



**TEREX** | COMEDIL

# CTT “City”

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## Chapter 3

**A**



## 1

## PREPARATION OF THE JOB SITE

## 1.1 INTRODUCTION

The responsibility for the preparation of the crane's job site rests entirely with the crane user. Any clearing, leveling, building up or reinforcing of the ground where the crane will be positioned and operated shall be carried out by him, as well as the verification of feasibility of the different crane installations proposed by the manufacturer.

## 1.2 CHECKING THE GROUND'S CONSISTENCY

The primary requirements to be met at the job site before the arrival of the crane are: concrete foundations, ground beneath the ballast placed under the undercarriage or rail tracks, depending on the crane configuration chosen.

The installation of such elements depends particularly on the type of ground and foundation on which these assemblies are to be placed, as well as on the crane own characteristics.

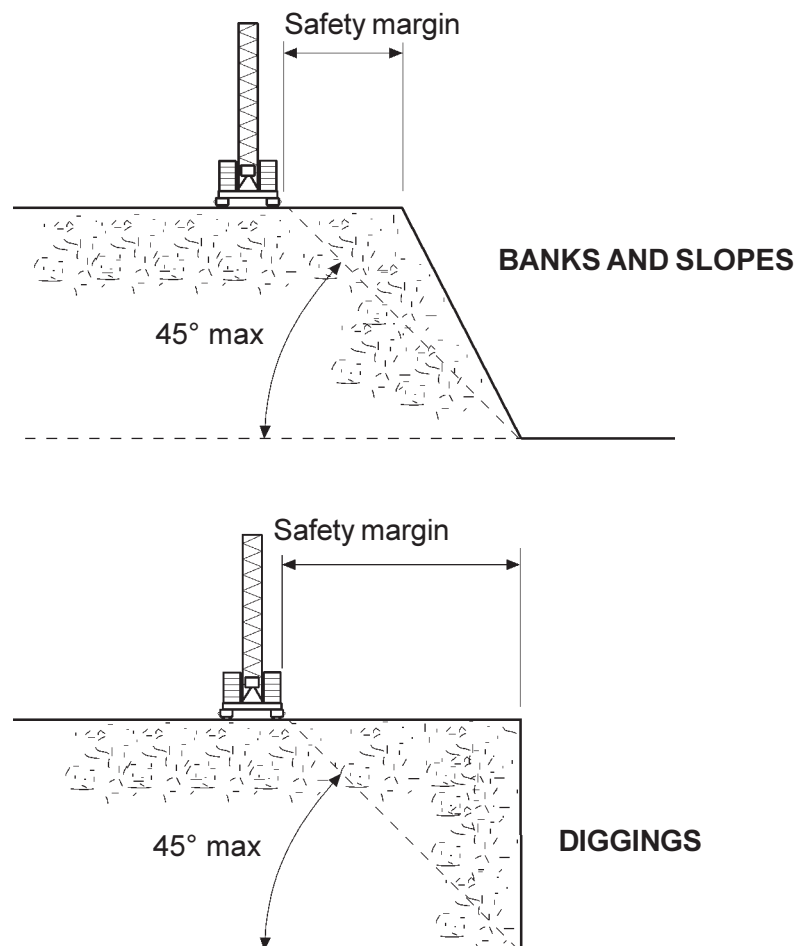
The Buyer therefore must carry out a careful inspection and analysis of the ground consistency on which the crane shall stand.



**Attention:** When close to diggings, slopes, banks, etc., keep such a safety margin as to grant a load distribution angle of 45°.

The safety distance depends also on the ground characteristics (water quantity, friction, etc.).

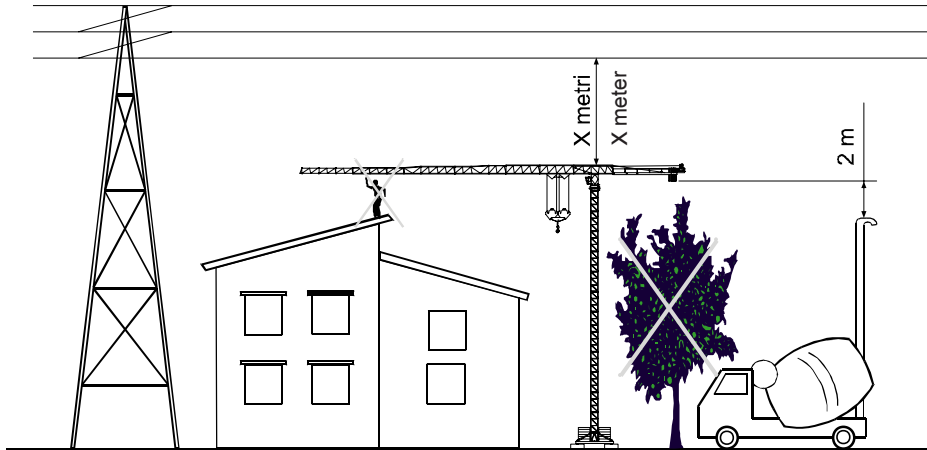
Should ground conditions be critical, provide against sinkings with a containment concrete wall (picture 1.2.1).



Picture 1.2.1

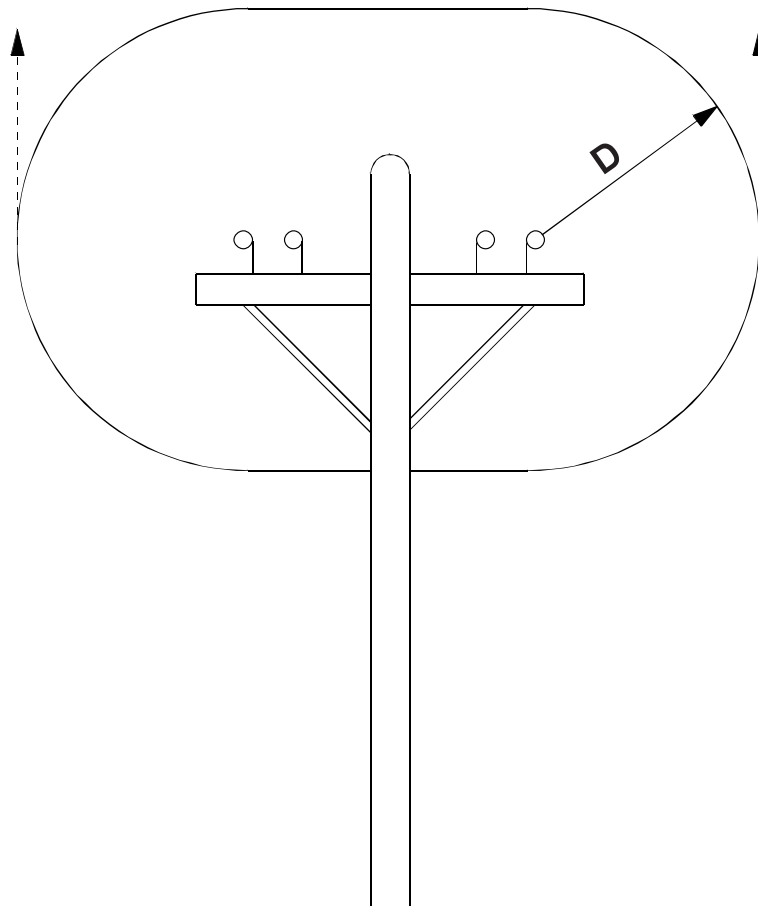
### 1.3 CHECKING THE CRANE'S INSTALLATION AREA

When choosing the location for the crane at the job site, the Client shall be particularly careful to ensure that the crane is not obstructed during its operational movements. Likewise he shall check that, when the crane is out of service, its free slewing doesn't allow it to come in contact with existing buildings, buildings under construction, stored materials, scaffolding, adjacent cranes, machines, installations, cables, trees, etc. (picture 1.3.1).



**Picture 1.3.1**

If the crane is working near electrical lines, precautionary measures shall be taken to prevent any crane part or the load from entering into the danger zone area shown in picture 1.3.2.



**Picture 1.3.2**



REQUIRED CLEARANCE FROM HIGH VOLTAGE POWER LINES				
Normal Voltage [kV]				Minimum Clearance D
Operations near High Voltage Power Lines				
				[m] [ft]
to 50				3 10
over 50	to	200		4.5 15
over 200	to	350		6 20
over 350	to	500		7.5 25
over 500	to	750		10.5 35
over 750	to	1000		14 45

Table 1.3.1

Caution shall be exercised when working near overhead lines because they can move horizontally or vertically due to wind, moving the danger zone shown in picture 1.3.2 to new positions.

A qualified signalperson shall be assigned to observe the clearance when the crane moves to within a jib's length of the Table 1.3.1 limits. Actually the crane operator is not in the best position to judge distance between the power line and the crane or its protuberances.

When a crane is installed in proximity to power lines, durable signs shall be installed at the operator's station and on the base of the crane, warning that electrocution or serious bodily injury may occur.

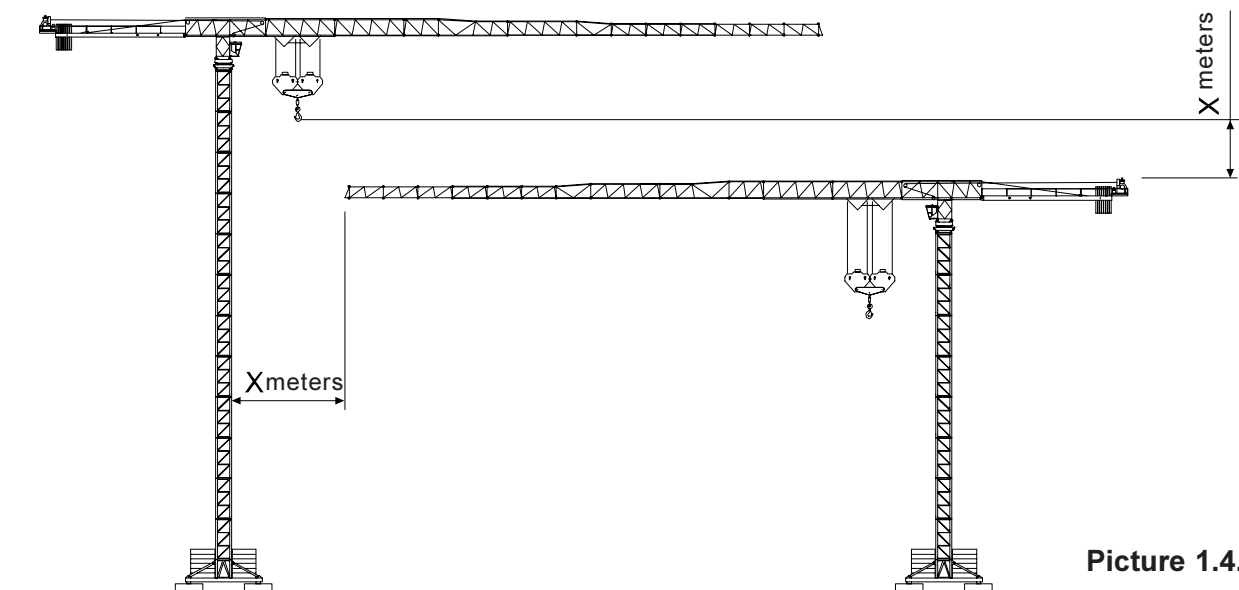
Anyhow, before the commencement of operations near electrical lines, the person responsible for the job shall notify the owners of the lines or their authorized representatives, providing them with all pertinent information and requesting their cooperation to determine the proper safety distance according to the line power.



## 1.4 INTERFERING CRANES

When two or more cranes working at close range in the same job site can interfere with each other, the following precautions must be taken:

- A) jibs must be offset to avoid collision of any structural parts considering the maximum oscillation amplitude and a reasonable safety distance;
- B) the minimum distance between the two cranes must be great enough to prevent the cables and loads of the higher crane from interfering with the lower crane;

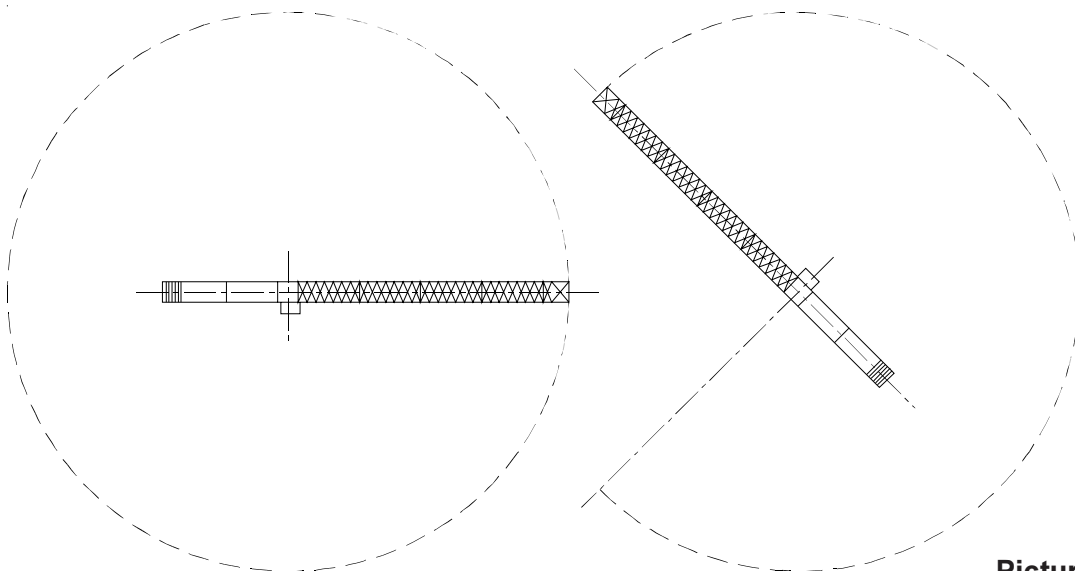


**Picture 1.4.1**

"X" distance depends on the dimensions of the loads

- C) electrical or radar anti-collision devices can be installed to limit the crane working range. Always consult the Manufacturer for the installation of this safety device.

Remember that cranes must be always offset in height to avoid any interference when out of service.



**Picture 1.4.2**

## 1.5 ELECTRIC POWER SUPPLY

### 1.5.1 Introduction



The connection of the crane to the electric energy source is upon the User.

For a correct operation of the crane, the installation should meet precise safety and size requirements.

To the purpose, some useful information are given for the best layout and realization of the electric connection.



The crane supply is three-phase type with protective bonding circuit, without neutral wire.

In the pages inside you will find:

↳ the *total electric power requirement* **"Pt"** (expressed in kVA);

↳ the *rated power of the hoist winch* **"Pa"** (expressed in kW or HP);

↳ the *speed control system of the hoist winch*:

**APC** = 3-speed polarity change control

**AFC** = 4-speed frequency variation control

Refer to the following documents to know the values involved :



a) crane identification plate (placed on the base mast section and called for in **Chapter 1\_2\_e - General information** of the crane's operation manual);

b) crane specifications sheet (called for also in **Chapter 2 - Technical specifications** of the crane's operation manual) (picture 1.5.1), which is supplied to the customer upon delivery of the crane together with other preliminary information for the preparation of the job site.

Total electric power requirement <b>"Pt"</b>		Picture 1.5.1		
	24 APC 40	65 * kVA	400 V - 50 Hz	2000/14/CE
	30 AFC 40	70 * kVA	400 V - 50 Hz / 460 V - 60 Hz	

Hoist winch speed control system		Hoist winch rated power <b>"Pa"</b>			
			m/min	t	kW
24 APC 40			5	4	24
			29	4	
			58	2	
			2.5	8	30
			14.5	8	
			29	4	
30 AFC 40 (VARIANT)			0 ⇨ 3	4	
			3 ⇨ 10		
			10 ⇨ 41		
			41 ⇨ 66	1.38	
			66 ⇨ 82	1.86	
			0 ⇨ 1.5	8	
			1.5 ⇨ 5	8	
			5 ⇨ 20.5	8	
			20.5 ⇨ 33	4.76	
			33 ⇨ 41	3.72	

## 1.5.2 The power line

### 1.5.2.1 Mains supply rated voltage values

#### 50 Hz Mains supply

Comedil cranes are designed to work with 50 Hz supply and nominal voltage **“Vn”** 400 V ± 10%.

It means that, with the crane ON and no movement in progress, the voltage value shall not exceed 440 V while, with the crane in service and total power rating absorbed, voltage value, even for short time periods, shall not be less than 360 V.

#### 60 Hz Mains supply

Comedil cranes are designed to work with 60 Hz supply and nominal voltage **“Vn”** 460V +6% -10%.

It means that, with the crane ON and no movement in progress, the voltage value shall not exceed 490 V while, with the crane in service and total power rating absorbed, voltage value, even for short time periods, shall not be less than 420 V.

### 1.5.2.2 Choosing the autotransformer



If the supply source cannot satisfy the rated mains voltage, it is necessary to install an autotransformer of proper characteristics to increase or reduce it. These vary according to the total power rating required (refer to **“Pt”** value and round it up, as necessary) and to the voltage terminals.

Comedil can supply the following autotransformers:

400 to 480 Volt Mains supply		
Total Power Rating <b>“Pt”</b> [kVA]	Voltage Terminals [Volt]	Comedil Code
50	400-420-440-460-480	832799117
60	400-420-440-460-480	832799118
75	400-420-440-460-480	832799104
440 to 575 Volt Mains supply		
Total Power Rating <b>“Pt”</b> [kVA]	Voltage Terminals [Volt]	Comedil Code
50	440-460-480-575	832799122
60	440-460-480-575	832799123
75	440-460-480-575	832799124

Table 1.5.2

### 1.5.2.3 Crane transfer to different job sites

During the final inspection performed at Comedil's workshop, the crane is set to work in conformity with the supply mains in force in the destination Country.



Should the machine be transferred to another Country with different mains supply, adjust the transformer voltage terminals inside the electrical boxes on the rotating upper part of the crane accordingly.



**Remember that only cranes equipped with “Variant” drive units can work in Countries with 60 Hz supply mains.**



## 1.5.2.4 Supply cables size

On establishing the supply voltage value, determine the cross-sectional area of the cable connecting the power source to **“QEL”** electrical box (with supply disconnecting device) on the base mast section of the crane (see **Chapter 4B - Tower erection**).

The minimum cross-sectional area of the cable depends on **“In”** nominal current of the crane [to be calculated by the formula  $In = Pt : (Vn \times \sqrt{3})$ ], on the cable type, on the installation type and on the temperature that the cable itself can withstand (see standards in force).



When using, instead, H07RNF or N1VVK multicore cables in an ambient air temperature of 25° C, attain strictly to the values shown in table 1.5.3.



Refer to **“Pt”** value and round it up, as necessary.

Total Power Rating <b>“Pt”</b> [kVA]	Current 400V - 50 Hz [A]	Minimum Cross-sectional Area [mm <sup>2</sup> ]
30	43	10
35	51	16
40	58	16
45	65	25
50	72	25
55	79	25
60	87	25
65	94	25
70	101	35
75	108	35

Table 1.5.3

**U.S. Customary Units**

Total Power Rating <b>“Pt”</b> [kVA]	Current 460V - 60Hz [A]	Minimum Cross-sectional Area [sq.inches]	U.S. Size [AWG]
30	38	0.0163	7
35	44	0.0259	5
40	50	0.0259	5
45	56	0.0259	5
50	63	0.0259	5
55	69	0.0413	3
60	75	0.0413	3
65	82	0.0413	3
70	88	0.0413	3
75	94	0.0521	2

On establishing the minimum cross-sectional area of the cable, make sure that voltage drop **"dV"** falls within the designed limits.

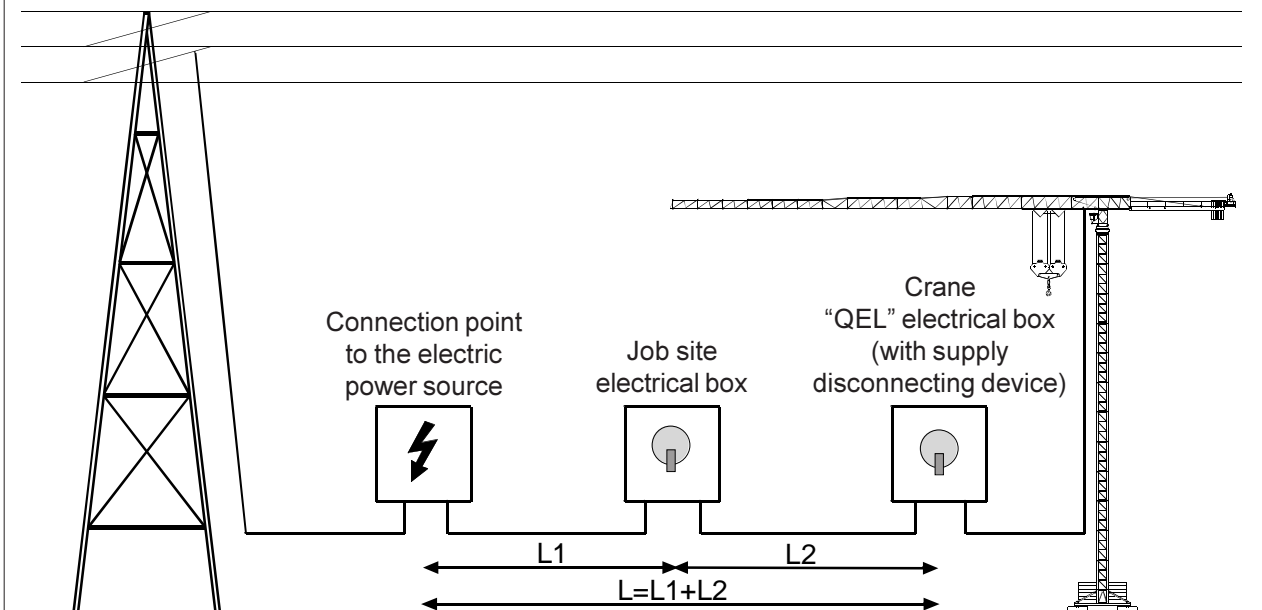
For the calculation, refer to **"Id"** maximum peak current value, which varies according to the crane model and to the hoist winch it is equipped with (table 1.5.4).

	Hoist winch type	
	AFC	APC
Winch power [kW]	Maximum peak current <b>"Id"</b> [A]	
11	-	100
15	60	-
18	70	176
22	100	-
24	-	244
30	110	-

**Table 1.5.4**



The voltage drop depends on the current and on the cross-sectional area and length of the cable (Picture 1.5.2).



**Picture 1.5.2**

- "L"** = line cable length
- "Vs"** = nominal voltage under full load at the connection point to the electric power source
- "Vn"** = nominal voltage of the crane (400 or 460V)
- "Id"** = maximum peak current as per table 1.5.4
- "dV"** = maximum allowable voltage drop, to be calculated by the formula :  

$$dV = Vs - ( Vn - 10\%Vn )$$

On establishing "**dV**" maximum allowable voltage drop value, calculate "**dVu**" unitary voltage drop factor by the formula:

$$dVu = (dV \times 1000) : (L \times Id)$$

Calculation is carried out in meters ( $1\text{ m} = 3.281\text{ feet}$ ).

On establishing "**dVu**" unitary voltage drop factor, choose the cross-sectional area of the cable as per table 1.5.5, approximating the value by defect.

Cable Cross-sectional Area			"dVu"
[mm <sup>2</sup> ]	[sq.inches]	[AWG]	
10	0.0163	7	3.5
16	0.0259	5	2.2
25	0.0413	3	1.5
35	0.0521	2	1.1
50	0.0828	0	0.77
70	0.1184	00	0.57
95	0.1661	0000	0.46

Table 1.5.5

### Example:

#### CTT 161 with 24 APC40 hoist winch

$$Vn = 400\text{ V}$$

$$Vs = 410\text{ V}$$

$$Id = 244\text{ A}$$

$$L = 150\text{ m (492 ft)}$$

$$dV = 410 - (400 - 400 \times 0.1) = 50\text{ V}$$

$$dVu = (50 \times 1000) : (244 \times 150) = 1.36$$

$$\text{cable } 25\text{ mm}^2\text{ } dVu = 1.5$$

$$\text{cable } 35\text{ mm}^2\text{ } dVu = 1.1$$

$$\text{cable } 50\text{ mm}^2\text{ } dVu = 0.77$$



small size



correct size



excessive size



If the crane is rather high, consider a fair margin, or make the calculation include a line length value equal to the crane's own height.

### 1.5.3 Electric protections

#### Thermal protection

Assuming the cable has been chosen basing on those directions previously given and it energizes the crane exclusively, no thermal insulation is needed. It should be, anyhow, equal to **"In"** value.

#### Magnetic protection

The magnetic protection factor depends on the maximum current value that the supply cable can withstand when suffering the effects of a short circuit and shall conform to the standards in force. It shall be, anyhow, 10 times **"In"** value (if fuse **"aM"** type and automatic switch - **D curve**).

#### Protection against direct contacts

The crane doesn't need to be protected against direct contacts, since all electric components are insulated with IP23 minimum degree of protection and the cables are all double-insulation type.

As provided by CEI EN 60204-32 - para. 7.7) standard *"an earth fault/residual current protection can be used to reduce damage to equipment due to earth fault currents."*

*The setting of the devices shall be as low as possible consistent with correct operation of the equipment"* (setting should not be less than 500 mA).

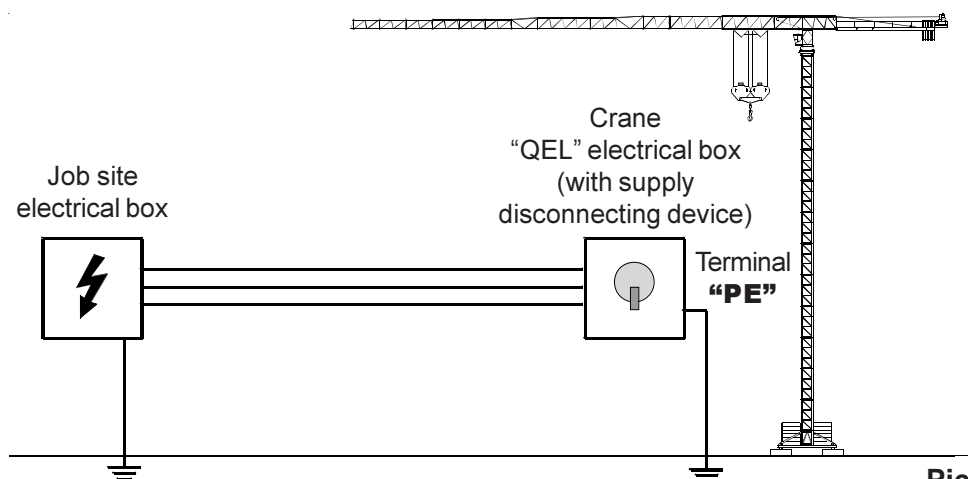
### 1.5.4 Grounding

The crane equipment grounding depends on the current distribution system chosen.

The most common systems are:

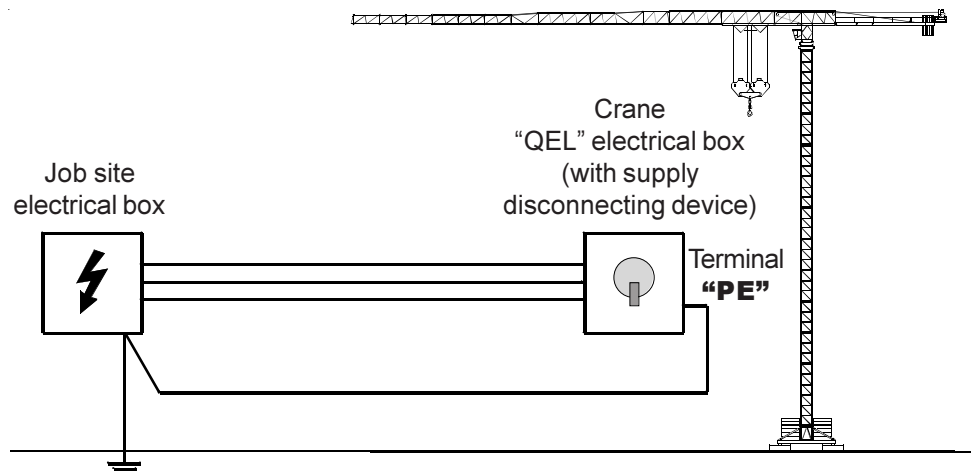
#### 1.5.4.1 Grounding the electric equipment

##### a) **TT electric network** (picture 1.5.3)



Picture 1.5.3

## b) **TN-S electric network** (picture 1.5.4)



**Picture 1.5.4**



In both systems **“PE”** terminal, located on **“QEL”** electrical box (with supply disconnecting device) at the base mast section of the crane, grants the safe grounding of all electrical parts the machine is equipped with.

### 1.5.4.1 *Grounding the structure*



For size, installation, test and maintenance of the protective grounding system against atmospheric discharges, the laws and standards of the Country where the crane is installed shall be complied with.

## 1.5.5 **Power unit supply**

To choose the proper power unit, remember that:

- 1) the unit shall have to make the voltage drop, depending on **“Id”** maximum peak current value, keep the designed limits;
- 2) the frequency value variation cannot exceed  $\pm 1\%$  with **“In”** nominal voltage ( $-2\%$  with **“Id”** peak current).

## 1.6 **CALIBRATING WEIGHTS**



*The customer is responsible for the preparation of the weights for the operational testing and for the calibration of the safety devices.*

Weights shall be prepared as indicated in **Chapter 7 - Limiting devices adjustment** of the crane's operation manual.

## 1.7 **TIE-IN ASSEMBLY**

To reach heights exceeding those indicated, the crane shall be suitably tied to the building.

Consult Comedil for specific information regarding tie-in locations and slab opening requirements.