN 13155;
- hoisting equipment designed for more than 20,000 load events, in which the design must meet the requirements of the ATVH, paragraphs 2.2 to 2.6.

As a general rule, the regulations in Corus Directive R1.05.80.01 must be followed for all calculations.

2.2. Equipment for hoisting through clamping

In hoisting equipment that clamps the load when hoisting, the maximum stress occurring may not exceed the minimum yield stress stated for the material thickness concerned, divided by a safety factor.
This factor being:

- for a working load up to 12 tonnes normal use V = 3.25
- for a working load above 12 tonnes normal use V = 2.75

2.3. Equipment for hoisting through suspension

In hoisting equipment that supports the load when hoisting, such as hoisting beams, coil tongs, plate/sheet and strip lifters, C-hooks, pallet hooks, vacuum lifters, grabs, tilting and tipping hoppers etc., the maximum stress occurring may not exceed the minimum yield stress stated for the material thickness concerned, divided by a safety factor V = 2.5.

2.4. Auxiliary equipment for forklift trucks

In forks and other auxiliary equipment for forklift trucks, the maximum stress occurring may not exceed the minimum yield stress stated for the material thickness concerned, divided by a safety factor V = 3.

2.5. Machinery

Maximum permissible stresses, surface pressures, etc. for parts not manufactured in accordance with Corus drawings must meet the requirements of NEN 2020.

The following applies for surface pressures:

- for rotating shafts with bronze linings:
  provided with forced lubrication: 9 N/mm^2

- for shafts with limited movement:
  steel bushes and forced lubrication: 25 N/mm^2
  plastic bushes (depending on quality): 35-70 N/mm^2
- for fixed shafts with hardened steel bushes (D-clasps): 70 N/mm^2

Surface pressures for keys: (occurring at nominal torque) maximum: 80 N/mm^2

In accordance with NEN 2020, the nominal motor torque must be allowed for in gearings.

3. GENERAL REMARKS CONCERNING DESIGN

3.1. Identification marks on hoisting equipment

The following is marked on each piece of hoisting equipment:

- the working load in tonnes (SWL ... tonnes);
- the maximum and minimum dimensions of the loads to be lifted, measured across the sides where they are to be picked up (...-... mm);
- identification number of the hoisting equipment (number provided by Corus);
- dead load, round off to 100 kg (E.M. ... tonnes);
- UGD position.

These details must be marked permanently with 70mm high characters on a clearly visible location, in consultation with Corus.

3.2. Manufacturing guidelines

The basis of the manufacturing guidelines is assumed ‘skilled craftsmanship’ on the part of the manufacturer. Examples are:

- use of the correct, approved materials;
- parts are carefully and smoothly flame-cleaned;
- forces should act in the longitudinal direction of the material;
- all edges must be rounded off;
- depending on the materials and construction used, relevant parts must be annealed after flame-cleaning;
- series of holes must follow a straight line;
- the dimensioning must be such that all parts are guaranteed replaceable;
- all parts must be easily accessible for maintenance and inspection;
- parts that will be inaccessible in the assembled equipment must be adequately preserved prior to assembly;
- avoid abrupt changes in profile;
- pivots must be constructed as smooth as possible and fitted with buffer plates;
- the construction as a whole must be smooth and straight so that moisture or dirt cannot collect on the surfaces or in corners;
- cabling is preferably run through the interior of the construction. External cabling is run through steel tubing;
- signal lamps are protected against mechanical loads;
- plugs are easily accessible from the parking bay.

3.3. Welding work

Welding work must take place in accordance with the S1.45.04.01 welding instructions.
This implies that welding work and welders are subject to quality assurance in accordance with EN 287, 15614 and 3834, as applies to ‘welding class 1’.

All parts transferring forces, and all parts welded to these, must be welded in accordance with welding class 1.

When building up worn holes through welding, at least 2 layers must be applied.

Prior to any welding work, a welding plan must be submitted to Corus for approval.

3.4. Preservation

Unless the order states otherwise, the hoisting equipment must be preserved in accordance with: S3.10.56.01 standard, code CO.030, colour: RAL 1018 (yellow) with black warning stripes.

All bolts, washers and nuts must be treated after assembly with the relevant coating system. For information and application of safety colours, please see the S1.91.73.01 standard.

3.5. Inspection and testing

Certificates must be supplied for all the materials used, stating the chemical analysis and all the mechanical properties, including the notch test value (Charpy V in accordance with EN 10.045).

The materials for the load bearing parts, or the parts welded to these, must be supplied with a type 3.2 certificate in accordance with EN 10204 (2004) if the manufacturer of this material is established in a country outside of the CEN. In addition, in this case the qualified inspector appointed by the customer, or the inspector appointed in accordance with official regulations, must be established in a CEN member country.
If the manufacturer is established in a CEN member country, a type 3.1 certificate in accordance with EN 10204 (2004) will be sufficient.
All other non-load bearing materials must be supplied with a type 2.2 certificate in accordance with EN 10204 (2004).

If applicable, the hoisting equipment will first be subjected to functional and dynamic tests at the manufacturers' and/or suppliers'.
Hoisting equipment must be tested under the responsibility of the supplier, during which a Corus expert will be present, before it is commissioned.
A test protocol will be completed as part of the testing.

Dynamic test load

Working load	Clamped hoisting	Suspended hoisting	Forks
100%	200%	150%	200%

3.6. Machinery

3.6.1. Installing machinery

Machinery must be constructed and installed in such a way that all parts can be inspected, without first having to dismantle other parts.
Faces under motors must be sufficiently large, so that motors can be moved back, in order to clear the flange bolts. Filler plates must be fitted under the motors (minimum 5 mm) to allow for any differences in shaft height when motors are exchanged. Motors, gearboxes, etc. should be mounted on planed or milled faces and secured with at least 2 fitting bolts or spring pins.

3.6.2. Gearbox casings

The gearbox casings used must be of a robust design.
Welded casings must be annealed.
The insides of the casings must be blasted, cleaned meticulously and finished with a 65-micrometer coat of oil-resistant paint.

The gearbox casings must be provided with an easily accessible filler opening, drain tap and level indicator.

The casing must be provided with a legend plate, clearly indicating the following details:

- oil type :.....;
- oil capacity :..... litres;
- gear ratio :i = ...

3.6.3. Gears

Gear designs must be calculated for non-hardened teeth in accordance with EN 6336 or DIN 3990.

3.6.4. Shafts and pins

Shafts and pins must be designed and manufactured in accordance with NEN 2020.
Keyways must be rounded at the base, in accordance with NEN 2430, while the termination of the keyway must at least be the width of a keyway away from a diameter transition. All shafts and pins in hinge points should rotate freely and be locked with 2 half rings attached to a full ring.
Hinge points should have bushes, which must be equipped with a lubrication facility, if applicable.
When two bushes are used in a hinge point, these must be pressed into a face preventing them from moving inwards.
Grease nipples on axle stubs must be recessed.

3.6.5. Couplings

Should a coupling fail, this may not cause the load to fall from the equipment.
In all drives, a flexible coupling must be fitted between motor and gearbox.
Couplings, gearboxes etc. with alternating power transmission must have a tolerance of at least H7/r6.

Guards over shaft couplings etc. must be fitted in such a way that the hub stubs remain visible, enabling instant detection of axial shifts in the couplings.
Guards must be manufactured from minimum 3 mm thick plate.

3.7. Structural material

3.7.1. Steel structure

Structural parts subject to the forces of load transfer and all parts welded to those parts must be manufactured from one and the same grade and quality of steel in accordance with EN 10.025, annealed and straightened, and must have a guaranteed notch impact value of at least 27 Joule at -20° (SxxxJ2+N).
If the stresses calculated for a particular construction are too high, steel in accordance with EN 10.113 may be used. The selection of other material requires our prior approval.

3.7.2. Forks for forklift trucks

Forks must be manufactured from:

- S355J2+N as standard material;
- S690N for increased loads;
- SAE 8460 in the case of extreme loads.

Repairs to forks made from S355J2+N materials may only be carried out in cases of dire need.
Repairs to forks made from S690 materials may only be carried out by specialised companies.
SAE 8460 materials may not to be repaired by welding or straightening.

3.7.3. Laminated hooks and forged brackets

Laminated hooks and forged brackets must be manufactured from ageing-resistant material, in accordance with EN 10.113.

3.7.4. Shafts and pins

Shafts and pins that function as pivot or hinge points must be manufactured of alloyed steel in accordance with EN 10.083.

3.7.5. Bearing bushes

The choice of material for bearing bushes is dependent upon the temperature the bushes will be subjected to.
For an operating temperature in excess of 100 °C:

- Bronze: 84-10-4-2 (Cu 84±2, Sn 10±1, Pb 4±2, Ni 2±1) or CuAl11NiFe70 in accordance with DIN 17671 or equivalent material. The selection requires our approval.

For an operating temperature lower than 100 °C:

- provided they can withstand the load, plastic bushes that can withstand knocks and will not become brittle may be used.

Plastic bushes may not contain asbestos.

The selection of materials for bushes requires our prior approval.

3.7.6. Shaft couplings

Forged or cast steel or nodular cast steel GN42.

3.7.7. Gearbox casings

Cast steel or welded design to grade S235J2+N.

3.7.8. Bearing housings

Sheet or cast steel or nodular cast steel GN42.

3.7.9. Forged steel

Steel types in accordance with the following standards may be used:

- EN 10.083: high-grade steel;
- DIN 17210: Einsatzstähle;
- DIN 17212: Stähle für Flamm- und Induktionshärten,

or equivalent steel grades.

3.7.10. Cast steel

Cast steel in accordance with Corus Directive R1.78.40.01.

3.7.11. Rope sheaves

Cast steel or welded design, with a tensile strength of minimum 590 N/mm2.

4. SPECIFIC REQUIREMENTS FOR HOISTING EQUIPMENT

4.1. C-hooks

4.1.1. General

The C-hook must be manufactured in such a fashion that, in unloaded suspension from a crane hook, the mandrel is horizontal, while the mandrel length should be at least 3/4 of the width of the coils to be transported.

4.1.2. Production halls and workshops

When used in halls and workshops, the C-hook must have a backwards incline of at least 1° when loaded.

4.1.3. Harbours

When used in a harbour installation, the loaded C-hook must have a backwards incline of at least 3° when loaded.

4.2. Coil clamps

For single clamping, the points of action of the horizontal forces exerted onto the coil must be at least 150 mm apart vertically.

4.3. Coil tongs

When loaded, the inner side of each suspension arm must be at an angle of 1° upwards and outwards in relation to the vertical.
Surface pressure on the bearing feet may not exceed 60 N/mm2.
The bearing surfaces for the coil must be exerted in the same vertical plane and must be free to adjust maximum 2° in either direction in relation to the horizontal plane.
The shape of the bearing surfaces must be determined in consultation with the principal; this in view of the dimensions of the cores of the coils.

4.4. Plate and coil lifters

When loaded, the inner side of each suspension arm must be at an angle of 1° upwards and outwards in relation to the vertical.
The bearing surfaces must both move in the same horizontal plane and may longitudinally have a skew of maximum 1 mm per running meter.

4.5. Auxiliary equipment for forklift trucks

Auxiliary equipment for forklift trucks must be designed taking a safety factor of V = 3.0 into account. The capacity of the equipment is dependent on the forklift used and its load centre distance, among others.
The auxiliary equipment must meet the stipulations of the EC Machinery Directive (2006/42/EC) and may not adversely affect the stability of the vehicle.

4.6. Forks

The following instructions apply to forks:
- NEN ISO 2330, 13284

5. DELIVERY OF HOISTING EQUIPMENT

5.1. Technical information to be provided upon delivery

The following must be provided upon delivery of the hoisting equipment in accordance with the EC Machinery Directive:

- an instruction manual in Dutch;
- a maintenance manual in Dutch;
- a spare parts list in Dutch;
- calculations and drawings of the final version in digital form, as recorded in the drawing rules R1.05.80.01, R1.05.80.02 and R1.05.80.03;
- the material certificates;
- the final welding protocol.

The identification number, titles and drawing numbers will be provided by Corus.