# 1 INDUSTRIAL FLOOR SLABS ON GRADE

## 1.1 INTRODUCTION

The floor slab is to be a <post-tensioned><fibre reinforced><conventionally reinforced> concrete slab constructed on grade to the design criteria shown on the structural drawings. The Contractor shall be responsible for the design of the slab to support the loads listed on the structural drawings. The structural drawings indicate a nominal thickness for the slab. If the Contractor intends to use a different thickness, then the Contractor shall advise the Engineer in writing prior to preparing any shop drawings.

Alternative designs will be considered but these must be from Approved Contractors experienced with this type of floor slab. All designs shall be accompanied by a Producer Statement “Design” and Producer Statement “Design Review” by an independent Chartered Engineer.

## 1.2 SUBGRADE PREPARATION

The Subgrade shall be formed to the levels indicated on the drawings to a levels tolerance of ± 25mm. After construction of the Subgrade has been completed the Contractor will engage a competent Surveyor to carry out an as built level survey. A copy of these results is to be provided to the Engineer for review.

## 1.3 TESTING OF THE SUBGRADE

A geotechnical investigation has been carried out by <*insert name of company and report reference*> and a copy of the report forms part of the contract documents. The target “K” value for the subgrade of this project is K = <*insert value after discussing with geotechnical Engineer*>. The slab design is to be based upon this value when preparing tender prices. Once the Contractor has been appointed, the K value is to be site checked in accordance with the following clauses. The slab design shall be modified if the K value varies significantly from that expected. The Contractor shall advise the Engineer within 5 days of the site testing and prior to placing any subbase.

### 1.3.1 Subgrades in Cut

The Contractor shall cut the site to approximately 150mm above Subgrade level and at this stage the Contractor shall arrange for the Geotechnical Engineer to carry out Benkelman Beam tests Scala tests or other approved testing to determine the actual K value of the Subgrade and provide the results to the Engineer for approval. Following approval the final trimming to subgrade level shall be completed and the as built level survey undertaken.

### 1.3.2 Subgrade in Fill

Where the site is to be filled then the compacted engineered fill material will be placed up to the design subgrade level. At this stage the Contractor shall arrange for the Geotech Engineer to carry out Beam tests, Scala tests or other approved testing to determine the K value of the subgrade. Provide the results to the Engineer for approval. Following approval the final trimming to Subgrade level shall be completed and the as built survey undertaken.

## 1.4 SUB-BASE PREPARATION

The basecourse shall be compacted in accordance with the <*“Earthworks” or “Siteworks”*> Section of the General Specification.

The basecourse layers will be suitable hardfill graded and compacted to provide a closed even surface not prone to rutting.

The top surface of the basecourse will be placed to a levels tolerance of +0mm or -10mm. A certificate and levels plan is to be provided by a Registered Surveyor engaged by the Contractor certifying that these tolerances have been achieved. A copy of these reports is to be provided to the Engineer for review.

## 1.5 DESIGN LOADS FOR THE FLOOR SLAB

Refer drawings. The Contractor can assume for the purposes of design that the slab is not fully loaded until <*90*> days after casting.

## 1.6 FLOOR SLAB JOINTS

No opening joints in the floor will be accepted other than those shown on the structural drawings. Where joints are shown, the Contractor shall take care to form the joints carefully to maintain alignment and flatness.

## 1.7 CONCRETE STRENGTH

Refer drawings for minimum values.

## 1.8 FLOOR FINISH

The floor shall be finished as per the requirements of NZS 3114:1987 for the class of finish described on the structural drawings - however the tolerances for floor surface regularity shall be limited as per section 1.9 below.

## 1.9 FLOOR SURFACE REGULARITY

## 1.11 Free Movement Floors

The floor surface regularity shall be measured by a Registered Surveyor, who shall be engaged by the Contractor to provide an as-built plan of the finished slab. The survey shall be carried out within 72 hours of the floor being poured. The elevation of points of the floor on a 3 m by 3 m grid shall be measured, and the standard deviation of the difference in elevation between all adjacent survey points calculated. Points of the floor within 1.5 m of a wall, column or other existing structure shall be excluded from the survey. The maximum allowable standard deviation shall be limited as per the classification shown on the structural drawings and described in the table below. The floor shall be deemed to be non-compliant should the standard deviation exceed this limit. Additionally all survey points shall be within ± 15 mm of the specified level.

| **Floor Classification** | **Typical Use** | **Limit in standard deviation of Elevation Difference (mm)** |
|---|---|---|
| **FM1** | Buildings containing wide aisle racking with stacking or racking over 13 m high where very high standards of flatness and levelness are required. May require strip pour techniques be used. | 2.25 |
| **FM2** | Buildings containing wide aisle racking with stacking or racking over 8 m high but not greater than 13 m, free movement areas and transfer areas | 3.25 |
| **FM3** | Buildings containing wide aisle racking with stacking or racking up to 8 m high. Retail offices and manufacturing facilities | 4.00 |

### 1.9.2 Defined Movement Floors

The floor will be constructed to the flatness requirements of the floor classification shown on the structural drawings and described by prEN 15620. Relevant sections of prEN 15620 are reproduced below. Additionally all survey points shall be within ± 15 mm of the specified level.

#### Definitions

E is the elevational difference between adjacent fixed points 3 m apart.

Z is the dimension between the centres of truck front wheels in mm and ZSLOPE is the cross aisle slope between the centres of truck front wheels in mm per metre due to tolerances and deformations.

dZ is the elevational difference between the actual centres of truck front wheels.

dX is the elevational difference between the centre of the front axle and the centre of the rear axle. The axle spacing is assumed to be a virtual dimension of 2 metres.

dZ and dX shall be determined as shown in the figure 1 below

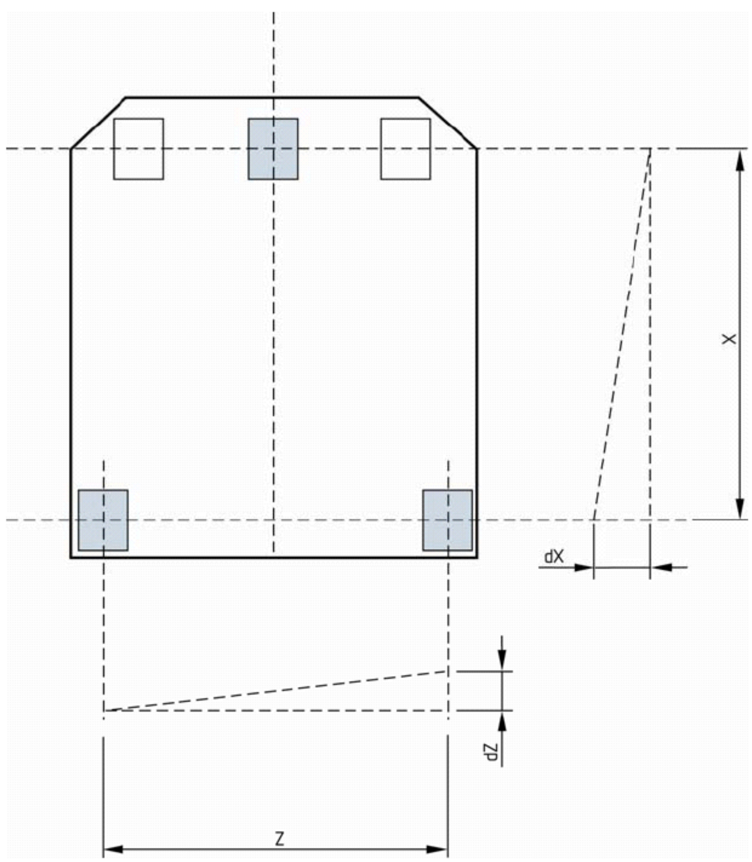


Figure 1: Z Dimension between the centres of truck front wheels in mm, X Wheelbase or 2000 mm

The data interval, the minimum measurement interval between readings, shall be less than or equal to 300 mm with additional readings within 50 mm of each side of the joints.

$d^2Z$ is the change in dZ over a forward movement of 300 mm along the wheel tracks.

$d^2X$ is the change in dX over a forward movement of 300 mm along the wheel tracks.

$d^2Z$ and $d^2X$ shall be determined as shown in figures 1 and 2 shown below.

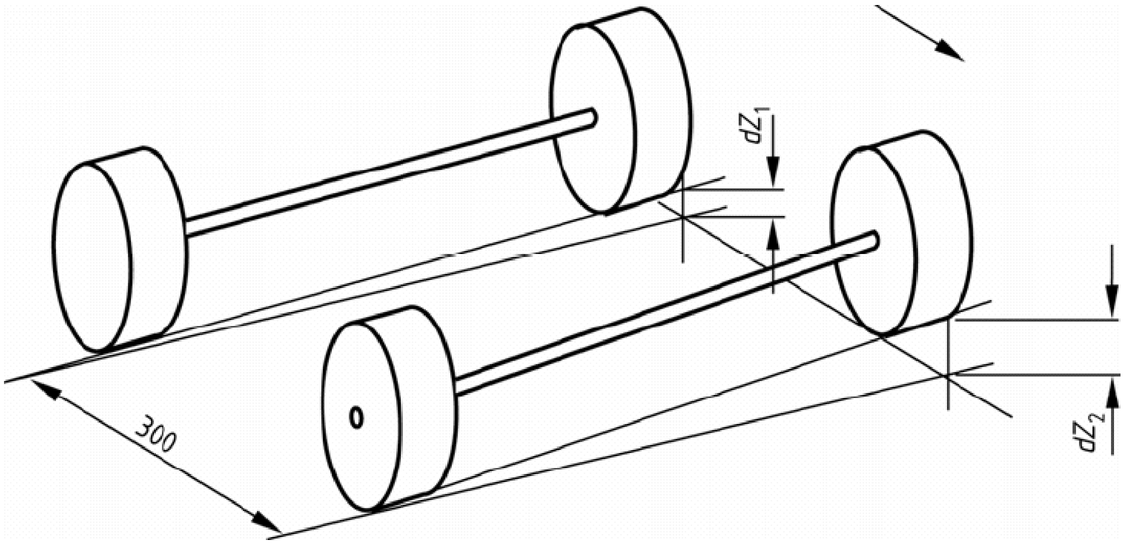


Figure 2 Determination of $d^2Z$ is $dZ_2 - dZ_1$

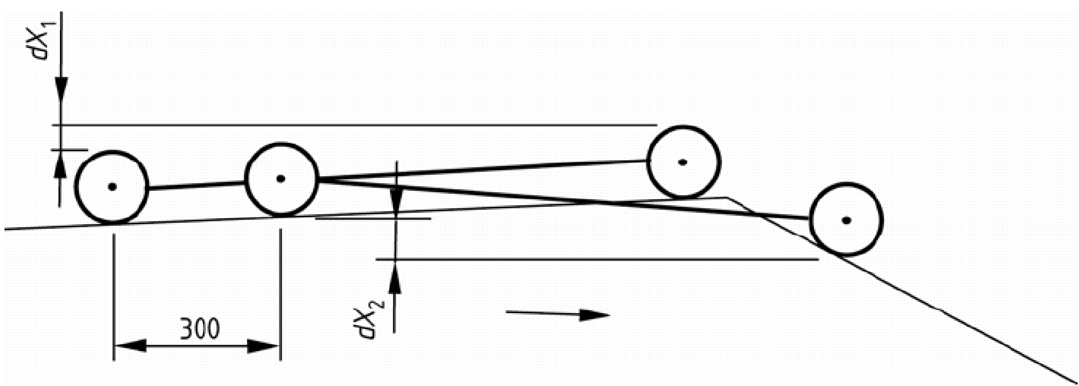


Figure 3 Determination of $d^2X$ is $dX_2 - dX_1$

### Limiting Values

The values of properties shall not exceed the values given in Tables 5 and 6a. The values in Table 6b are based on MHE with a wheel base of 2000 mm, for other dimensions the designer may adjust the values on a linear extrapolation basis. The values given in table 6b or the extrapolated values shall not be exceeded.

Different floor classifications in tables 6a and 6b may be used for the limiting values specified in the down aisle and the cross aisle directions.

**Table 5 — Classification and limiting values of $Z_{SLOPE}$ and $E_{SD}$**

| Classification | Top beam level m | $Z_{SLOPE}$ mm per metre | $E_{SD}$ mm |
|---|---|---|---|
| DM 1 | Over 13 | 1,3 | 3,25 |
| DM 2 | 8 to 13 | 2,0 | 3,25 |
| DM 3 | Up to 8 | 2,5 | 3,25 |

**Table 6a — Limiting values of dZ and $d_2Z$**

| Classification | dZ | $d_2Z$ |
|---|---|---|
| calculation | Z x $Z_{SLOPE}$ | dZ x 0,75 |
| DM 1 | Z x 1,3 | Z x 1,0 |
| DM 2 | Z x 2,0 | Z x 1,5 |
| DM 3 | Z x 2,5 | Z x 1,9 |

**Table 6b — Limiting values of dX and $d_2X$**

| Classification | dX | $d_2X$ |
|---|---|---|
| calculation | 2 x 1,1 x $Z_{SLOPE}$ | Fixed values |
| DM 1 | 2,9 | 1,5 |
| DM 2 | 4,4 | 2,0 |
| DM 3 | 5,5 | 2,5 |

NOTE The values given in table 6a relate to the safe clearances between the MHE and the racking. The values given in table 6b relate to the ride quality of the MHE and have a limited effect on the safety clearances between the MHE and the racking.

## 1.10 NON COMPLIANCE

In the event of the floor being outside the required tolerances the Contractor has the following options for consideration by the Engineer:

a) Provide certification and justification from an independent Chartered Engineer for the as built slab thickness

or b) Provide a remediation plan for Engineers approval. For a defined movement floor it is expected that the remediation plan will involve grinding of the floor to ensure it complies with the required tolerances.

or c) Provide a monetary bond to the value of at least the value of the floor slab for a period of 10 years

or d) Remove the slab and reconstruct to the specified thickness and tolerance.

## 1.11 CURING

The slab shall be water cured for a minimum of 7 days. The contractor shall provide a method statement as to how this will be achieved. Alternatively the Engineer may approve curing using a membrane forming compound that complies with the requirements of NZS 3109:1997. <*Should a membrane curing system be approved then it shall be compatible with future painted line markings or any other surface coating required for this floor.*>

## 1.12 CLEANING

The floor must be cleaned as follows:

a) At handover to the racking or fit out Contractor at the date specified within the Contract or alternative date as agreed with the Client and Engineer.

and b) At Practical Completion to the satisfaction of the Client and Engineer.

Cleaning of the floor will include removal of loose concrete, rust and mill scale off edges of cast in steel movement joint plates to the satisfaction of the Client and Engineer.