Contents
1. Introduction:.........................................................................................................................3
2. Specifications:.........................................................................................................................4
3. Vibrating Wire Piezometer Operation...................................................................................5
4. Calibration and Interpreting Readings..................................................................................6
  4.1 Electrical Connection.........................................................................................................6
  4.2 Calibration Sheet Interpretation........................................................................................7
  4.3 Data Reduction...................................................................................................................8
  4.4 Pressure Head/Water Level Calculation............................................................................9
  4.5 Barometric Compensation...............................................................................................9
5. Installation Procedure ..........................................................................................................10
  5.1 Installation in Standpipes ...............................................................................................10
  5.2 Installation in Boreholes (traditional sand layer method)...............................................10
  5.3 Installation in Boreholes (direct grout method)................................................................11
  5.4 Installation in Fills and Embankments ..........................................................................12
6. Instrument Troubleshooting...............................................................................................13
7. Field Installation Records Sheet .........................................................................................14
8. Standard Temperature vs Resistance Values ......................................................................15
9. Definitions ............................................................................................................................16
10. HMA Group Conditions of Supply ..................................................................................17

Important Note

Always ensure that the zero reading is taken at installation.
For further information, see the data reduction and installation sections of this manual.
1. Introduction:

The HMA Geotechnical Vibrating Wire Piezometer has been designed to easily measure remote fluid pressures in earthen masses.

The Vibrating Wire Piezometer functions on the principle of tensile wire vibration. As the native reading taken is a frequency measurement, water penetration, temperature variations and contact resistance do not affect the output unlike several other types of electrical instrumentation. The piezometers can be read using a handheld vibrating wire readout unit, or a standalone datalogger. Providing the HMA Geotechnical Vibrating Wire Piezometers are installed in accordance with the prescribed techniques, the instrument has the capacity to operate indefinitely.
2. Specifications:

<table>
<thead>
<tr>
<th><strong>Piezometer</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure Ranges (kPa)</strong></td>
<td>350, 700, 1000, 2000, 3000, 5000</td>
</tr>
<tr>
<td><strong>Over Range</strong></td>
<td>1.5 x Rated Pressure</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>0.025% full scale</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>&lt; 0.5% full scale</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-20 to 60°C</td>
</tr>
<tr>
<td><strong>Filters</strong></td>
<td>0.5 and 20 micron</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>19mm dia, 136mm long</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>0.11kg</td>
</tr>
<tr>
<td><strong>Signal Output</strong></td>
<td>Continuous Gauge Frequency</td>
</tr>
<tr>
<td><strong>Frequency Range</strong></td>
<td>2000 - 3500 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Cable</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>2 Pair Twisted 22AWG</td>
</tr>
<tr>
<td><strong>Conductor Gauge</strong></td>
<td>22AWG</td>
</tr>
<tr>
<td><strong>Insulation Material</strong></td>
<td>PP Compound</td>
</tr>
<tr>
<td><strong>Nominal Thickness (mm)</strong></td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Nominal OD (mm)</strong></td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Drain Wire Gauge</strong></td>
<td>24AWG</td>
</tr>
<tr>
<td><strong>Applicable Standards</strong></td>
<td>AS/NZS 1125, AS/NZS 3808</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Electrical Properties</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max. Conductor DC Resistance @ 20°C</strong></td>
<td>56.95 Ohms per km</td>
</tr>
<tr>
<td><strong>Voltage Test: Core to Core</strong></td>
<td>1kV AC for 1 Minute</td>
</tr>
<tr>
<td><strong>Voltage Test: Core to Screen</strong></td>
<td>1kV AC for 1 Minute</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mechanical Properties</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-15 to 90°C</td>
</tr>
<tr>
<td><strong>Min. Bend Radius</strong></td>
<td>63mm</td>
</tr>
<tr>
<td><strong>Approximate Mass</strong></td>
<td>5.83kg/100m</td>
</tr>
</tbody>
</table>
3. Vibrating Wire Piezometer Operation

The HMA Geotechnical Vibrating Wire Piezometer provides a reliable static pressure output to be utilised in a number of applications, such as:

- Water level monitoring
- Soil deposit pressure monitoring
- Compacted fills for dams
- Mining applications (Dewatering, Pumping, Backfill)
- Slope stability
- Seepage

The piezometers are based upon the principle of vibrating wire resonance. The instrument consists of a vibrating wire element connected to a sensitive, perpendicular diaphragm. Exerting pressure, such as pore water pressure, on the diaphragm will cause it to deflect therefore altering the tension and corresponding resonant frequency of the vibrating wire.

Each time a measurement is taken, electromagnetic coils adjacent to the vibrating wire pluck the instrument wire and then measure the resonant frequency of the wire. The frequency of the wire is read by a handheld readout or a datalogger.

![Figure 1. Vibrating Wire Piezometer construction](image)

Hand held readouts and dataloggers usually return a Digits (B) reading, being the frequency squared divided by 1000 \((\text{Hz}^2 \times 10^{-3})\) as this value is directly proportional to the pressure applied to the diaphragm. By using vibration frequency as a measurement method, water penetration, lead wire resistance and contact resistances are deemed negligible. Long runs of instrumentation cable can be installed also, unlike other forms of piezometers.

The stainless steel housing of the piezometer ensures resistance to corrosive environments.

Standard filters are 20-micron pore diameter sintered stainless steel. However, a variety of filter permeabilities are available to meet different application requirements.
4. Calibration and Interpreting Readings

Prior to shipment each piezometer is individually calibrated with respect to applied pressure. Although comparatively minimal, further corrective calibrations regarding changes in barometric pressure and temperature may also be necessary. It should also be noted that the manufacturers factory elevation is 110 metres above sea level, meaning that further corrections for site elevation may be required.

The site test reading of each piezometer should be checked and noted upon delivery. Theoretically once calibrated the site test reading should closely match the factory reading.

All Geotechnical Systems Vibrating Wire Piezometers have been calibrated to international standards using either pneumatic or deadweight pressure testers. Both testers are traceable to the national standards at the National Bureau of Standards (U.S.A).

Each Vibrating Wire Piezometer ships with a calibration sheet provided by HMA Geotechnical.

4.1 Electrical Connection

![Figure 2. Typical HMA Geotechnical Vibrating Wire Piezometer cable](image)

<table>
<thead>
<tr>
<th>Conductor Definitions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Vibrating Wire</td>
</tr>
<tr>
<td>Black</td>
<td>Vibrating Wire</td>
</tr>
<tr>
<td>Green</td>
<td>Thermistor</td>
</tr>
<tr>
<td>White</td>
<td>Thermistor</td>
</tr>
</tbody>
</table>
4.2 Calibration Sheet Interpretation

HMA Geotechnical supplied piezometers include basic information such as the client name, job number, serial number, and pressure rating at the top of the page.

These are important records to keep, please ensure these sheets are filed away safely.

You will need to refer to the calibration sheet when performing calculations to deduce the pore pressure. The key coefficients have been highlighted below that will be required when performing pressure calculations.

![Calibration Sheet Image]

**Figure 3. Typical HMA Geotechnical calibration sheet**
4.3 Data Reduction

To calculate the pore water pressure being applied to the piezometer the following formula should be used:

\[ P = (F_0 - F_1)CP + (T_1 - T_0)CT \]

Where

- \( P \) = Pressure (Dependant on pressure coefficient, usually kPa)
- \( F_0 \) = Zero reading prior to installation \textit{taken at site} (Hz\(^2\) x 10\(^{-3}\))
- \( F_1 \) = Current piezometer reading (Hz\(^2\) x 10\(^{-3}\))
- \( CP \) = Pressure coefficient (kPa / Hz\(^2\) x 10\(^{-3}\))
- \( CT \) = Temperature Coefficient (kPa / °C)
- \( T_1 \) = Current temperature reading (°C)
- \( T_0 \) = Zero temperature reading prior to installation \textit{taken at site} (°C)

Refer to “Standard Thermistor Resistance/Temperature tables” table to determine the temperature from the resistance reading from the vibrating wire piezometer’s internal thermistor.

\textbf{Note:} The zero reading must be taken on site and is detailed in the installation section of this manual.

Do not use the factory reading unless there is no other option. While it is possible to use this value in the event that a zero reading has not been taken prior to installation on site, data will not reflect the true pressure experienced by the transducer.
4.4 Pressure Head/Water Level Calculation

The pressure head is calculated by dividing the kilopascals value taken from a Vibrating Wire Piezometer by the specific weight of water. Table 1 indicates appropriate values with an example given below.

<table>
<thead>
<tr>
<th>Degrees Celsius</th>
<th>Specific Weight (kN/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9.805</td>
</tr>
<tr>
<td>5</td>
<td>9.807</td>
</tr>
<tr>
<td>10</td>
<td>9.804</td>
</tr>
<tr>
<td>15</td>
<td>9.798</td>
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<tr>
<td>20</td>
<td>9.789</td>
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<td>25</td>
<td>9.777</td>
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<tr>
<td>30</td>
<td>9.765</td>
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<td>40</td>
<td>9.731</td>
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<td>50</td>
<td>9.69</td>
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<td>9.642</td>
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<td>70</td>
<td>9.589</td>
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<td>80</td>
<td>9.53</td>
</tr>
<tr>
<td>90</td>
<td>9.467</td>
</tr>
<tr>
<td>100</td>
<td>9.399</td>
</tr>
</tbody>
</table>

*Table 1. Temperature vs Specific Weight*

**Example 1**
A Piezometer is reading 140kPa at 20 degrees Celsius. The pressure head is found by dividing 140kPa by 9.789.

\[140kPa/9.789 = 14.3m \text{ Pressure Head}\]

4.5 Barometric Compensation

In some instances, it will be necessary to compensate for barometric pressure changes. If a Vibrating Wire Piezometer is installed in an open borehole, small fluctuating pressure changes may be due to the barometric pressure. This can be overcome by using lower pressure vented piezometers, which utilise a different style of cable inclusive of a vent tube from the instrument to the top of the hole. The vent tube is terminated with a desiccant chamber to prevent moisture ingress. HMA Geotechnical can supply these piezometers when requested.
5. Installation Procedure

5.1 Installation in Standpipes

To install the piezometer in open standpipes the transducer is normally lowered to the surface of the water and slightly immersed to allow the unit to come to thermal equilibrium (approximately 5 minutes). A zero reading is taken and the piezometer can then be lowered to the desired position in the standpipe.

In situations where packers are used in standpipes the same sequence as above should be noted and special care should be taken to avoid cutting the cable jacket with the packer since this could introduce a possible pressure leakage path or short circuit the instrument.

5.2 Installation in Boreholes (traditional sand layer method)

HMA Geotechnical piezometers can be installed in boreholes in either cased or uncased holes. Careful attention must be paid to borehole sealing techniques if pore pressures in a particular zone are to be monitored.

Boreholes should be drilled either without drilling mud or with a material that degrades rapidly with time, such as Revert. The hole should extend from 150 to 300mm below the proposed piezometer location and should be washed clean of drill cuttings. The bottom of the borehole should then be back filled with clean sand to a point 150mm below the desired piezometer tip location.

The piezometer can then be installed, as delivered, or preferably encapsulated in a filter cloth bag containing clean, saturated sand.

It is then lowered to the surface of the water and slightly immersed to allow the unit to come to thermal equilibrium (approximately 5 minutes). A zero reading is taken and the piezometer can then be lowered to the desired position in the borehole.

While holding the instrument in position (a mark on the cable is helpful) clean sand should be placed around the piezometer and to a point 150mm above it.

Immediately above the collection zone the borehole should be sealed with either alternating layers of bentonite and sand back fill tamped in place for approximately 300mm followed by common back fill or by an impermeable bentonite – cement grout mix.

If multiple piezometers are to be used in a single hole, the bentonite-sand plugs should be tamped in place below and above the upper piezometers and also at intervals between the piezometer zones. When designing and using tamping tools, special care should be taken to ensure that the piezometer cable jackets are not cut during installation.

It should be noted that as the vibrating wire piezometer is basically a no flow instrument, collection zones of appreciable size are not required and the piezometer can in fact, be placed directly into most materials provided that the fines are not able to migrate through the filter.
5.3 Installation in Boreholes (direct grout method)

HMA Geotechnical piezometers can be installed in boreholes in either cased or uncased holes. Careful attention must be paid to borehole sealing techniques if pore pressures in a particular zone are to be monitored.

Boreholes should be drilled either without drilling mud or with a material that degrades rapidly with time, such as Revert. The hole should extend from 150 to 300mm below the proposed piezometer location and should be washed clean of drill cuttings.

Typically a number of piezometers will be installed within the same borehole when using the direct grout method. Piezometers are typically installed in deep boreholes (up to 800m) using this technique. Due to the long cable lengths and the associated self weight induced strain on the piezometer cables it is advisable to use catenary cable to support the piezometer cables down the borehole. The piezometer cables are fixed to the catenary cable using cable ties at intervals of 1 to 2 metres.

The grout tremie tubes also need to be attached to the catenary wire. It is important to know at what lifts the grout will be placed as well as how many grout tubes are required. It is also important not to overpressurise the piezometers during installation as this may permanently damage the piezometers. Please note the piezometers have an over range 1.5x that of the specified pressure range. However, the piezometer is only calibrated to is specified pressure range and not the over range.

The porous filter is removed from the piezometer tip and the annulus is fully filled with silicon greasing making sure that all air bubbles are removed. A rubber diaphragm (can use cut finger tip from a rubber glove) is then placed and fixed firmly, over the silicon grease filled annulus, to the stainless steel housing of the piezometer. The piezometer can then be installed down (silicon greased filled annulus pointing down the borehole).

It is then lowered (with catenary cable attached) to the surface of the water slightly immersed to allow the unit to come to thermal equilibrium (approximately 5 minutes). A zero reading is taken and the piezometer can then be lowered to the desired position in the borehole.

Once the piezometers are all in position the grout can be pumped down the first (deepest) grout tube. As mentioned earlier it is important not to overpressurise the piezometers with the grout during installation. Please note that typically the specific gravity of a bentonite/cement grout is about 1.6. Once the first lift of grout has been placed it should be left to cure overnight.

The procedure can be repeated for the other piezometers in the same borehole. It is good practice to continually check the piezometer readings during the grouting process.

Once the cables have been all grouted in and the grout has cured the piezometers can now be read.
5.4 Installation in Fills and Embankments

HMA Geotechnical piezometers are normally supplied with direct burial cable suitable for placement in fills such as highway embankments and dams, both in the core and in the surrounding materials, each installation must be treated separately.

In installations in non-cohesive fill materials the piezometer may be placed directly in the fill or, if large aggregate sizes are present, in a saturated sand pocket in the fill. The cable should be similarly protected from the large aggregate.

In fills such as impervious dam cores where sub-atmospheric pore water pressures need to be measured as opposed to the pore air pressure, a ceramic tip with a high air entry value is required and should be carefully placed in direct contact with the compacted fill material.

If only the pore air pressure is required then the low air entry tip is acceptable. It should be noted that the low air entry tip measures the air pressure when there is a difference between pore air pressure and pore water pressure, the difference between the two pressures is due to the capillary suction of the soil.

The general consensus is that it is normally of no consequence to embankment stability. As a general rule the low air entry tip suitable for most routine measurements and, in fine cohesive soils, sand pockets should not be used around the piezometer tip.

The zero reading should be taken when the instrument has been installed.
6. Instrument Troubleshooting

To ensure that the vibrating wire piezometers are functioning properly it is advised that the instrument be checked periodically. As the transducers are sealed they cannot be opened for inspection, hence for inaccurate readings the flow chart below should be employed.

**Faulty Piezometer**
Disconnect from the logger if connected to one. Connect a hand held readout.

- If a reading is present
  - **Check logger operation**
    If the piezometer is functioning through a second readout device, check the original logger/readout for faults. HMA Geotechnical can repair a number of readouts.
- If no reading present
  - **Check instrument resistance**
    - Across the red and black wire using a multimeter, measure the resistance. If the value is not around 180Ω there is a problem with the cable.
    - If a value that is much smaller than 180 or much higher, there is possibly a short or break.
    - Checking the resistance across the green and white wires will confirm if there is a cable break. Resistance values should be within the range stated in the resistance/temperature table in this manual.
    - If the cable is run above ground, check for small bite marks. Animals can easily penetrate piezometer cable with their teeth.
    - Confirm your readout is operational!
- If reading is present, but fluctuating by small amounts (~2 or more Digits)
  - **Check earthing/shielding of instrument**
    Earthing and shielding of the instrument is important in every installation. Ensure that the shield/drain wire is connected to ground. If no shield present, strip cable back until it is exposed and wire into ground. This is especially important if generators are nearby. If this does not fix the problem, check the cable for damage.

*Figure 4. Piezometer troubleshooting matrix*
7. Field Installation Records Sheet

To assist with installations in the field, HMA Geotechnical provide a standard installation record sheet that allows any field operator to quickly record key data to be used by monitoring engineers at a later date.

An example is provided below, please contact HMA Geotechnical for a higher resolution copy.

<table>
<thead>
<tr>
<th>Installation Record</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hole Number</strong></td>
</tr>
<tr>
<td><strong>VWP Serial No.</strong></td>
</tr>
<tr>
<td><strong>BORE LOG</strong></td>
</tr>
<tr>
<td><strong>DEPTHS</strong></td>
</tr>
<tr>
<td><strong>CLIENT</strong></td>
</tr>
<tr>
<td><strong>INSTALLER’S NAME</strong></td>
</tr>
<tr>
<td><strong>LOCATION</strong></td>
</tr>
<tr>
<td><strong>START DATE</strong></td>
</tr>
<tr>
<td><strong>FINISH DATE</strong></td>
</tr>
<tr>
<td><strong>INSTALLATION TIME TAKEN</strong></td>
</tr>
<tr>
<td><strong>HOLE DEPTH</strong></td>
</tr>
<tr>
<td><strong>HOLE DIAMETER</strong></td>
</tr>
<tr>
<td><strong>HOLE REF. No.</strong></td>
</tr>
<tr>
<td><strong>INSTRUMENT TYPE</strong></td>
</tr>
<tr>
<td><strong>SERIAL No.</strong></td>
</tr>
<tr>
<td><strong>WORK PERFORMED:</strong></td>
</tr>
<tr>
<td><strong>ANCHOR OR INSTRUMENT DEPTHS (m)</strong></td>
</tr>
<tr>
<td>33 34 35 36 37 38 39 40 41 42 43 44</td>
</tr>
<tr>
<td><strong>ZERO/ BASE READINGS UNITS (&quot; x 10^3)</strong></td>
</tr>
<tr>
<td>7 8 9 10 11 12 13 14 15 16 17 18</td>
</tr>
<tr>
<td><strong>FINAL READINGS UNITS (&quot; x 10^3)</strong></td>
</tr>
<tr>
<td>72 73 74 75 76 77 78 79 80 81 82 83</td>
</tr>
<tr>
<td><strong>DETAILS OF CONDUIT, TRENCHING, BACKFILL PERFORMED:</strong></td>
</tr>
<tr>
<td><strong>DETAILS AND TIMES OF PLANT EQUIPMENT AND SUBCONTRACTORS USED:</strong></td>
</tr>
<tr>
<td><strong>DETAILS OF ANY OTHER MATERIAL USED:</strong></td>
</tr>
<tr>
<td><strong>NOTES AND PROBLEMS ENCOUNTERED:</strong></td>
</tr>
</tbody>
</table>
### 8. Standard Temperature vs Resistance Values

<table>
<thead>
<tr>
<th>Ohms</th>
<th>Temp °C</th>
<th>Ohms</th>
<th>Temp °C</th>
<th>Ohms</th>
<th>Temp °C</th>
<th>Ohms</th>
<th>Temp °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>53100</td>
<td>-30</td>
<td>4105</td>
<td>18</td>
<td>13390</td>
<td>-6</td>
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<td>42</td>
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<td>5692</td>
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<td>773.7</td>
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9. Definitions

**Factory Reading**
The reading taken at the factory during calibration and shown on the calibration sheet.

**Site Test Reading**
The reading taken on receipt of the equipment to prove its functionality after shipping.

**Zero Reading**
The reading taken during the installation and used for all subsequent calculations. This is the most important reading the installer must take during a field install.

**Pressure Coefficient**
The pressure factor obtained during factory calibration of the instrument and shown on the calibration sheet. This is a calibrated value that determines the amount of pressure (usually in kilopascals) per digit reading. Found on the calibration sheet, calculations cannot be performed without this value.

**Temperature Coefficient**
The temperature factor obtained during factory calibration of the instrument and shown on the calibration sheet. This is a calibrated value that determines the effect of temperature on the Vibrating Wire Piezometer digits reading.
10. HMA Group Conditions of Supply

Accurate as of 14th July 2015. Subject to change. An up to date copy can be viewed at hmagrp.com.

1. Agreement
(a) These Conditions of Supply, any Quotation and any other document referred to in that Quotation, are accepted by you and then us (together, the “Agreement”) form a legal agreement between you and us.
(b) Acceptance by you of the Agreement will constitute an offer from you to purchase the Supply from us, which will then be open for acceptance by us. Your offer may be made by doing either one or more of the following things:
(i) Signing these Conditions of Supply, or
(ii) Signing and returning the Quotation or otherwise accepting the Quotation; or
(iii) Issuing a purchase order or similar request for goods or services in response to the Quotation.
(c) Once your offer is made, we are at liberty to accept or reject your offer in our absolute discretion by:
(i) Notifying you in writing; or
(ii) Performing the Supply in accordance with a purchase order issued by you.
(d) You are responsible for ensuring that all purchases made under this Agreement are made in accordance with the Quotation and that the information to enable us to proceed with the order forthwith otherwise we shall be at liberty to amend the Contract Price and related delivery period to cover any variation or delay.

2. General & Definitions
(a) Where the following words are not already defined in this Quotation or another part of this Agreement:
(i) Confidential Information means the content of this Agreement, any information of a party which is marked confidential and any information which is by its nature confidential.
(ii) Contract Price means the price payable in respect of any supply made under this Agreement, more particularly described in the Quotation.

3. Payment
(a) Where we have approved credit to you (and subject to the terms of any credit approval), unless otherwise specified in the Quotation, the terms of payment are in full by cash or bank cheque 30 days from the date of the invoice.
(b) Where outstanding any provisions have not been completed and any other agreement with us has not been completed and any other agreement with you (notwithstanding any change in the conditions of supply and installation of any goods, immediately upon delivery of the goods to you.
(c) Such delivery shall be in every case deemed to be delivered to you and accepted by you upon delivery to you at the time of delivery to sign a receipt for such goods.
(d) We shall be entitled, at our option, and without notice to you to suspend any work or refusal delivery of any goods, and
(e) If the goods supplied by us to you will not be paid to you and will remain our absolute property until such time as we have been paid all monies due and owing to us in relation to any account.

4. Title and Risk
(a) In the case of delivery, all risk in the goods and the title to delivery to you, your Nominee or a nominated carrier for transportation to you, or to some other place or site nominated by you upon pick-up by you or your agent.
(b) The goods shall be at your risk upon delivery to the nominated carrier.
(c) At the time of delivery the Goods shall become your property.
(d) You must effect and maintain with a reputable insurance company insurance for the goods, against all risks as it thinks appropriate.
(e) Note our interest on the insurance and
(f) A signed receipt for the goods shall be produced on demand by you under this clause when the goods are needed to us, upon request.

5. Delivery/Installation Dates
(a) Any dates given in our Quotation for delivery or installation are estimates only and while we shall use reasonable commercial endeavours to meet such dates you acknowledge and agree that no liability shall attach to us for any losses or damage, whether direct or consequential, arising out of any such delay in delivery or
(b) In the event you are delayed in receiving the Goods due to acts of God, storm, flood, war or insurrection, industrial disputes, or due to the unavailability of materials on reasonable commercial terms, we are unable to deliver or install, or if any item may be dispatched to you or (in the absence of any specified time, within a reasonable time), or at all, the Agreement shall be voidable at the option of either party with no right by the other party to claim any damages beyond liability for payment of any completed (or partially completed) Supply.

6. Title and Risk
(a) The title to the Goods remains with us until you have paid for them unless otherwise agreed in writing by us.
(b) The Goods shall be at your risk upon delivery to the nominated carrier.
(c) The Goods shall become your property at the time of delivery.
(d) You must effect and maintain with a reputable insurance company insurance for the goods, against all risks as it thinks appropriate.

7. Security and IPMA
(a) To the extent permitted by law, and for better securing payment of the Contract Price plus any other charges, you hereby grant to us, our nominees and any other person or entity referred to in the Conditions of Supply, in respect of the Goods and all other items in your possession, security interest and other property in favour of us.
(b) You acknowledge and agree that this Agreement constitutes a security agreement in respect to our security interests in all present and after-acquired goods in accordance with the IPMA.
(c) You also acknowledge and agree that the IPMA applies to our security interests set out in clause 8 and 9 above.
(d) To the extent permitted by law, the following provisions of the IPMA do not apply, and for the purpose of s 115 of the IPMA are contracted out of this Agreement:
(i) Sections 136 instead of the following security agreements.
(ii) The assignment of security interests and the satisfaction of the same.
i. section 19(b) (section of都想政)，to the extent that it includes or gives a notice to the contrary.
ii. section 125a (section of letter or document).
iii. section 125b (section of letter or document). 
iv. section 125c (section of letter or document).

For the purposes of section 149 of the PPSA, you (and we) agree that any payments received from you pursuant to or in any way connected with this Agreement, will be applied in the following order of priority:

1. Firstly, if there are any debts or obligations outstanding to us which are not secured by either the loan or debt instrument or any other security interest created by this Agreement or any other document required to give effect to a security interest created by this Agreement.
2. Secondly, if there are any debts or obligations outstanding to us which are secured, but not prepaid or settled in accordance with the terms of the security agreement or any other security interest created by this Agreement.
3. Lastly, any other debts or obligations secured by any other security interest created by this Agreement.

(a) You consent to:

i. the registration with the relevant authority or public register of any security interest created by this Agreement or any other document required to give effect to a security interest created by this Agreement.

(b) You warrant that:

i. all the information and documents provided in connection with this Agreement are true and correct;
ii. all the information and documents provided in connection with this Agreement are current and up-to-date;
iii. all the information and documents provided in connection with this Agreement are complete and accurate;
iv. all the information and documents provided in connection with this Agreement are complete and accurate;

(c) You must:

i. acknowledge and agree to any changes in the law or any regulatory requirements that are applicable to the Goods or Services provided by the Company;
ii. acknowledge and agree to any changes in the law or any regulatory requirements that are applicable to the Goods or Services provided by the Company;
iii. acknowledge and agree to any changes in the law or any regulatory requirements that are applicable to the Goods or Services provided by the Company;
iv. acknowledge and agree to any changes in the law or any regulatory requirements that are applicable to the Goods or Services provided by the Company;

(d) In the event of any dispute or claim, you must:

i. file a claim in accordance with the relevant insurance policy or any other applicable law;
ii. file a claim in accordance with the relevant insurance policy or any other applicable law;
iii. file a claim in accordance with the relevant insurance policy or any other applicable law;
iv. file a claim in accordance with the relevant insurance policy or any other applicable law;

(e) In the event of any dispute or claim, you must:

i. file a claim in accordance with the relevant insurance policy or any other applicable law;
ii. file a claim in accordance with the relevant insurance policy or any other applicable law;
iii. file a claim in accordance with the relevant insurance policy or any other applicable law;
iv. file a claim in accordance with the relevant insurance policy or any other applicable law;

(f) In the event of any dispute or claim, you must:

i. file a claim in accordance with the relevant insurance policy or any other applicable law;
ii. file a claim in accordance with the relevant insurance policy or any other applicable law;
iii. file a claim in accordance with the relevant insurance policy or any other applicable law;
iv. file a claim in accordance with the relevant insurance policy or any other applicable law;