

SUPPLEMENTARY TRANSPORT AND CRANE SPECIFICATION

The present document describes additional WTG installation requirements to supplement the General Document for Transport and Crane guidelines (DG200853-Rev.26 for Delta4000 transport, access roads and crane guidelines) under the Contract.

For avoidance of doubt, the present deviations document has prevalence on Contractor's specification on the aforementioned document.

1. Requirements for access roads (Ref. General Document Sec. 5)

The requirements for access roads (i.e. from Route Transition Point to the Site entrance) are the same as for Wind Farm roads in the section below (i.e. from Site entrance to the buffer yard and each WTG) except for the bearing capacity which shall be min 12t/axle.

2. Requirements for wind farm roads (Ref. General Document Sec. 6)

All the wind farm roads shall be designed as "inter turbine main roads".

2.1. Bearing capacity (Ref. General Document Sec. 6.1)

The Parties agree that the roads that are used for relocating cranes between two WTG crane pads will be design considering a bearing capacity of 12t/axle, except in the stretches between the main hardstand and the last auxiliary crane pad, this stretch of road must have a bearing capacity of 16t/axle to allow the auxiliary crane to relocate during boom assembly.

For the turbine types with hub height equal or higher than 140 mts, bearing capacity has to be increased to 20t/axle, in all road sections planned for crane relocation.

2.2. Minimum road width (Ref. General Document Sec. 6.2)

2.2.1. In straight stretches

The Parties agree that the roads from the Route Transition Point to the Site and within the Site will be constructed with a minimum 4.5m effective road width with adequate safety shoulders with full bearing capacity. In sections where we need to drive in reverse the road must have a minimum effective width of 5.0 m.. For health and safety reasons, reversing vehicles will only take place at designated turning heads. Reversing vehicles should be avoided or limited to <250m in a straight line. Reversing along bends and on steep inclines >2% will not be undertaken.

The road area where the full bearing capacity is available shall be marked by using sticks/snow poles which are not to be mixed with actual snowploughing poles. Bearing capacity tests of the

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roads shall be done where tires are supposed to be running. Appropriate widening shall be made in curves, funnels and inclinations.

2.2.2. In horizontal and opposing curves

The radius bends shall be designed using swept path analysis considering the transport combinations described in the route survey, automatic rear steering and adding safety margin on the outside and the inside of the curve to cover the difference between the software and the actual behavior of the vehicles. Few curve examples are provided below for Employer's guidance to cross-check against its swept path analysis parameters:

2.2.2.1. N149 and smaller

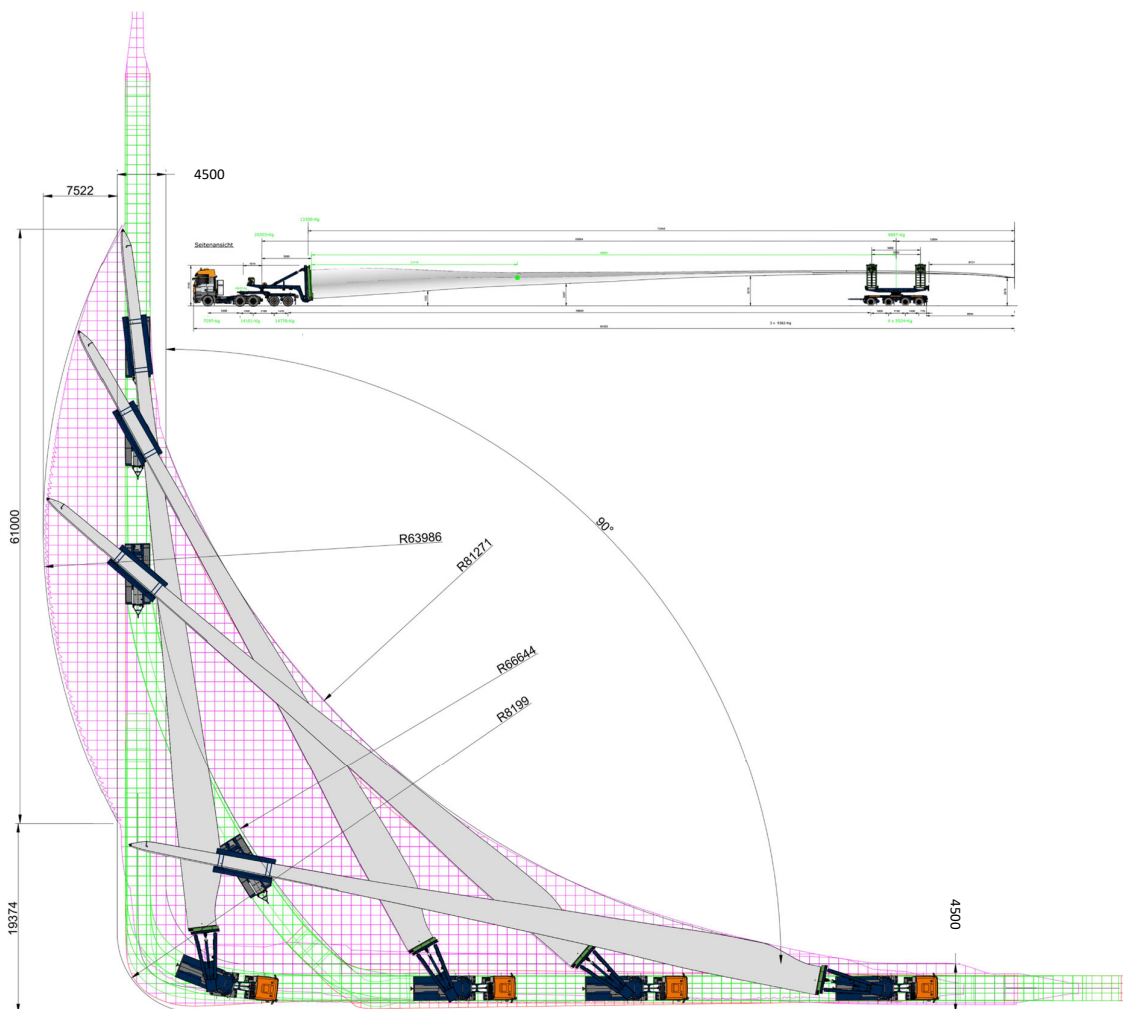


Figure 1 - 90 degrees curve for NR_74.5, the area in green shall be drivable, the inner in magenta shall be at the same level as the drivable area and the area along the outer sweeping curve in magenta shall be free of trees and other obstacles.

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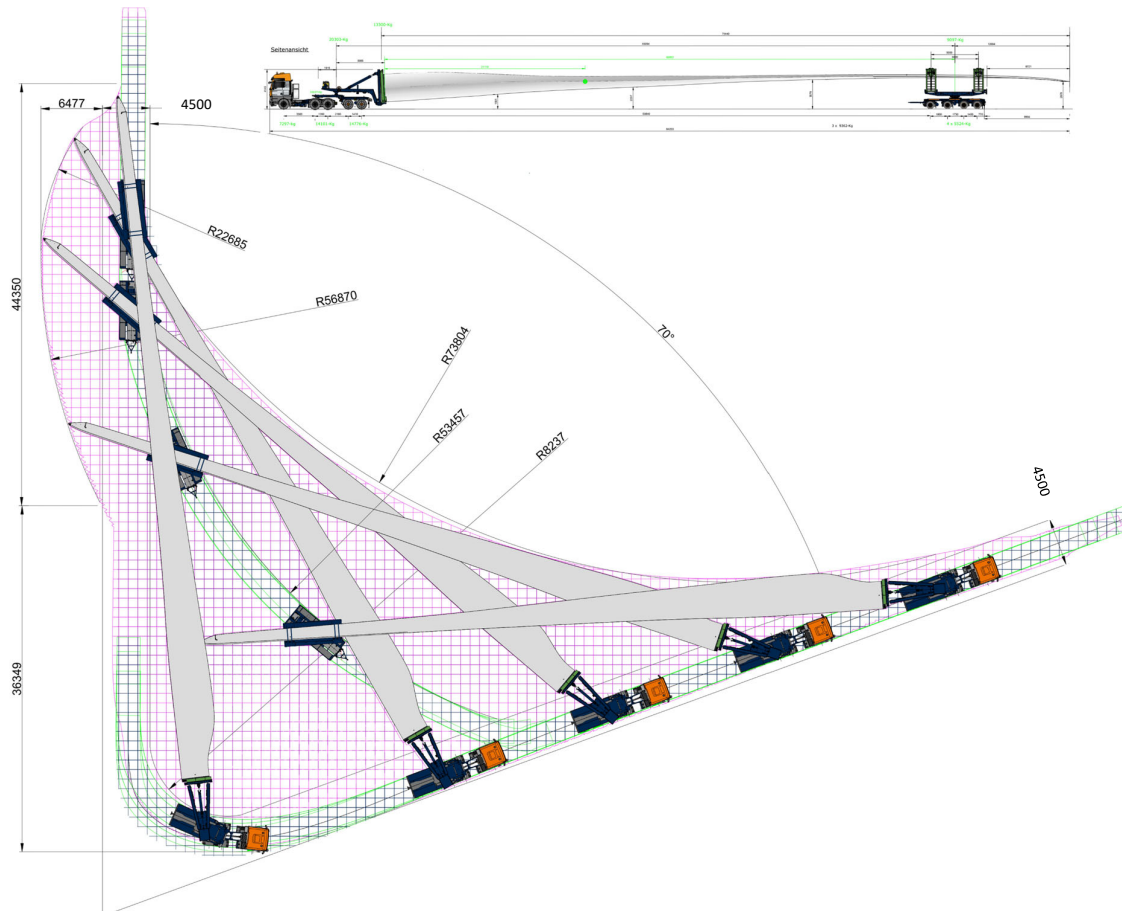


Figure 2 - 70 degrees curve for NR_74.5, the area in green shall be drivable, the inner in magenta shall be at the same level as the drivable area and the area along the outer sweeping curve in magenta shall be free of trees and other obstacles.

Bends and road geometry is subject to minor changes/modifications following carrying out a trial/dummy run with an appropriate blade vehicle; such dummy run would be performed before start of WTG transportation.

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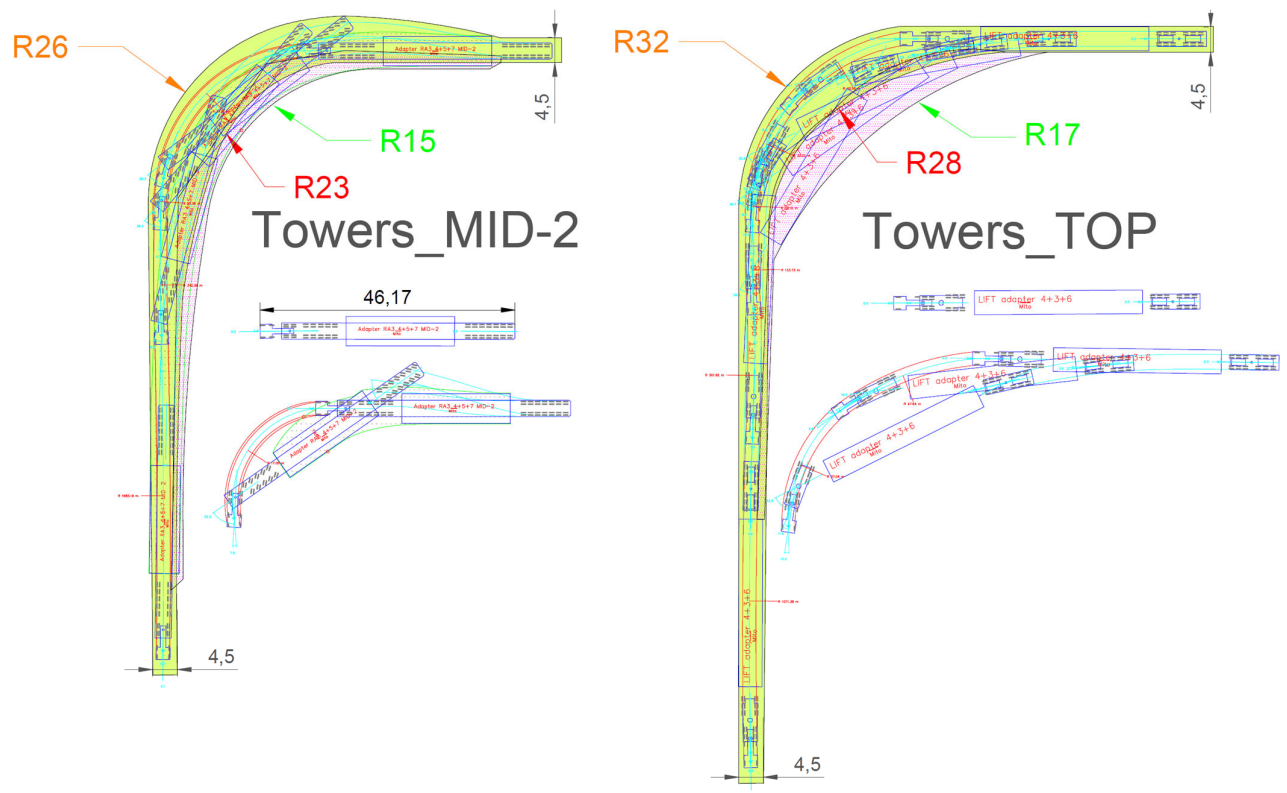


Figure 3 - 90 degrees curve for towers section, the area in green shall be drivable, the area in magenta shall be at the same level as the drivable area.

Bends and road geometry is subject to minor changes/modifications following carrying out a trail/dummy run with an appropriate blade vehicle; such dummy run would be performed before start of WTG transportation.

2.3. Maximum slope (Ref. General Document Sec. 6.3)

The Parties agree that tow/braking trucks are generally needed with abnormal transports and main crane relocations on gravel roads with slopes greater than 6% (six percent) and tarmac roads greater than 10% (ten percent) depending on the road surface and weather conditions. If such tow/braking trucks are finally needed, the Contractor shall be entitled to extension of time and recovery of such cost from the Employer.

2.4. Vertical curves for grade profiles (Ref. General Document Sec. 6.4)

The Parties agree that the min vertical radii shall be as follows:

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	N133	N149	N155	N163	N175
Convex	500 m	800 m	800 m	1000 m	1200 m
Concave	700 m	800 m	800 m	900 m	900 m

If projects limitations require optimization of vertical curves it shall be discussed with Nordex.

2.5. Side slopes (*Ref. General Document Sec. 6.5*)

Bi-directional gradients (i.e. in more than one direction) especially on junctions and bends shall be avoided, as it may cause a twist issue on the trailer coupling of the WTG component delivery.

2.6. Clearance height (*Ref. General Document Sec. 6.6*)

The Parties agree that there will not be restrictions in terms of height clearance from the Route Transition Point to the Site and within the Site. Employer must ensure that the inside and outside sides of the horizontal curves (section 2.2.2) must be completely free from any obstacles (e.g. soil surplus from civil works).

2.7. Road construction (*Ref. General Document Sec. 6.8*)

The road shall have a well-drained, silt/mud free compacted granular surface. Poor surface material can significantly impact the delivery of components and the WTG erection works, thus leading to extensive delays and additional costs. On slopes, poor surface material can lead to loss of traction.

Along the road where the edges where not clearly defined/visible during certain weather conditions (e.g. fog) , especially on the widened bends, some form of edge demarcation (e.g. snow poles) is to be provided by the Employer according to Contractor's site management recommendations and local minimum requirements for construction sites.

Roads shall be made wider, in accordance with Good Wind Industry Practice and local road standards, on road stretches where there is a risk of fall for the trucks at different heights. For the avoidance of doubt, the road widening shall have the same bearing capacity as the rest of the road.

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Snow shall be removed from the road to the extent required to allow safe and orderly performance of the Contractor's works.

Any special structures, restricted areas, floating access roads, etc., shall be clearly signed/highlighted on site. This is to ensure any component delivery vehicles does not stop and impose any static loading.

2.8. Quality inspections (Ref. General Document Sec. 5.8.1)

Please consider the specifications in chapter 5.8.1 [Quality inspections] of the Transport, Access Roads and Crane Guidelines document, however this is a guidance document and the exact testing & frequency needs to be specified by the designer. Upon completion of the construction works and prior to Contractor's commencing delivering components to site, Contractor requires a compliance statement confirming that the roads have been constructed and have met the criteria of the design/specification (including test results i.e. plate bearing test or any other testing specified by the designer). Submission timeline of reports are set out in Exhibit H [Employer's documentation].

3. Assembly pad requirements (Ref. General Document Sec. 7)

3.1. Dimensions (Ref. General Document Sec. 7.1)

The Parties agree that the crane hardstanding area shall have as minimum dimensions and follow same principles as the example below:

PLACEHOLDER
FOR REVISED
CRANE PAD LAYOUT

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Crane pads located at the end of a road shall have a road extension of 15m after the WTG foundation to allow for transport trucks to be offloaded. This road extension should be longer in case of towing is required.

Auxiliary crane pads areas shall be placed without overlapping with the access road, to ensure the full road width is usable.

3.2. Crane pad (Ref. General Document Sec. 7.3)

3.2.1. Bearing capacity

The assembly pad shall have a minimum bearing capacity of 250 kN/m². In case of a hybrid tower installation the minimum bearing capacity shall be increased to 300 kN/m².

3.2.2. Slope

The assembly pad shall have a maximum slope of 0,5% (zero-point five percent) in all directions.

3.3. Quality inspections (Ref. General Document Sec. 7.13)

Please consider the specifications in chapter 7.13 [Quality inspections], however this is a guidance document and the exact testing & frequency needs to be specified by the designer. Upon completion of the construction works and prior to Contractor's commencing delivering components to site, Contractor requires a compliance statement confirming that the roads has been constructed and has met the criteria of the design/specification (including test results i.e. plate bearing test or any other testing specified by the designer). Submission timeline of reports are set out in Exhibit H [Employer's documentation].

4. Crane boom assembly area (Ref. General Document Sec. 7.4)

4.1. Auxiliary Crane Pads

The main crane boom assembly area shall include the number of auxiliary crane pads as shown on the layout in section 3.1. The auxiliary crane pads shall have a maximum slope of 1% and a minimum bearing capacity of 250 kN/m².

4.2. Slope

The main crane's boom assembly area shall be designed considering that the boom could be assembled with a variation of height but maximum -3% negative declination with the crane hardstand where the main crane is located. In this case booms support areas must be constructed in a position to be defined based on the crane type. Positive inclination is allowed to the extent it

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is gradually up. The Contractor has not made allowance for additional equipment like containers for boom support, or for working at elevated height levels when assembling the boom in greater positive/negative angles. If the boom tip end will be raised in the air due to terrain falling away from road, then there must be access with cherry picker to reeve the hook.

5. Main components storage areas (Ref. General Document Sec. 7.5)

The Parties agree that storage area for blades, hub, drive train, nacelle and steel tower section shall be provided adjacent to the respective assembly pad and the wind farm road in accordance with the drawing in section 3.1 and with a bearing capacity of 200 kN/m².

The Parties agree to have all the crane hard standings and WTG foundation accessed forwards (i.e. considering that the crane hardstand is before the WTG foundation in the direction of travel), all the crane pads will be connected via site roads so no need to mob/demob the cranes using public roads and the site road network will be designed with several entries/exits to allow for circular and proper traffic management.

Parties agree that additionally, an area of 70 m² (hardened and levelled) will be provided for 2 containers: one for tools, one for the crane supplier, next to the main hardstand.

Emergency lane shall be provided in the crane pad in case a single access to the respective WTG is available and the road's width is insufficient to drive safely around the longest vehicle with an ambulance and rescue equipment.

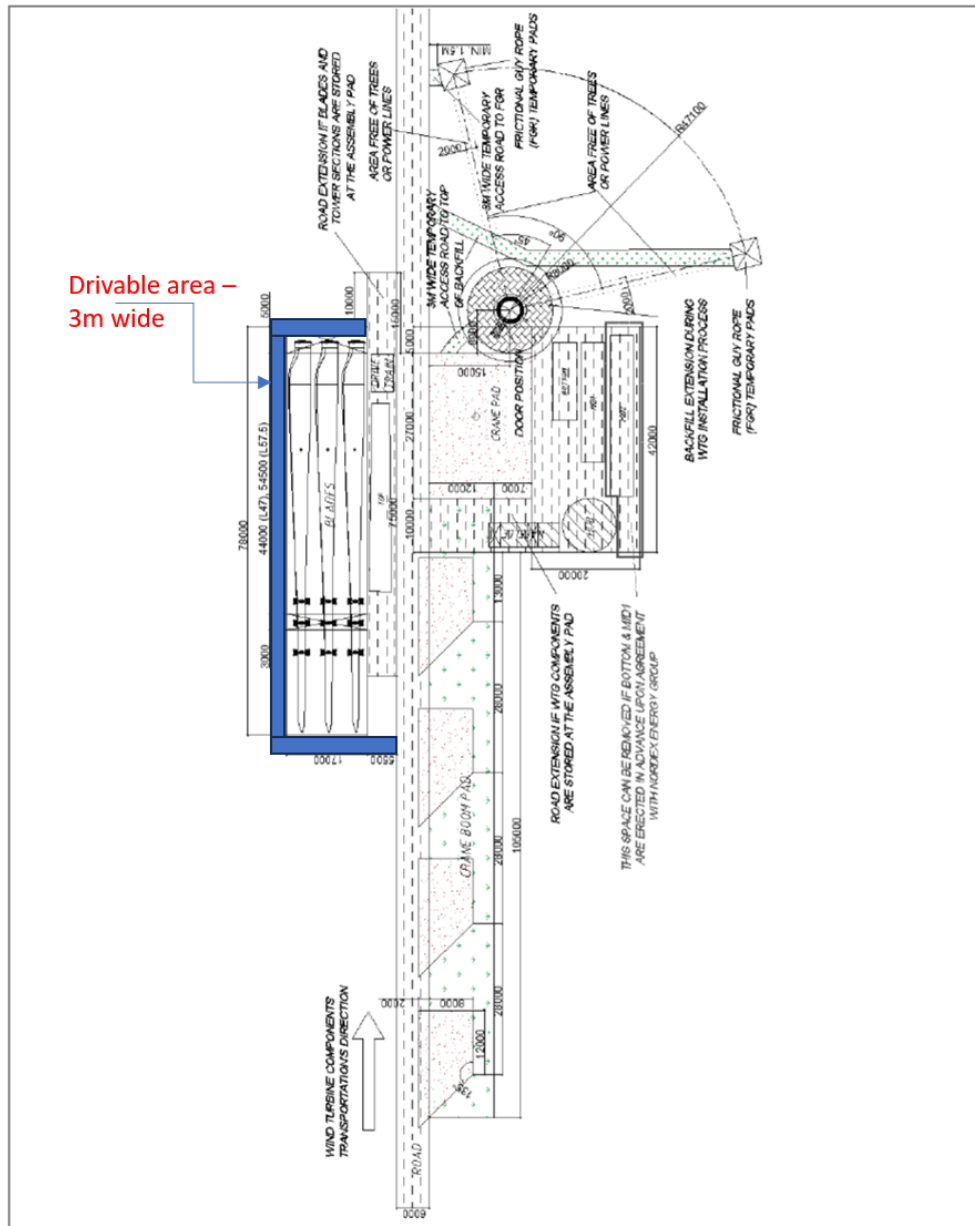
5.1. Level difference

The main components storage area shall be at the same level as the respective assembly pad and the wind farm road.

5.2. Blade Storage

A corridor with a width of 3 mts around the blade storage area shall be prepared to allow access with a telehandler (Manitou) as in the figure below. This area must be levelled and provide sufficient bearing capacity for a telehandler to drive through.

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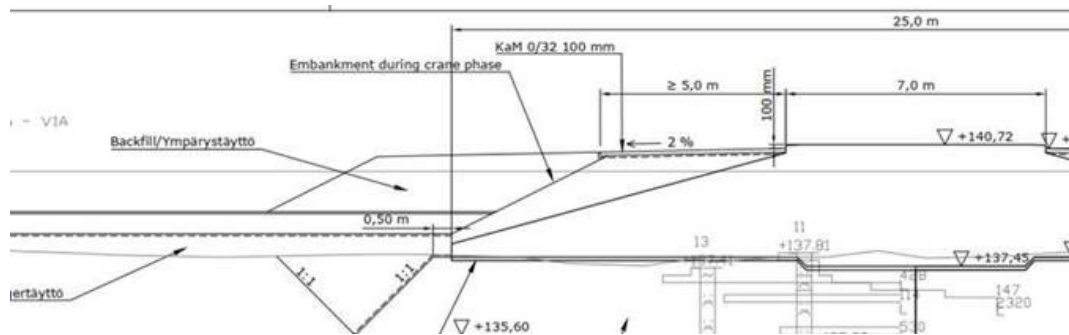
The area between the blade fingers shall be cleared and levelled but not necessarily gravelled, providing about 50 cm clearance below the blade fingers, so that the crane tool can easily take the blades. An extra 5m behind the blade storage area should be cleared from obstacles to allow the blade griper to pick the blade up and also to provide safe access to Contractor's personnel to remove snow from the blades.

For The N175, blades must be stored on the left side of the WTG (looking from the hardstand) in order to avoid the need to rotate the blade under the hook. Deviations of this requirements must be checked with Nordex.

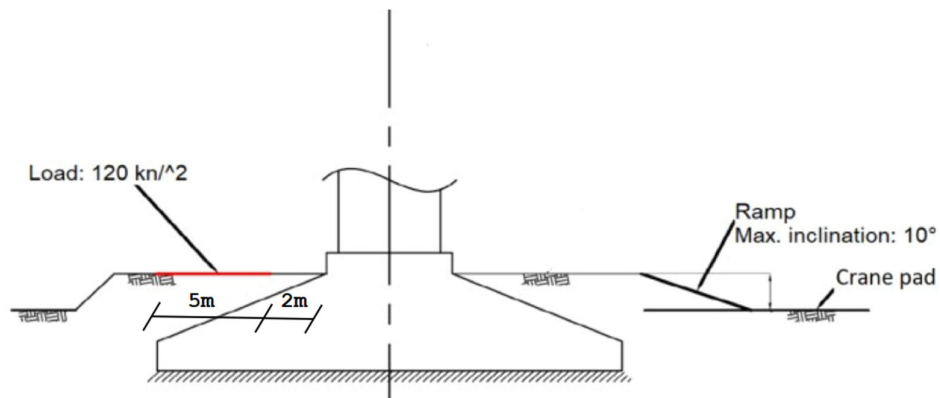
6. Foundation (Ref. General Document Sec. 7.7)

6.1. Backfill

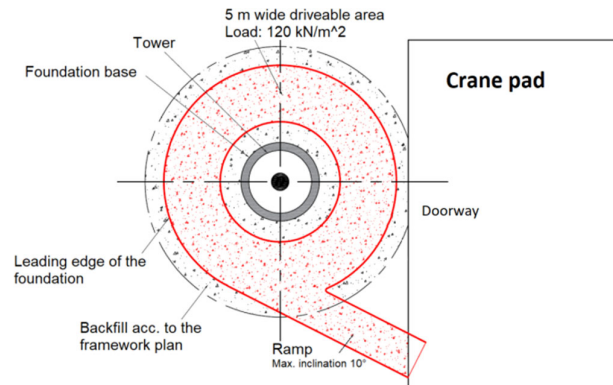
During erection phase, the foundation backfilling shall not interfere with the components storing areas or pre-assembly/main crane's operations. In the event that the foundation backfilling is done in two steps like the sketch below, the first step of backfilling should allow to install the stairs to the access door (or similar) during the bottom tower section erection process:



Prior to the start of installation, the dewatering arrangement around the tower, safe pedestrian access and gravel path to the tower access stairs shall be in place. For all projects, backfilling shall comply with the features on the figures below:



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A drivable working area shall be provided around the foundation, with a width of 5 m and separated from the foundation by 2 m as shown in the figures above. This area shall be levelled, have a bearing capacity of 120 kN/m² and a ramp with a maximum inclination of 10°. In case of towers with external flanges, the area must be maintained throughout the lifetime of the wind turbine.

Access ramp and/or staircase from the crane pad to the top of the foundation's backfilling to be done in accordance with standard transport and crane specification. Tower staircase landing plinth details/dimensions/level are shown on the appendices to Exhibit D [Foundation for external stairs]. The drawing shows a concrete block for the plinth built up from the concrete foundation upwards. Due to the geology, backfill material on site, a deviation is accepted by Contractor to replace it with a structural square concrete slab (able to support the loading from the base of the stairs) which can be adjusted/moved as required on site after the staircase has been erected. In that event, Contractor would recommend 1400mm x 1400mm with lifting eyes to allow any adjustment of the plinth should the staircase be misaligned during WTG erection works, similar to as shown below:

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This allow a clean landing platform at the base of the stairs. Once the WTG has been erected and the stairs are aligned with the plinth, the surrounding ground can be brought up to within 50mm of the top of the landing plinth. Furthermore Contractor would also advise a light brush finish and would suggest to see the plinth slightly raised above the surrounding stone level only by 50mm. This would prevent loose stone from accumulating/ creeping onto the step and adding a slip risk.

6.2. Tower sections' preassembly area for concrete tower

The Parties agree that the Employer will provide pre-assembly slabs in an amount to be defined.

6.3. Frictional guy ropes

The Parties agree that the following positions shall not be considered to avoid working underneath suspended loads:

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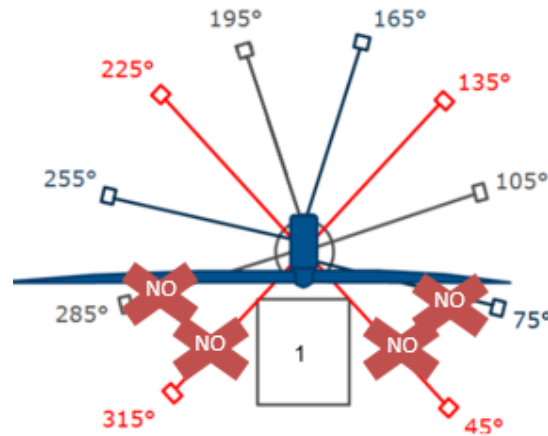
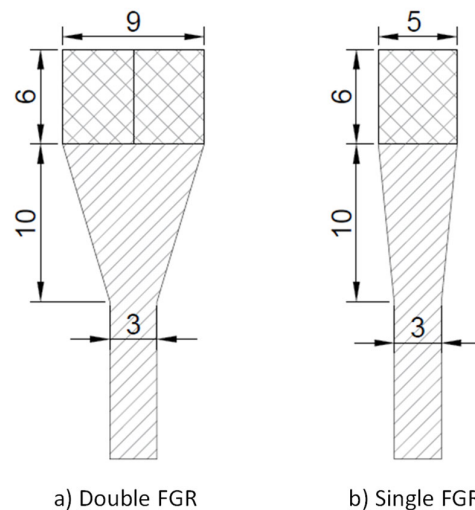


Figure 1- top view, general case, installation variants for frames, crane hard standing area (1)

Areas to place the FGR shall be at the same elevation as the final elevation of the foundation to the extent that is possible. Variations on the elevation shall be compensated with the distance to the tower by keeping the alpha angle within the required limits and considering the maximum length of the rope of 180m.

The access track to the FGR shall be free from obstacles, cleaned, levelled and compacted, no less than 175kN/m² and max 2% lateral slope. Conditions shall be maintained periodically to keep the defined characteristics. The area must have a well-drained, silt/mud free compacted granular surface (particle size <50mm).

Size of the area to place the FGR shall be, in length: 6 mts, and in width: 5 mts for the single FGR and 9 mts for the double FGR. Access to this area must include a 10 mts long widening of the road as per the figure below:



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6.4. Taglines during lifting operations

The Parties agree that the areas around the taglines will be free of obstacles and accessible for personnel and/or equipment. Access roads to both tagline positions shall be provided by the Employer.

7. Other elements

7.1. Rotation areas

7.1.1. Requirements

For H&S reasons, backwards driving of trucks must be avoided as much as possible. For this reason, hammerheads shall be provided at the end of every road and at other positions within the wind farm to allow trucks to turn around after the unloading of the main components. Nordex keeps the right to revise the amount and position of hammerheads.

7.2. Parking areas for wind turbine component transports

The Employer shall provide a turnout/parking bay area after the Site entrance (specific location to be discussed with Nordex) to allow parking 3 blade laden trucks without obstruction of regular traffic in case of arrival during nighttime or where instructed by the authorities to be taken off the public roads, also for waiting when components are being offloaded.

7.3. Crossing areas

Other turnouts/parking bays with a size of 5x50m shall be built after the Route Transition Point at reasonable distances where there is a lack of sight/visibility or where no crane pad or other suitable area is available to be used for the same purpose to allow for priority for oncoming loaded vehicles so that other vehicles can give way in road sections of two-way traffic, especially in spine roads to avoid traffic congestion while relocating main cranes.

In the event of need of towing/braking units, additional flat turnout's areas shall be provided by the Employer to allow the connection and disconnection of such units.

7.4. Site office and warehouse (*Ref. General Document Sec. 8.6*)

The Parties agree that the site office and warehouse shall have an area of:

- 2,100 m² for a wind farm up to 10 WTGs

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- 3,700 m² for a wind farm with 11-20 WTGs
- 5,500 m² for wind farms with more than 21 WTGs or as agreed with Nordex

on Site and be constructed in the location to be included in Exhibit A [Site Map].

The area will be free from obstacles (such as overhead lines), cleaned, levelled and compacted, no less than 175kN/m² and max 2% lateral slope. Conditions shall be maintained periodically to keep the defined characteristics. The area must have a well-drained, silt/mud free compacted granular surface (particle size <50mm).

7.5. Warehouse

In case of the hybrid tower, additional warehouse areas shall be agreed with Nordex.