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SUBSTRUCTURE ON FIXING ANGLES

1. INSTALLATION ON FIXING ANGLES

1. 1. GENERAL NOTES

There are two types of fixing angles:

- ☐ Not reusable fixing angles; they are set into the concrete block.
- ☐ Reusable fixing angles; they are fixed onto the concrete block by means of the fixing rods.

The choice of the concrete block and the loads and reactions applied on the fixing angles are given in the brochure 17A.

1. 1. 1. FITTING THE FIXING ANGLES

A bad mounting of the fixing angles may cause serious troubles when using the crane (perpendicularity not observed, warpage of the fitting surfaces of the mast).

An operating method is given as indication in paragraph 18A-0420 for not reusable fixing angles and in paragraph 18A-0430 for reusable fixing angles. The fitting elements (frame, standard mast section) recommended in the operating method can be supplied at the same time as the fixing angles and before the crane.

NOTE: The frame is only used for fitting the fixing angles.

1. 1. 2. EXECUTION OF THE CONCRETE BLOCKS

The plans described on the following pages are in compliance with the maximum loads given for each case.

IMPORTANT : The reinforcement is given on the following pages as an indication and can be carried out differently, if necessary, under the responsibility of a competent specialist.

2. PREPARING THE CONCRETE BLOCKS

2. 1. FABRICATION RULES FOR REINFORCED CONCRETE

Concrete and reinforcement determined according to the B.A.E.L. (reinforced concrete boundary condition) Rules, 1983.

2. 1. 1. CONCRETE

□ **ftj** = characteristic tensile strength of the j days old concrete

□ **fcj** = characteristic compressive strength of the j days old concrete

NOTE 1 – In any case, the compressive strength is measured by axial pressure of the cylinder having a periphery of 200 cm² cross section and a height which is the double of its diameter (16 cm). These dimensions suppose an aggregate size of at least equal to 40 mm, a condition generally fulfilled for reinforced concrete.

NOTE 2 – The dimensions and characteristics of the reinforcements and of the concrete for the execution of concrete works indicated in this manual, are defined by a compressive strength value at 28 days old (j = 28).

Reinforced concrete mixing of 350 kg/m³ – CPA45

that means, for 1 m³ of sand with gravel:
350 kg PORTLAND cement 45.

For a vibrated concrete correctly prepared, we obtain:

fc28 = 20MPa

ft28 = 0,6+0,06fc28 = 1,8MPa

P = Weight of reinforced concrete in daN

D = Average density of reinforced concrete equal to about 2,35

2. 1. 2. STEEL (except other indications)

Es: Longitudinal modulus of elasticity of steel: 200000 N/mm²
i.e. 200000 MPa

Type 1: Reinforcement with high adherence obtained by hot-rolling of natural high-carbon steel.

Quality: Fe E 40 i.e. fe=400MPa

SHOULD THE ABOVE RULES NOT APPLY, REFER TO THE RULES APPLIED IN THE USER COUNTRY.

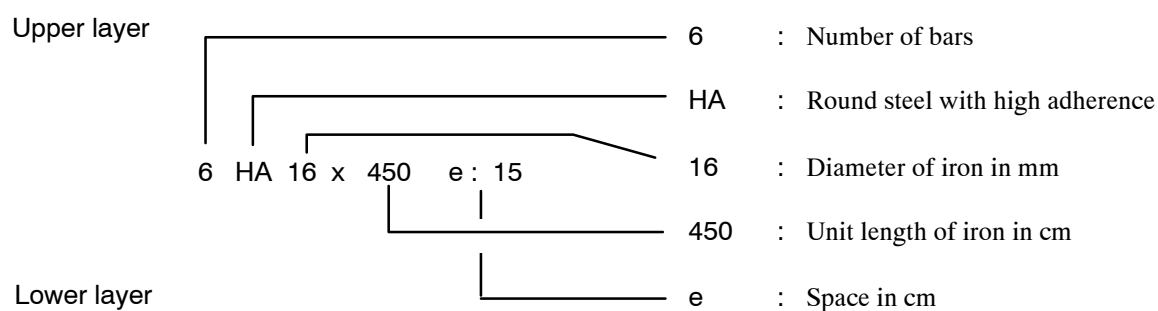
2. 2. EXPLANATION AND SYMBOLS

Designation of a concrete block (M54N).

- ☐ M: Concrete block
- ☐ 54: Weight of the concrete block in tons.
- ☐ N: Internal coding

The reinforcement of a concrete block is composed of an upper and a lower reinforcing cage connected by pins. Each cage comprises two crossed layers.

(Example)



ep: pin

D: density

V: volume in m³

L: length in cm

I: width in cm

H: height in cm


1LH : First upper layer

1LB : First lower layer

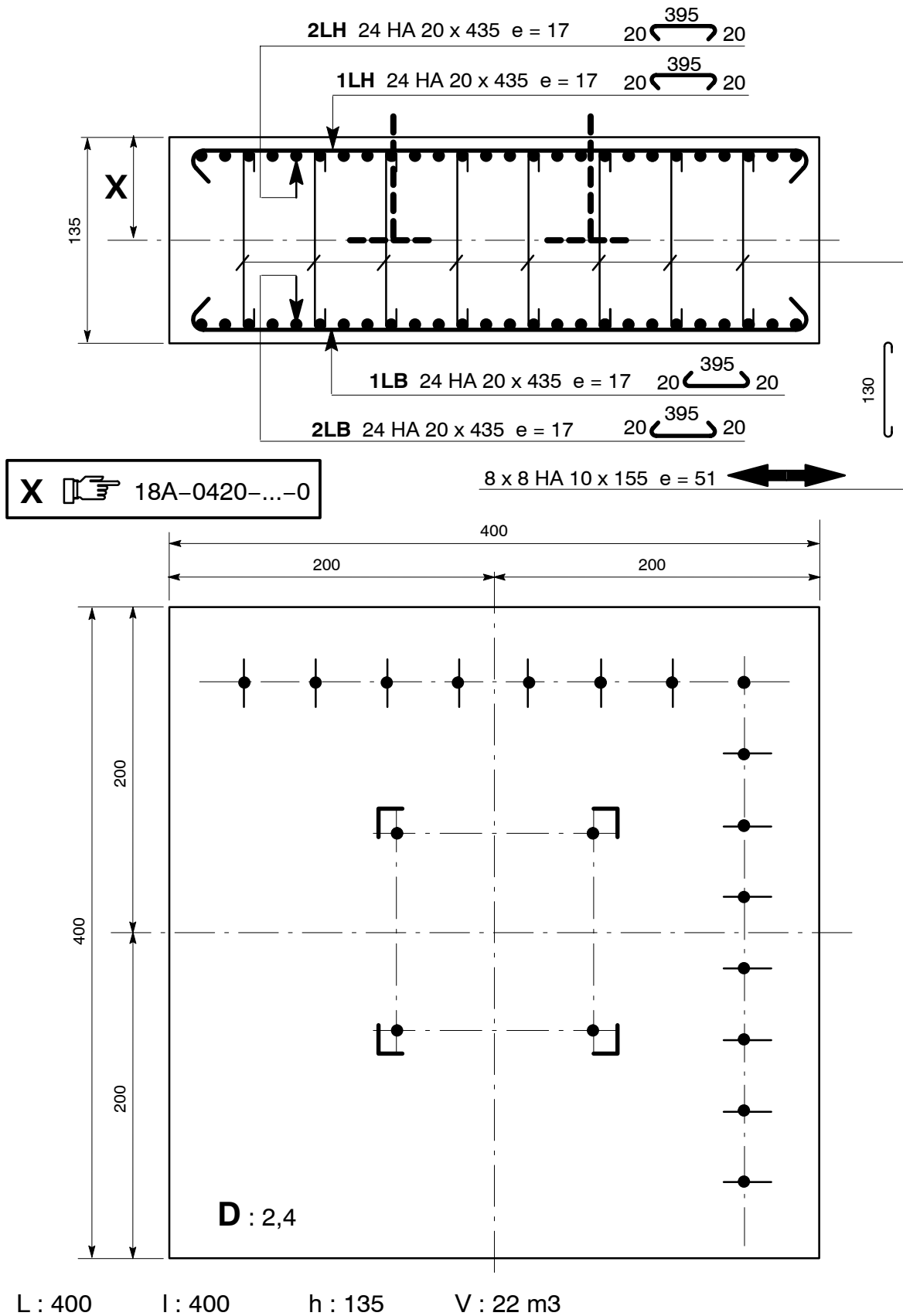
2LH : Second upper layer

2LB : Second lower layer

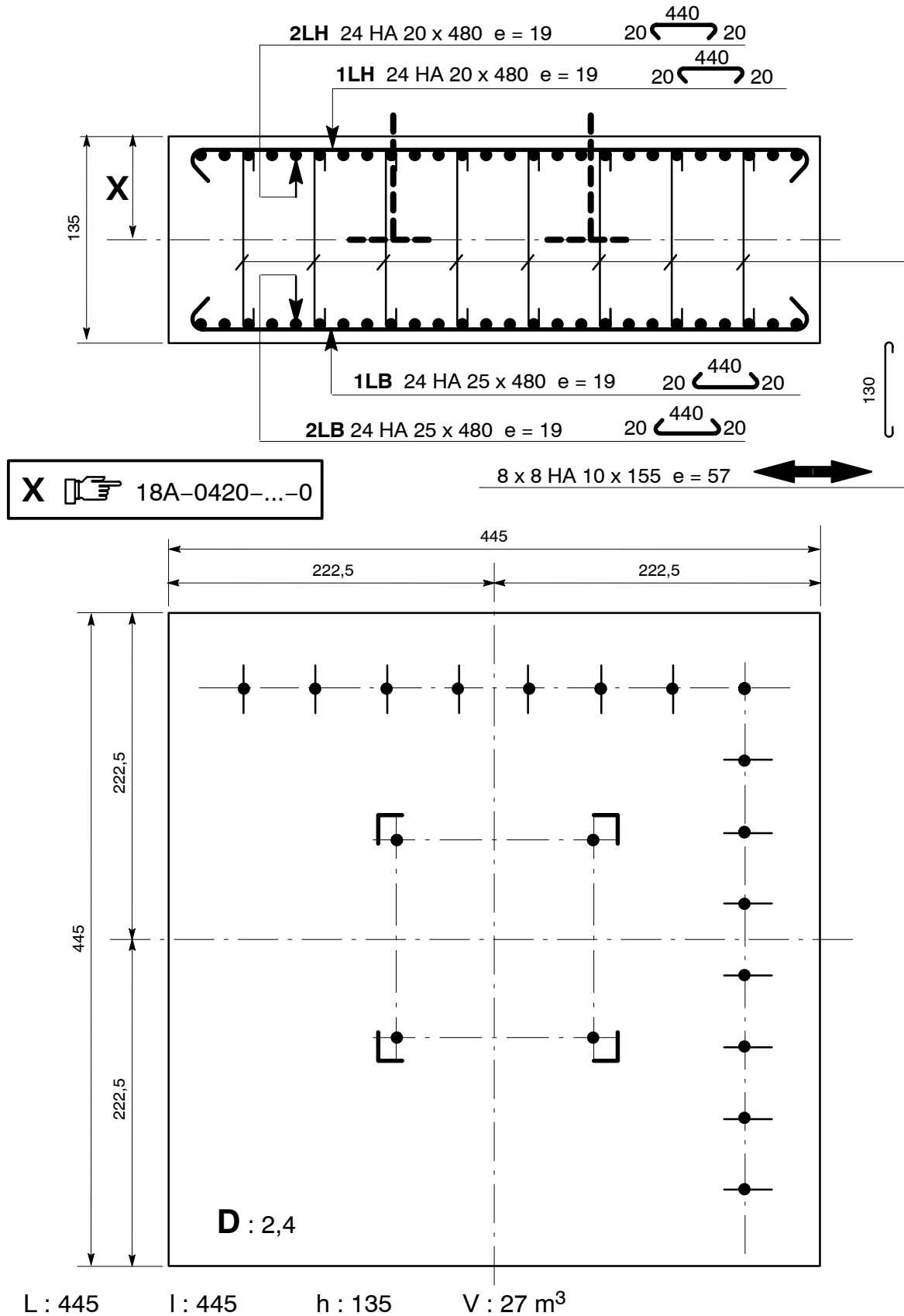
T : stem

 In both directions

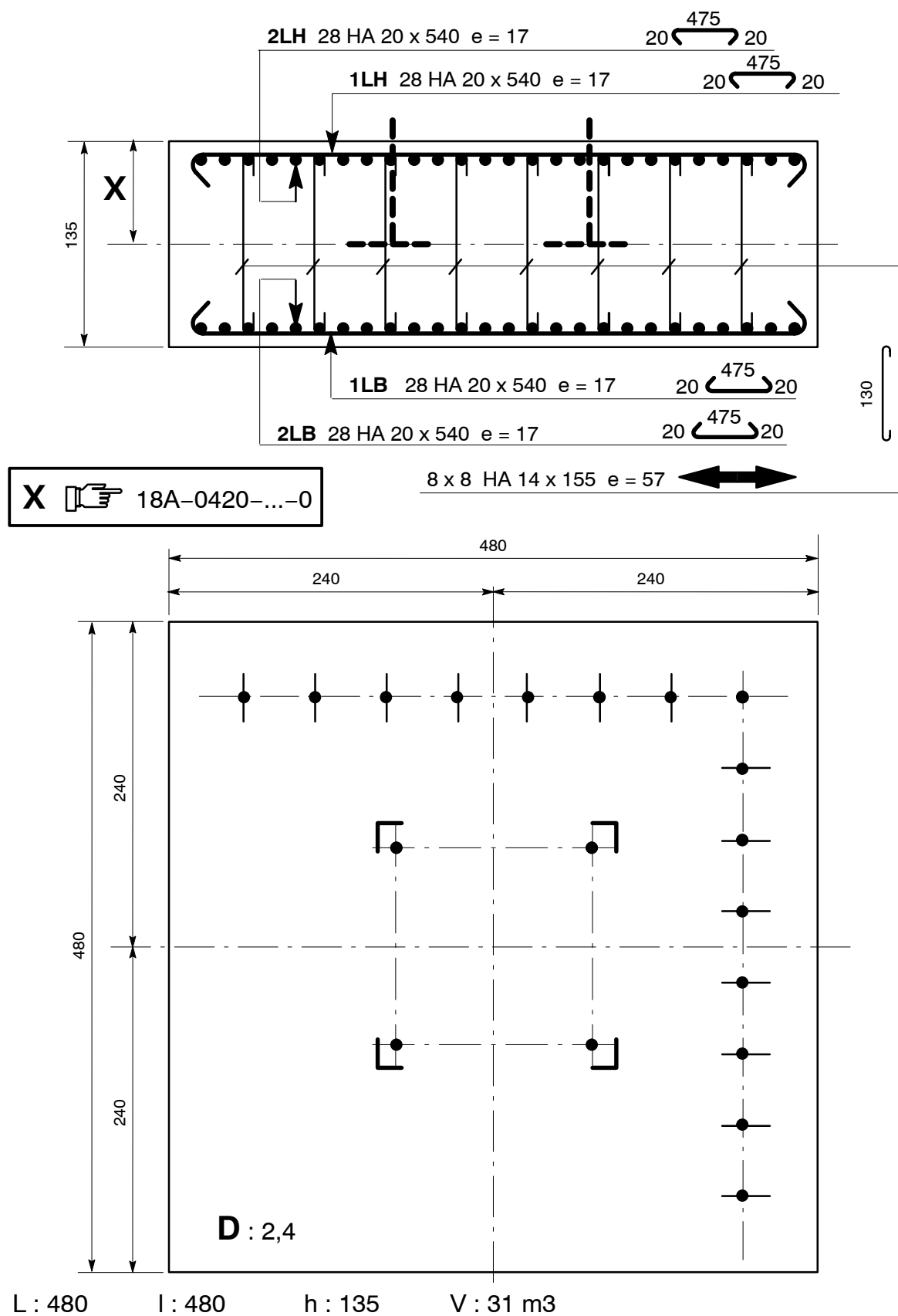
2. 3. CONCRETE BLOCK (M52N)



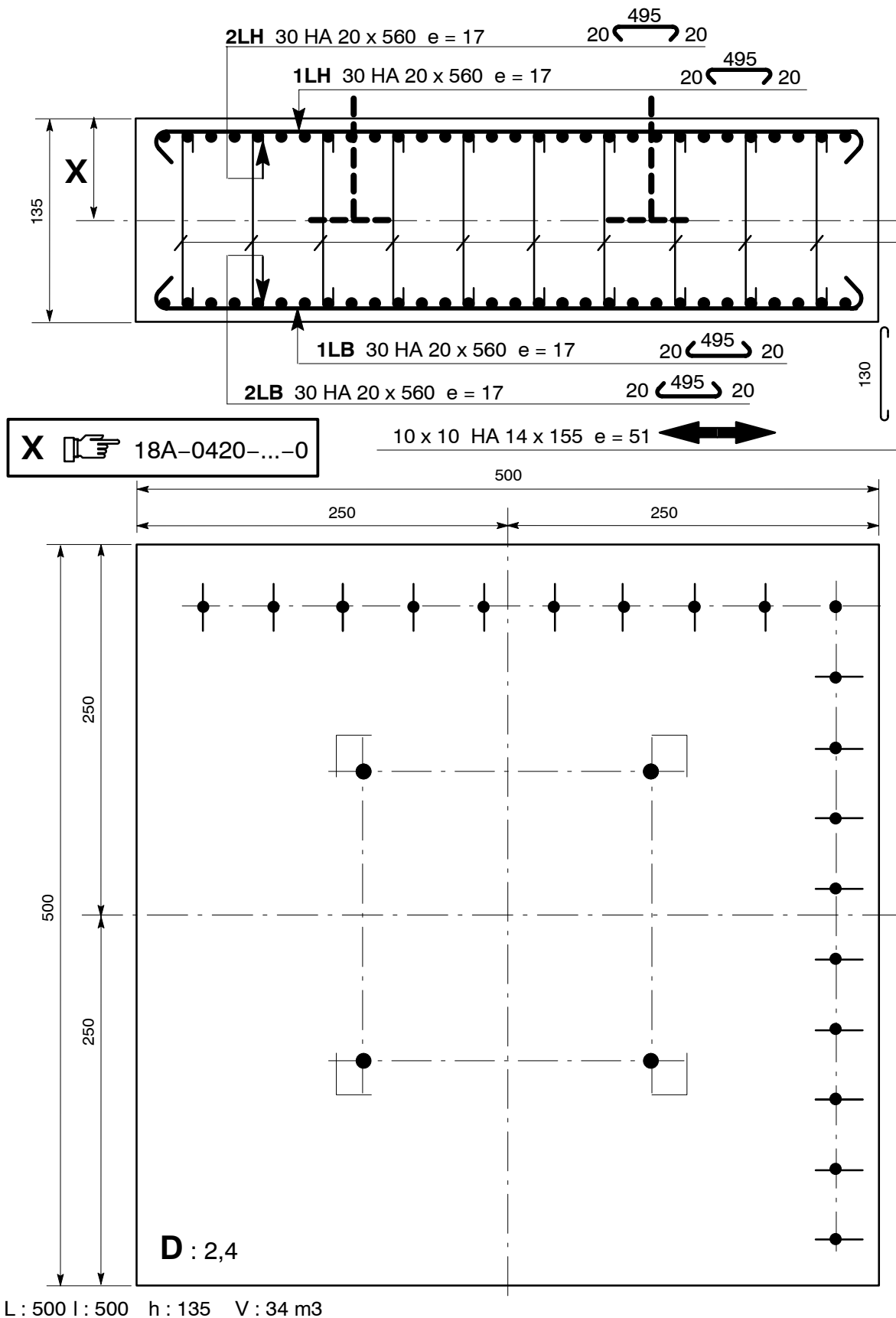
2. 4. CONCRETE BLOCK (M64N)



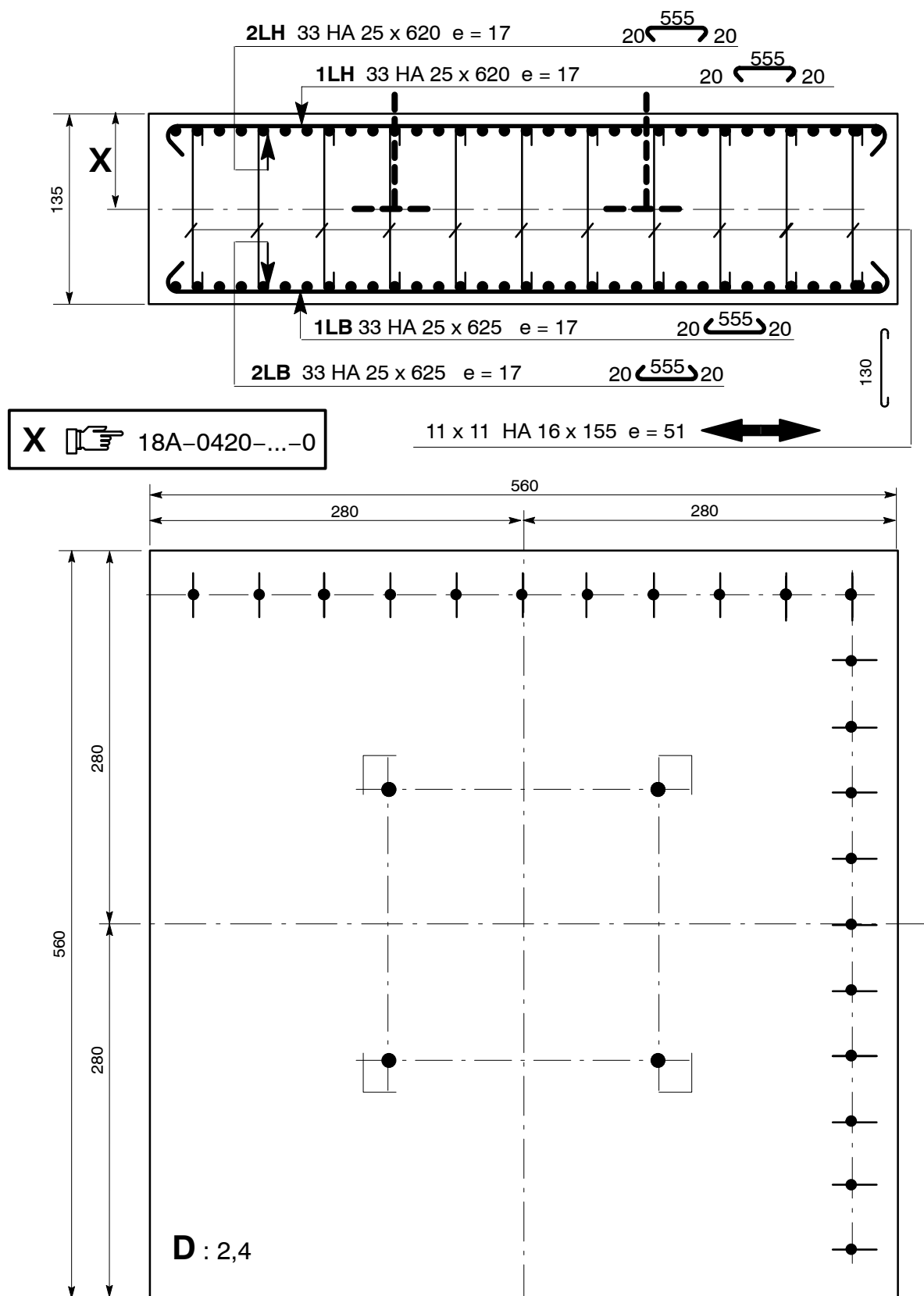
2. 5. CONCRETE BLOCK (M74N)



2. 6. CONCRETE BLOCK (M81N)

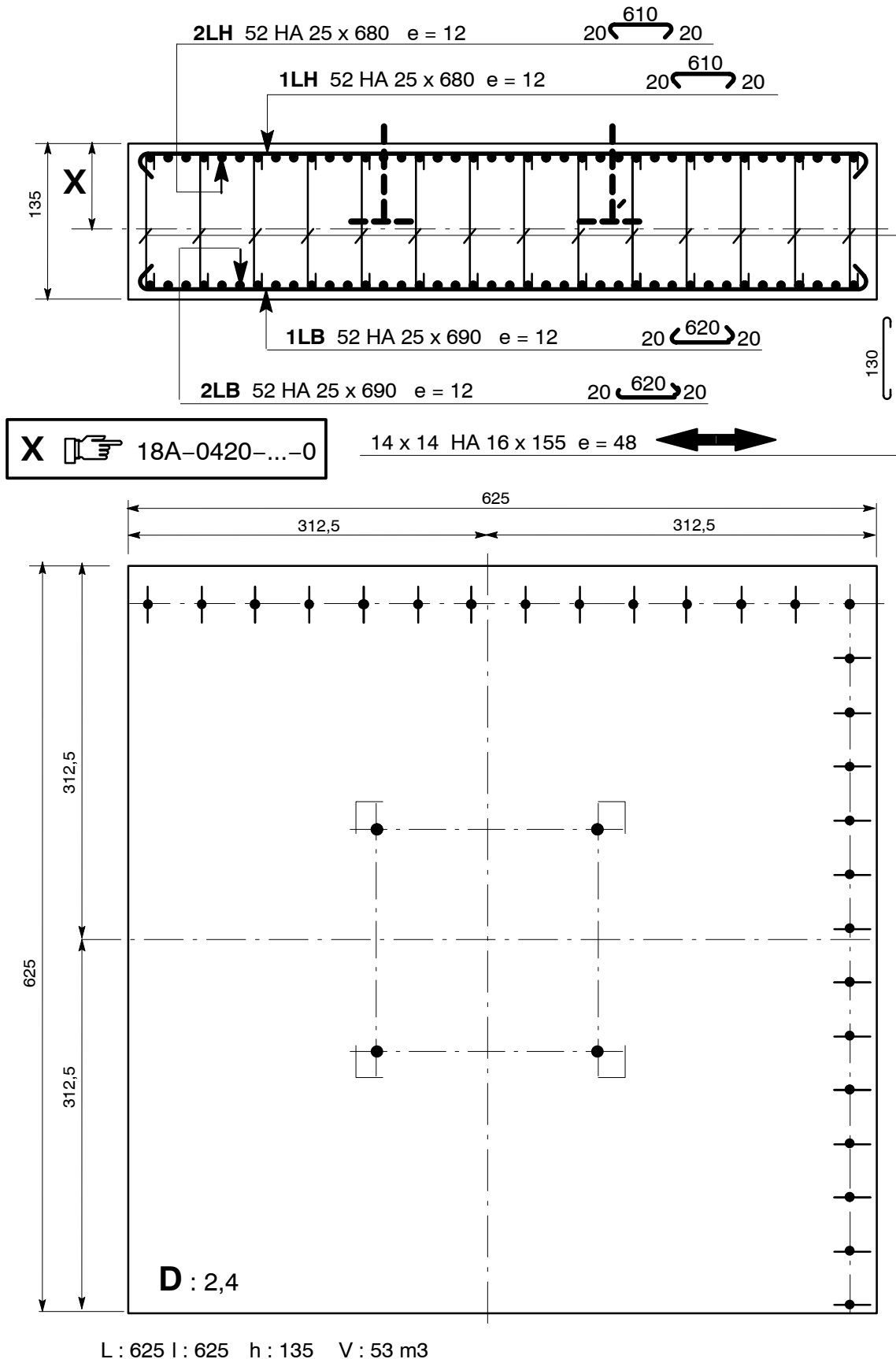


2. 7. CONCRETE BLOCK (M101N)



L : 560 l : 560 h : 135 V : 42 m3

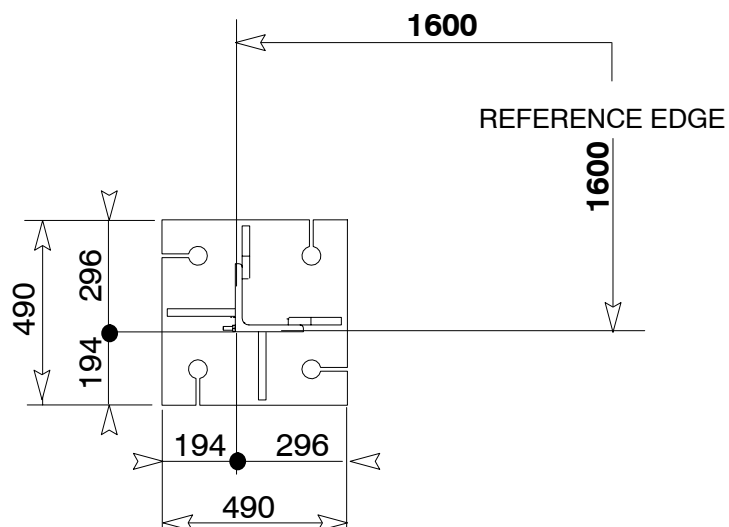
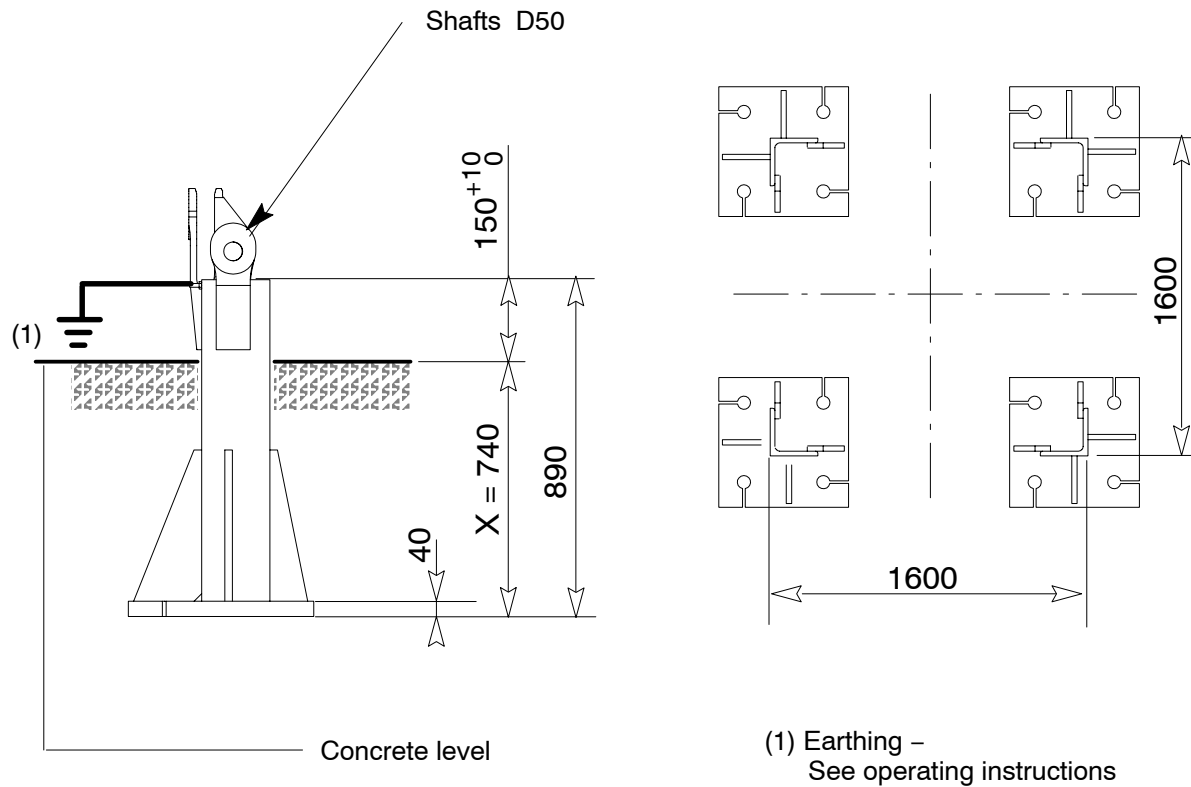
2. 8. CONCRETE BLOCK (M126N)



L : 625 l : 625 h : 135 V : 53 m3

3. FITTING THE NOT REUSABLE FIXING ANGLES

3. 1. DIMENSIONS OF THE FIXING ANGLES



3. 2. SETTING INTO CONCRETE OF THE FIXING ANGLES

In order to set perfectly into concrete the fixing angles, following components are necessary:

- 4 fixing angles and 8 shafts
- 1 template
- 1 sighting device

The fixing angles and the template can be supplied before the delivery of the crane.

The fixing angles must be symmetrically set into concrete with regard to the axes of the concrete block and form a square according to the dimension of the masts to be fitted.

Tolerance of surface evenness: 1/400 of the mast cross-section

Near the fixing angle, NEVER CUT REINFORCING STEELS NOR REDUCE THEIR NUMBER GIVEN.

Take care that the fixing angles are correctly earthed (see Operating Instructions).

The template is only used for fitting the fixing angles.

IMPORTANT: When assembling the fixing angles and the template, make sure that the bearing surfaces of borings and shafts are clean and free from any smear.

- ❑ Outside or inside the ditch, arrange the fixing angles (1) by observing their distance (Detail A – Figure 1).
- ❑ Engage the template (2) into the 4 fixing angles; lower it until it comes to rest onto the fishplates at (a) (Detail C – Figure 1).
- ❑ Engage the standard mast section (3) into the fishplates of the fixing angles (Detail B – Figure 1). Raise the template (2) in order to pin-connect the 4 x 2 shafts (4). Block the shafts (4) by means of the pins (5); fix the pins with split pins (Detail C – Figure 1).

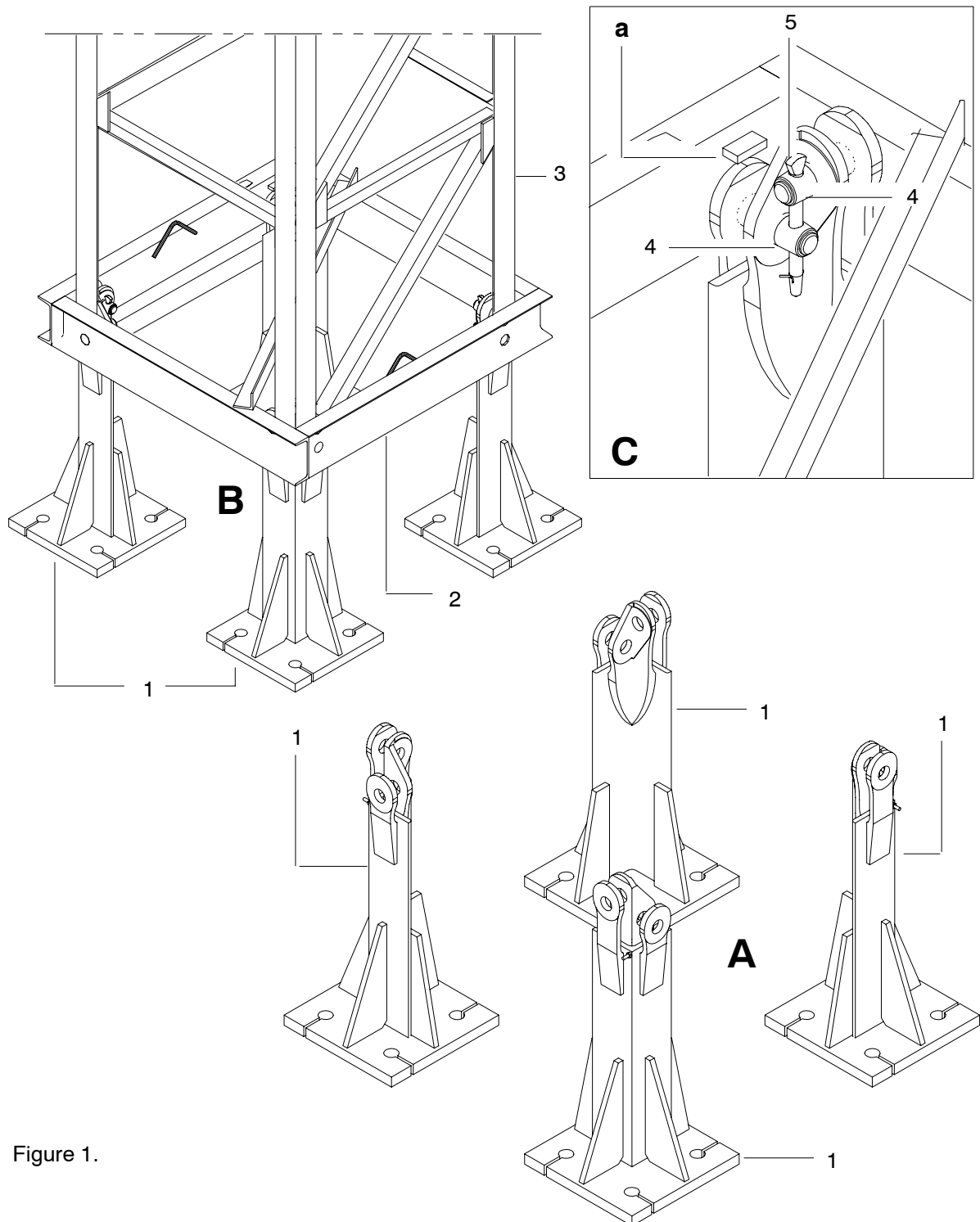


Figure 1.

- ☐ Position the assembly comprising the fixing angles, the template and standard mast section in the reinforcement arranged in the ditch and carry out an adjustable wedging (1) under the plates of the fixing angles (Detail A – Figure 2).

IT IS ESSENTIAL TO OBSERVE THE DIMENSION OF 150 mm (Detail B – Figure 2).

- ☐ Check the perpendicularity of the assembly by means of the sighting device.
- ☐ Pour the concrete block and wait that it is completely dry before dismantling the template and the standard mast section.

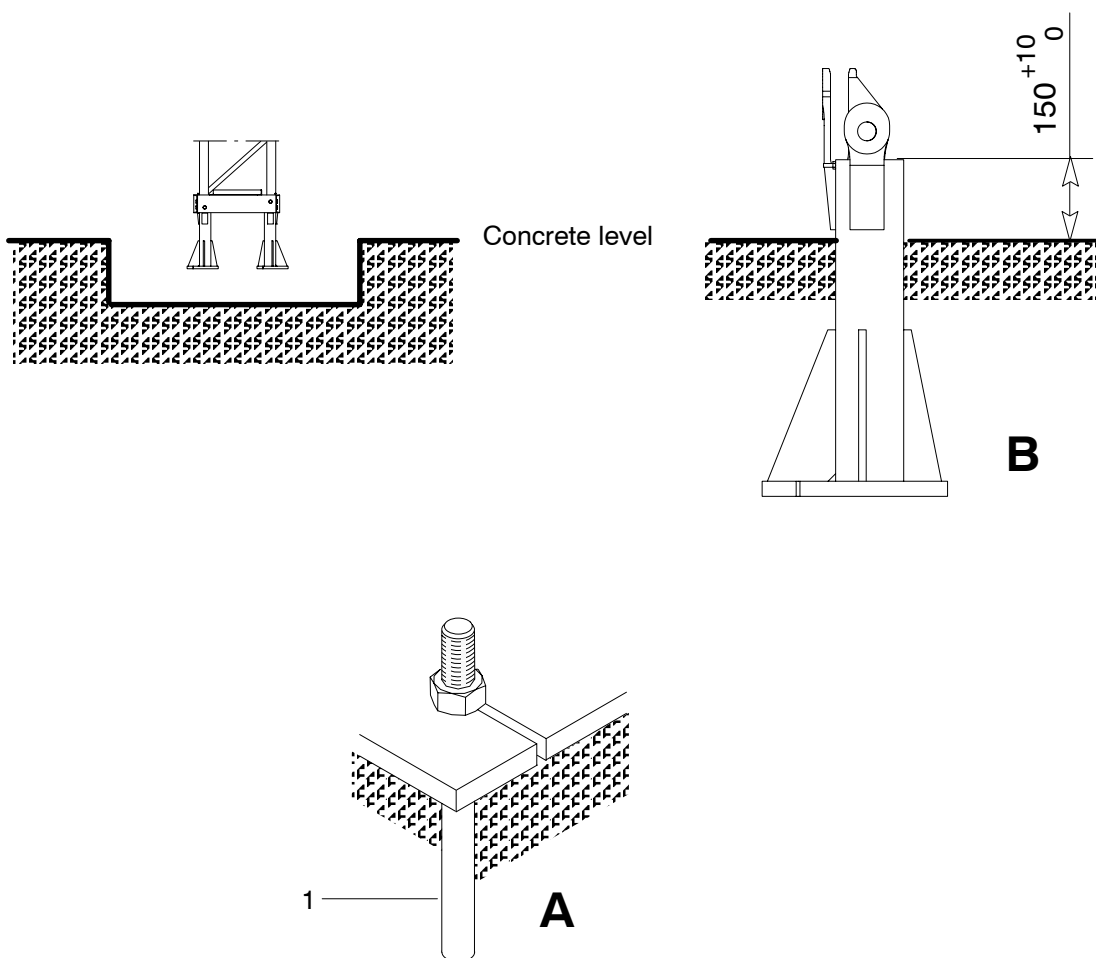
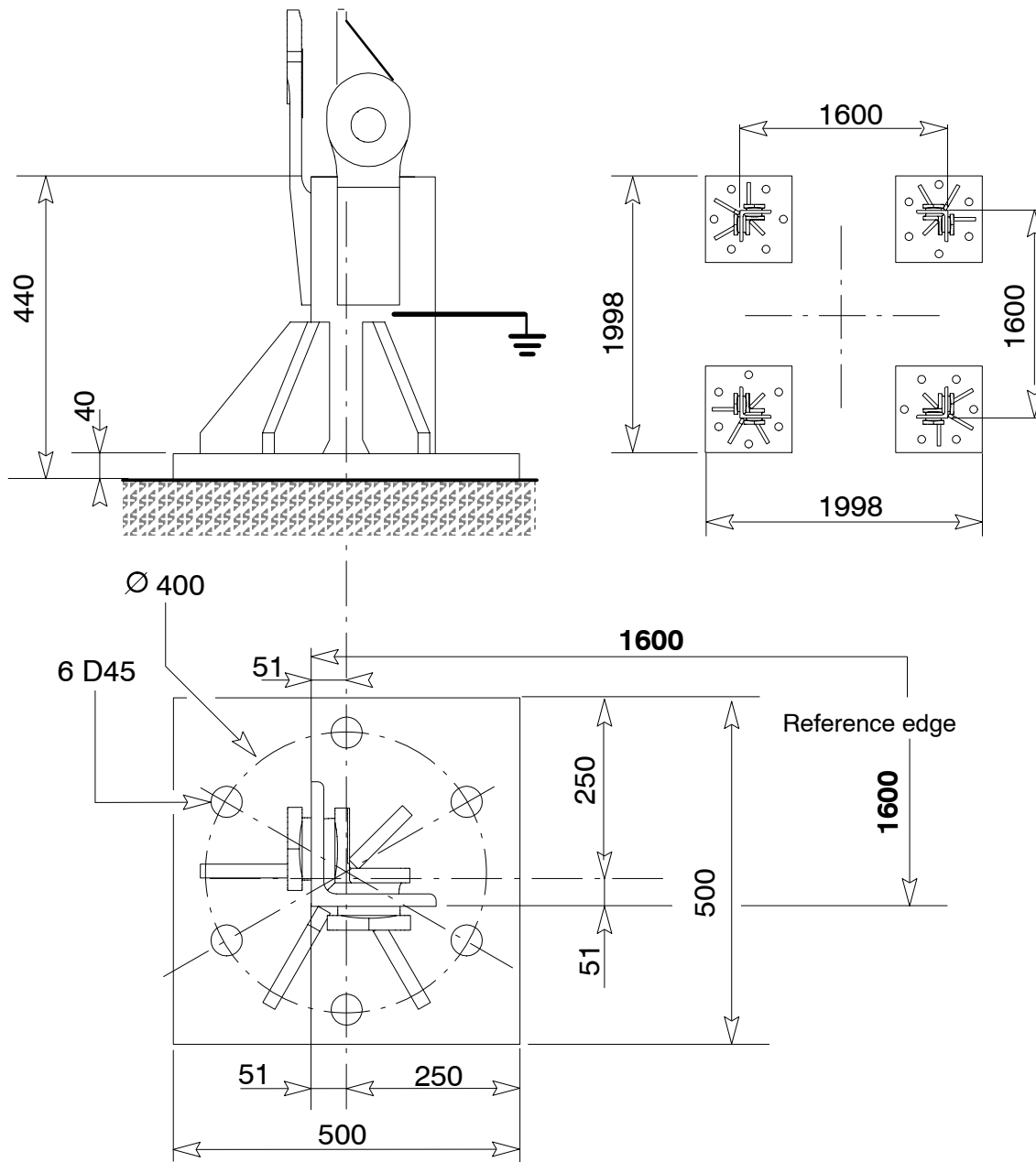


Figure 2.

4. FITTING THE REUSABLE FIXING ANGLES

4. 1. DIMENSIONAL CHARACTERISTICS OF THE FIXING ANGLES



Dimensions in mm

4. 2. FITTING THE FIXING ANGLES

The dimension, number and fitting of the fixing rods of the fixing angles onto the concrete block (or any other structure ...) are on the user's responsibility. The loads and reactions are given in chapter 17A.

It is possible to use the constructor's standard of concrete blocks for the informations of mass, dimensions and ground pressure. The concrete blocks are defined for the plate-type fixing angles. Therefore, it is **COMPULSORY** to adapt them to the reusable fixing angles and to the connecting method between the fixing angles and the concrete block. The adaptation of the reusable fixing angles to these concrete blocks is on the user's responsibility (the reinforcement type is to be adapted to the fixing rods used).

Near the fixing angle, **NEVER CUT REINFORCING STEELS NOR REDUCE THEIR NUMBER GIVEN.**

The fixing angles can be supplied before the delivery of the crane in order to use them as positioning jig for the fixing rods of the fixing angles. The template can also be supplied before the delivery of the crane.

The template is only used for fitting the fixing angles.

Fitting this equipment increases the hook height by 290 mm in comparison with the standard fixing angles to be set in concrete.

Take care that the fixing angles are correctly earthed (see Operating Instructions).

4. 2. 1. DETERMINATION OF A FIXING

The tables of the chapter 17A give the tensile load, compression and shearing forces applied on the fixing angles for the various working heights. These informations allow carrying out the calculation of the fitting of the fixing angles adapted to your case of use, knowing that the shearing force is always taken up by two fixing angles.

In general, it can be indicated that, in case of fixing by screw connections or by high-strength tie rod, a correct assembling will be obtained by observing the following data, that is to say:

- ☐ F – maximum static load under tensile strength on 1 fixing angle.
- ☐ Fe – the capacity corresponding to the elastic limit of the tie rod (Class 10.9 Fe = 90 Kg/mm² ; Class 8.8 Fe = 64 kg/mm² ; Class 6.6 Fe = 36 kg/mm²).
- ☐ Definition of the number of rods (N) to be used per fixing angle.

$$\frac{F}{0,3 Fe} = N \text{ to be rounded}$$

The number of the rods is always even: 4 or 6, and symmetrical with respect to the upright.

NOTE: Considering a permissible load per rod, equal to 0,3 of the elastic limit, taking up the moment given by the shearing force and the various dynamic coefficients are integrated.

- ☐ Prestress Fp to be applied on the high-strength rod (Fp = 0,5 Fe)

IMPORTANT: Besides these informations concerning the number and the quality of the rods, choosing and fitting workmanlike the fixings are entirely on the user's responsibility.

4. 2. 2. FITTING THE RODS

Fitting the rods varies depending on the number of rods used:

- ☐ 4 rods – use the holes 1, 3, 4, 6 (Figure 1)
- ☐ 6 rods – use the holes 1, 2, 3, 4, 5, 6 (Figure 1)

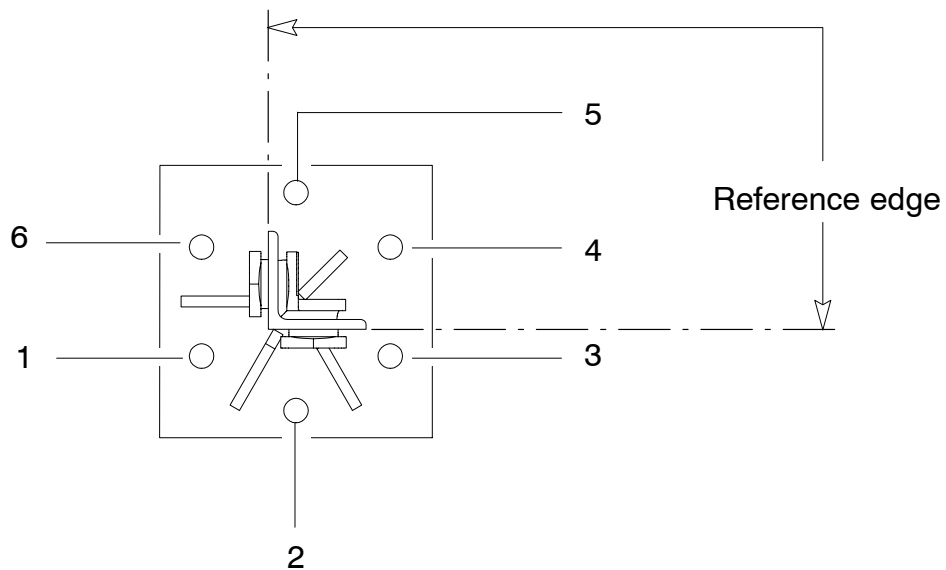


Figure 1

4. 2. 3. FITTING THE FIXING ANGLES

- ☐ Arrange the fixing angles (1) by observing their distance (Detail A – Figure 2).
- ☐ Engage the template (2) into the 4 fixing angles, lower it until it comes to rest onto the fishplates at (a) (Detail C – Figure 2).
- ☐ Tighten the nuts of the fixing rods according to the supplier's instructions.
- ☐ Engage the standard mast section (3) into the fishplates of the fixing angles (Detail B – Figure 2). Raise the template (2) in order to pin-connect the 4 x 2 shafts (4). Block the shafts (4) by means of the pins (5); fix the pins with split pins (Detail C – Figure 2).



Tolerance of surface evenness: 1/400 of the mast cross-section

IMPORTANT : When assembling the fixing angles and the template, make sure that the bearing surfaces of borings and shafts are clean and free from any smear.

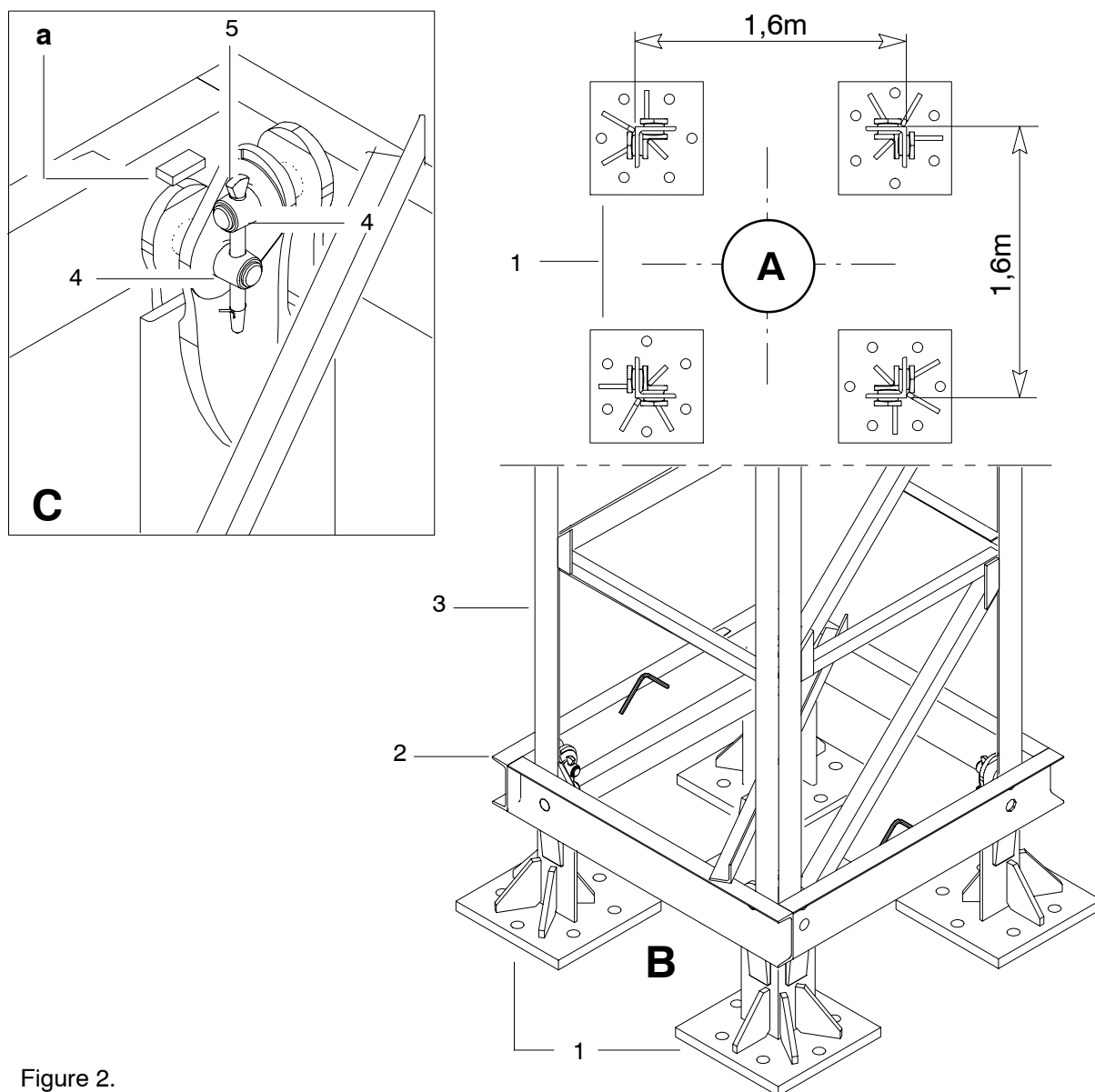


Figure 2.

