Method of Statement

Construction of Flat Concrete Floor

For

PT. xxxxxx

PT. Findotek

<table>
<thead>
<tr>
<th>Date</th>
<th>Rev No</th>
<th>Prepared by</th>
<th>Checked by</th>
<th>Approved by</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 Apr 2012</td>
<td>03</td>
<td>AF</td>
<td>AF</td>
<td>SF</td>
<td>Rev 03</td>
</tr>
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<td>AF</td>
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1. Introduction

*Findo Teknik*, is a supplier and applicator of high-tech commercial and industrial superflat floors. We have well experienced and competent management, reliable supervisors and a team of highly skilled & experienced workers.

We work hand-in-hand with our principal manufacturers to ensure that we constantly provide the best quality products and produce remarkable performance at a cost-effective price, tailored to individual needs.

Our customer are our most valuable asset. Thus, we strive to yield the best return to our customers’ investment in terms of quality, time and cost.

2. Sub-base slab

The sub-base for the concrete floor must be constructed according to the specification. The sub-base must be well compacted and well prepared in order to avoid settlement in the future.

3. Concrete Strength & Properties

The characteristics strength of the concrete shall comply generally with SI or ASTM standards. Readymix should be of consistent properties and its reply should be stable in order to achieve high level of floor flatness.

- Concrete Grade : Min 30 MPa
- Concrete Slump : 11 ± 1 cm (arrival on site) & consistent in quality
- Initial setting time : 3 to 5 hours

4. Quality control

- The main Contractor, the concrete supplier and floor specialist shall implement quality control testing throughout the supply of the concrete to the project so as to fulfill the performance requirements of the specifications
- The design mix is to be pre-determined.
- The sand silt content should not be more than 1 %.
- Air entraining agent is not recommended if floor hardener is to be used.

5. Pour Schedules

Determine the sequence and timing of each pour with consideration of the following :

- Determine area to be poured and finished in each work period.
- Formwork should be made of rigid steel with top level same as floor finishing level.
- Ensure concrete will be delivered in uniform and continuous supply for each concrete pouring.
- The interval for each truck is to be on time to ensure a continuous flow of concrete.
- Slump test is to be done for every truck.
- Concrete laying shall be in one direction following the floor level.
- The vibrating lazer screed shall move backwards to strike off the access concrete and flatten the surface to the floor finish level.
6. Environmental Control

The concrete placing and finishing for the floor hardener shall be protected against direct sun light, rain and strong wind. Roof and side wall claddings must be installed before the construction of the slab.
7. Sequence of Work

7.1. Set up Lazer Screed
   The main contractor shall provide suitable bench marks for setting up of lazer base stations.
   The main contractor shall also provide lifting services to unload equipment and shift the equipment to the floor for the setting up of the equipment.
   Setting up of lazer screed shall be done by the subcontractor.

7.2. Initial concrete placement
   All concrete to be discharged into the pouring area shall follow good concrete placing method.

7.3. Vibrating concrete
   During concrete discharge, wet concrete shall be vibrated with a poker vibrator especially at edges or beam area. The vibrator shall be inserted vertically into the concrete.

7.4. Floor finishing consists of five major steps
   A. Striking-off
   B. Flatness Enhancement
   C. Application of floor hardener (where applicable)
   D. Floating (Ride-on trowel and power trowel)
   E. Trowelling to Dense Smooth Finish

   A. Striking-off
   Also known as screeding by Lazer Screed is the process of leveling the fresh concrete. It takes place immediately after the placing and compacting operations. It is important to have good accuracy in striking to achieve floors flatness and levelness.

   B. Flatness enhancement.
   The flatness of the floor is further enhances by flat floor tools and equipment. These equipment includes channel float, checker rod and bump cutter.

7.5. Measurement for floor Flatness (FF) “Dipstick” F – Number System
   The measurements (FF) are to be done using the “Dipstick” digital floor measurement instrument capable of reading to 0.1mm accuracy in accordance to ASTM E1155 and ACI 302 Standard.

7.6. Time of measurement (FF)
   Measurement of floor flatness should be made, within 72 hours especially on the first mock up sample.

7.7. Handover
   The completed floor shall be considered handover to main contractor after inspection and measurement of floor finish. The floor shall be protected by main contractor.

8. Protection Against Damage
The concrete shall be protected from damage due to load overstress, heavy shock and excessive vibration, surrounding the concrete area particularly during curing period.

Construction load shall not be placed on newly completed floor.

Traffic should be kept off the finished floor for 3 days or longer to avoid surface damages and scratch marking.
All finish concrete surface shall be protected from damage by construction equipment, materials or other heavy tools.
# APPENDIX A

## Scope of Works

<table>
<thead>
<tr>
<th>Findo Teknik</th>
<th>Main Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Planning and coordinating with main contractor for pouring schedule, size of casting and joint location. To discuss on concrete design mix and trial mix by concrete supplier must be carried out with the witness of Findo representative.</td>
<td>Make available floor plan and target schedule of construction. Compaction of sub-base &amp; lean concrete construction, where applicable.</td>
</tr>
<tr>
<td></td>
<td>Supply &amp; laying of wire mesh, reinforcements, embedded parts, &amp; formwork.</td>
</tr>
<tr>
<td></td>
<td>Provide suitable bench marks near to pour area and confirm in writing prior to casting of concrete.</td>
</tr>
<tr>
<td></td>
<td>Supply and install timber steel formwork along perimeter or any drop off floor slab; top level of formwork should be the final finished level of concrete floor.</td>
</tr>
<tr>
<td><strong>2.</strong> Supply vibrating screeder, rider trowel and other equipment for the works</td>
<td>Provide lifting equipment to unload, shift and place the equipment onto area near to casting floor. Provide and install dowel bars along expansion joints in accordance to design drawings.</td>
</tr>
<tr>
<td><strong>3.</strong> Slump test of each truck to be checked by Findo, Contractor and Consultant.</td>
<td>Carry our slump test before placing of concrete for each and every truck. Ensure readymix supply is regular without long break interval.</td>
</tr>
<tr>
<td><strong>5.</strong> Apply floor hardener, where applicable, after initial setting of wet concrete. Enhance floor levelness with channel float, checker rod and bump cutter.</td>
<td>Provide lighting, water and storage area for material and equipment. Supply and laying of concrete according to good concrete pratice.</td>
</tr>
<tr>
<td><strong>6.</strong> Provide sufficient number of power float machines and labours for power floating work.</td>
<td>Provide protection to the floor slab after handover from Findo. Provide and placing of curing compound according to requirement</td>
</tr>
<tr>
<td><strong>7.</strong> <strong>Measurement</strong> Use Floor Dipstick to measure floor flatness and floor levelness and submit Dipstick report.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

Method Statement

CONSTRUCTION OF FLAT FLOOR

This Method statement describes the construction of flat floor standard of. It briefly outlines the process and method of the construction:

1. **Floor Base**
   - Main contractor must ensure that the floor base is firm and well compacted according to specifications.

2. **Floor Preparation**
   - Main contractor must ensure that the floor base be thoroughly cleaned by high pressure water jet or compressor air. BRC should be at least 50mm lower than the Finished Floor Level. BRC or reinforcement should be properly supported by chairs at regular interval of not more than 60 cm. Formwork should set up accurately and secured firmly such that its top elevation is the same as the final finished elevation of concrete floor.

3. **Roof Protection**
   - Building roof covering, gutter, rain water down pipe and side caldding shall be erected before the commence of flat floor concreting. This avoids the possible negative impact on the floor flatness & levelness due to rain, sun shine and strong wind.

4. **Datum Point – Finished Floor Level**
   - Main contractor must ensure accurate transfer of the reference level of datum point to the floor contruction area for setting of final finished floor elevation.

5. **Setting up Lazer Transmitter & Lazer Screed**
   - Start up Lazer Transmitter at about 2 m above grade.
   - Be sure the lazer transmitter is set up in a location that will not have anything in the way to cause interference.
   - Establish and set grade on the Mini Screed Grade Rod. Position machine vibrator plate onto the form.
   - Make sure both lazer receivers are clear to the transmitter and switch elevation control to manual.
   - Using the console level indicator, level the machine with the head lift switch.
   - Machine should be held firmly in this position while setting grade. Any machine movement will negatively affect the setup.
   - Near the lazer receiver masts, place the Grade Rod ring on top of plow and hold vertical.
   - Using raise/lower elevation control, adjust height of plow until the Mini Screed Grade Rod indicates proper grade.
   - Once the plow is on-grade, manually lower the lazer received (from top down) until the LED’s indicate the on-grade signal.
Repeat the process for the opposite side.
If on-grade is not achieved, hold down the respective reset button and tap the manual switch lower position to match grade on that side.
Switch elevation control to automatic.
Screed approximately 2 m then verify grade and make adjustment if required.

6 **Supply & Laying of Concrete**
Main contractor must ensure quality control of the ready-mixed concrete inclusive of traveling time. Readymix supply should be regular without break interval longer than 25 mins. It must comply with the required specification and mix-design and be supplied, inspected, laid and leveled with good concreting practice. Slump test must be carried out for each & every load of concrete delivery. Appropriate slump must be observed accordingly. Concrete vibrating poker is to be used.
7 **Vibraing & Initial Leveling by Vibrator Lazer Screed**
Vibrate & level the concrete by vibrator lazer screed which is operated by skilled operators.

8 **Bull floating**
Spread, float & work to integrate the floor hardener incorporate into the top layer of the concrete by bull-float at the initial stage and subsequently by power floating machine as the concrete gradually hardens up.

9 **Floor Hardener Application**
Spread evenly floor hardener on semi-hardened concrete. Divide the floor areas into grids and ensure that appropriate amount of floor hardener is applied evenly onto each area. Ensure the workers use appropriate foot ware or platform so not to leave shoes mark on the concrete surface.

10 **Initial Flatness Enhancement**
After application of floor hardener, float & flatten the floor with channel floats.
11 **Floor Surface Flattening**
Refined flattening work of the floor surface by hand trowel.

12 **Finishing**
Power trowelling by riding trowelling machine to the required floor surface finishing. This machine is heavy so the top concrete surface can be densified.

13 **Curing**
Apply curing compound according to requirement and specification.

14 **Measurement of floor flatness & levelness**
Floor measurement by certified surveyor, by means of the “Dipstick” F-number measuring instrument after the completion of the floor construction. The company carried out floor measurement must have the surface profiler measurement certificate.
### APPENDIX C

#### EQUIPMENT LIST

<table>
<thead>
<tr>
<th>No.</th>
<th>Descriptions</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mini Lazer Screed</td>
<td>1 Unit</td>
</tr>
<tr>
<td>2.</td>
<td>Bull Float</td>
<td>2 Units</td>
</tr>
<tr>
<td>3.</td>
<td>Checker Rod</td>
<td>1 unit</td>
</tr>
<tr>
<td>4.</td>
<td>Bump Cutter</td>
<td>1 Unit</td>
</tr>
<tr>
<td>5.</td>
<td>Hand Trowel</td>
<td>2 units</td>
</tr>
<tr>
<td>6.</td>
<td>Ride on Trowel</td>
<td>2 Units</td>
</tr>
<tr>
<td>7.</td>
<td>Lazer leveling Receiver</td>
<td>2 sets</td>
</tr>
<tr>
<td>8.</td>
<td>Floor Dipstick Floor Profiler</td>
<td>1 Unit</td>
</tr>
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</table>
APPENDIX D

Specifications of Floor Flatness & Levelness

According to American Concrete Institute ACI 302.1R-04, "Guide for Concrete Floor and Slab Construction," states that F-numbers define the flatness and levelness of a constructed concrete floor surface. The flatness F-number ($F_F$) controls local surface bumpiness by limiting the magnitude of successive 300 mm slope changes when measured along sample measurement lines in accordance with ASTM E 1155 (Standard Test Method for Determining $F_F$ Floor Flatness and $F_L$ Floor Levelness Numbers). The levelness F-number ($F_L$) controls local conformance to design grade by limiting differences in departure from design grade over distances of 3 m when measured along sample measurement lines in accordance with ASTM E 1155.

The F-number pair is always written in the order $F_F/F_L$. In theory, the range of flatness and levelness F-numbers extends from zero to infinity. In practice, $F_F$ and $F_L$ values generally fall between 12 and 45. The scale is linear, so the relative flatness/levelness of two different floors will be in proportion to the ratio of their F-numbers. For example, and $F_F30/F_L24$ floor is twice as flat and twice as level as an $F_F15/F_L12$ floor.

As there is manual floor hardener application, the floor specification that is achievable is $F_F35/F_L25$ floor which is defined as flat floor according to ACI 117-06.

Relationship between F-numbers & Straightedge

As stated in ACI 117R-90, “Commentary on Standard Specifications for Tolerances for Concrete Construction and Materials,” the relationship between straightedge and F-number tolerances for floor flatness is only a rough approximation because the two methods measure surface properties differently. As shown in the Figure, four 1/8 in. (3 mm) gaps under a 10 ft (3 m) straightedge would be a bumpier floor than one with only one 1/8 in. (3 mm) gap under the straightedge. Both floors, however, would meet the 1/8 in. gap-
under-the-straightedge requirement, while the F-numbers would differ markedly (see Figure 4.5.6(c) from ACI 117R-90 below).

Another problem with using a gap-under-straightedge tolerance is that there is no nationally accepted method for taking the measurements or establishing compliance of the surface being tested.

ACI 302.1R-04, “Guide for Concrete Floor and Slab Construction,” states that when straightedge tolerances are specified, 100% compliance with the maximum gap requirements is unrealistic. The guide suggests that compliance with four of five consecutive measurements is more realistic, with a provision that obvious faults must be corrected.
Sample floor profile with $F_F 33/F_L 29$
## Inspection & Testing Plan

<table>
<thead>
<tr>
<th>No</th>
<th>Inspection Activity / Test Items</th>
<th>Method of Inspection</th>
<th>Level of Acceptance/ Reference</th>
<th>Responsibility</th>
<th>Remarks</th>
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<td></td>
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<td></td>
<td></td>
<td>Sub</td>
<td>BKP</td>
</tr>
<tr>
<td>1</td>
<td>Lazer Transmitter</td>
<td>deviation at 30 m distance</td>
<td>within 5 mm</td>
<td>P</td>
<td>W</td>
</tr>
<tr>
<td>2</td>
<td>Lazer Screed &amp; Trowel Machine</td>
<td>trial start</td>
<td>No fault</td>
<td>P</td>
<td>W</td>
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<tr>
<td>3</td>
<td>Formwork Condition</td>
<td>visual</td>
<td>rigid &amp; stable</td>
<td>P</td>
<td>W</td>
</tr>
<tr>
<td>4</td>
<td>Formwork Top Elevation before Concreting</td>
<td>level &amp; lazer receiver</td>
<td>within +/- 2mm</td>
<td>W</td>
<td>P</td>
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<td>5</td>
<td>Readymix Concrete Slump at Pour Site</td>
<td>slump cone test</td>
<td>10 to 12 cm</td>
<td>W</td>
<td>P</td>
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<td>6</td>
<td>Constant Supply of Readymix</td>
<td>visual</td>
<td>break interval &lt; 20 mins</td>
<td>W</td>
<td>P</td>
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<tr>
<td>7</td>
<td>Concreting Compaction &amp; Rough Levelling</td>
<td>visual</td>
<td>evenly compacted &amp; levelled</td>
<td>W</td>
<td>P</td>
</tr>
<tr>
<td>8</td>
<td>Lazer Screeding</td>
<td>lazer receiver</td>
<td>within +/- 2mm</td>
<td>P</td>
<td>W</td>
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<td>9</td>
<td>Formwork Top Elevation after Concreting</td>
<td>level &amp; lazer receiver</td>
<td>within +/- 2mm</td>
<td>W</td>
<td>P</td>
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<td>10</td>
<td>Finished Concrete Surface</td>
<td>visual</td>
<td>no lamination &amp; defects</td>
<td>P</td>
<td>W</td>
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<td>11</td>
<td>Floor Profiling</td>
<td>Dipsticks</td>
<td>FF 35/ FL 25</td>
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**Notes:**
- P : Perform
- W: Witness
- A : Approve