



# **Timber Moisture Meters**

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## **Test & Measurement**

**[www.carrel-electrade.co.nz](http://www.carrel-electrade.co.nz)**

## **Calibration Services**

Carrel - Electrade Ltd offers repair and recalibration of timber moisture meters including standard tests for compliance with AS/NZS 1080. 1:1997 with the issue of traceability certificates.

We also manufacture a Calibration Test Card to check resistance type timber moisture meters.

Carrel-Electrade Ltd is the new force in Electrical Control and Automation in New Zealand. As manufacturers, importers and distributors of electrical equipment the company has more than 60 years of history and experience behind it, cementing its status as one of New Zealand's major suppliers of specialised electrical measuring and control equipment to industry.

The company maintains long-standing values such as service, dependability and reliability coupled with flair, ingenuity and innovation. We believe our advantage is our innovation and manufacturing flexibility on demand.

Our range of products provide customers with cost effective solutions from the not so difficult to the most complex problems, and services both broad industry and the power supply/power generation sectors.

Carrel-Electrade Ltd is New Zealand's only manufacturer of analogue panel instruments, timber moisture meters and electrical transducers.

Our T Series and LP Series electrical transducers, as with all products we manufacture, have been designed to meet the requirements of international standards and meticulous attention is paid to the quality and robustness of the units.

The latest range of "intelligent" transducers feature the ability to communicate directly with PLC's, computers and SCADA systems.

Our design and development team has wide experience in analogue and digital circuitry and we specialise in measuring and monitoring electrical systems.

In addition to standard products we work closely with end users to develop specialised measuring equipment to meet specific needs. These projects may involve the adaptation of standard products, or completely new designs. When coupled with the experience and expertise of our technical and sales staff and our national distribution network with warehouses in Auckland and Christchurch, Carrel-Electrade Ltd truly offer...

*not just products... solutions!*



**Proudly 100% New Zealand owned and operated**

Visit our website at: [www.carrel-electrade.co.nz](http://www.carrel-electrade.co.nz)

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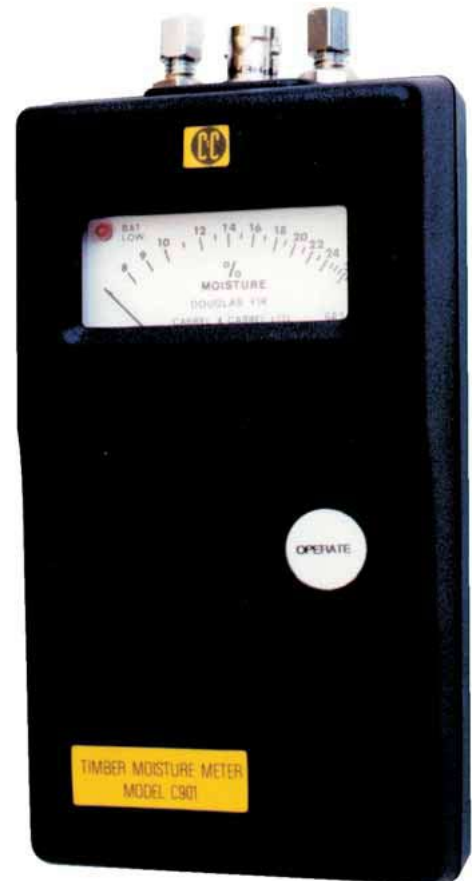
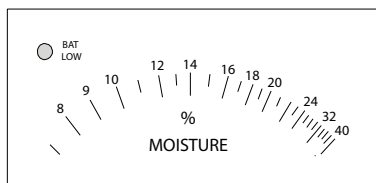
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## **C901 TIMBER MOISTURE METER**

The Carrel- Electrade C901 is a self contained hand held resistance type moisture meter. A BNC connector at the top of the unit enables the use of separate electrodes. Supplied complete with heavy duty vinyl carrying case with belt loop.



**Part No. C901/34 443**

### **Specifications**

<b>Range</b>	8% to 40% moisture content
<b>Calibration</b>	Referenced to AS/NZS 1080.1
<b>Operation</b>	Single push button
<b>Battery monitor</b>	LED indicator
<b>Electrode</b>	Built-in needles or plug-in external electrodes
<b>Battery</b>	1 x 9V heavy duty, IEC 6F22
<b>Dimensions</b>	165 x 80 x 40mm
<b>Weight</b>	255g

## **C301 CAPACITIVE TIMBER MOISTURE METER**



**Part No. C301/34 465**

**The C301 capacitive timber moisture meter is non-invasive and simple to use. No large electrodes or pins are required to be inserted into the timber.**

**Supplied complete with heavy duty vinyl carrying case with belt loop.**

### **Features**

- Capacitive type instrument with digital readout.
- Non-invasive operation
- Self contained with no external electrodes
- Continuous operation enabling large areas to be rapidly checked

### **Specifications**

<b>Range</b>	: 0 to 200% moisture content
<b>Material</b>	: Radiata pine, dry density 0.46 Tonnes/cub m
<b>Display</b>	: 4 digit LCD
<b>Operation</b>	: Single push button
<b>Battery Monitor</b>	: Digital display "Lo-b"
<b>Battery</b>	: 1 x 9V heavy duty, IEC 6F22
<b>Dimensions</b>	: 145 x 85 x 40mm
<b>Weight</b>	: 225g

### **How it works**

The back of the meter contains an electrode, which forms part of a capacitor. If a piece of material is placed in the field of the electrode then the capacitance will change according to the dielectric constant of the material. Dry wood has a low dielectric constant whilst water has a very high constant thus the water in a piece of timber will account for most of the change in capacitance. The meter measures this change and interprets it in terms of how much water is present ie the moisture content of the timber. This value is directly displayed on a digital display. The meter is calibrated to Radiata pine of dry density 0.46 Tonnes/cub m.

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**How to use it**

Hold the meter in one hand and place the electrode surface on the underneath of the meter directly against a flat surface on the object to be measured. Press the button with the thumb and the meter will read. The meter will work as long as the button is pressed and can be moved around looking for damp spots. Make sure that the electrode is in good contact with the timber surface. When the message "b-Lo" flashes on the display then a new 9V battery should be fitted.

**How to use it effectively**

Whilst the meter is very simple to use it has limitations, which should be taken into account to obtain effective readings.

1. Where accuracy is of prime importance readings should be checked with a resistive type meter conforming to the Standard AS/NZS1080. In this respect the meter is especially useful for screening for damp spots, which are then investigated with a conventional pin type meter.
2. The meter does not read well on irregular or rough surfaces. Make sure the whole of the electrode is in close contact with a flat part of the object being measured.
3. The meter measures moisture in any object close to the electrode. That includes fingers so keep them away from the under surface of the meter by grasping it by the handle only.
4. Whilst the meter has depth of penetration of up to 25mm it is more sensitive to moisture close to the electrode. This depth of penetration allows it to detect damp timber beneath wall boards but the reading is less than the actual moisture content of the timber due to the extra distance. In practice one should look for a marked change in the reading and follow up with a resistive meter.
5. The meter will read low on thin sections of timber because part of the field goes right through them into the air beyond. Likewise if the electrode area is not completely covered by the sample a low reading is likely.
6. Capacitive moisture meters can be used for any type of timber however they are very sensitive to timber density. This meter is set up for normal construction timber and denser timber will appear wetter whilst lighter timber will appear drier than the actual value. As it is very difficult to estimate timber density in the field a backup resistive measurement should always be resorted to when there is any doubt. Under these circumstances the meter is better used for comparisons between similar types of timber.
7. Capacitive readings are less sensitive to temperature than resistive readings however care is indicated if the temperature of the timber differs markedly from normal values especially if it is below freezing as ice has a different dielectric constant from liquid water.
8. The meter can be used for any insulating material likely to contain moisture however the natural dielectric properties of the material are likely to affect the reading to a great degree so some discretion is required. Sufficient thicknesses of paper products and cardboard seem to give a good reading as well as some types of MDF and particle board. Materials containing air pockets such as corrugated cardboard and tissue need to be compressed to obtain sufficient density. Materials containing conductive resins such as melamine boards and some types of particle board are to be avoided. Concrete, plaster and cement products can also be measured but again only for comparative purposes and to identify damp spots.
9. The meter is sensitive to the proximity of metal and other conductors such as graphite or salts. Do not be fooled by nails, screws, straps or other metal objects buried beneath the surface as they will give a higher reading than normal simulating a damp spot.

## **C400-SR DIGITAL TIMBER MOISTURE METER**

An affordable digital resistance type moisture meter suitable for timber handlers, kiln operators and the users who require a record of timber moisture readings.

This instrument is simple to use and is also capable of correcting readings for temperature and common NZ and Australian timbers.

The C400-SR timber moisture meter measures the moisture content of timber using the electrical resistance method specified in the AS/NZS 1080 Standard. It can record these readings and release them as and when required. Up to 170 readings can be stored in nonvolatile EEPROM memory. Two versions of this meter are available with stored data down loaded via an RS232 serial port in either MContent<sup>®</sup> kiln management format or comma separated variable (CSV) format for importing into spread sheets.



**Part No. C400-SR/34 475**

### **Features**

Calibrated to AS/NZS 1080 Standard (traceable)

Range: 10% to 100% moisture content

Optimum accuracy from 13% to 40% moisture content

Records up to 170 readings in nonvolatile EEPROM

Down load stored readings into MContent<sup>®</sup> or spread sheet

Compact size: 130 x 67 x 25mm, weight 160gm

Sealed water resistant case

Long battery life on low cost 9V battery

Low battery indicator

Ambient temperature measurement on built in sensor

(external sensor available as an option)

Automatic temperature correction of reading (selectable)

Correction scales for Standard, untreated Radiata Pine, NZ H1 & H3 treated Radiata Pine, Douglas Fir, Rimu, Macrocarpa etc.

Supplied with BNC connector for external slide hammer electrode

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**Setting up**

The C400-SR is supplied with a BNC connector suitable for use with the CSH102 slide hammer electrode and is ready for use. It is initially set on the default setting which is no temperature correction and the standard scale (AS/NZS 1080 Standard Relationship). These settings can be changed on a four way DIP switch located in the battery compartment (see below).

**Taking readings**

Attach the slide hammer electrode unit and insert the pins into the sample. Hold down the button in the middle of the meter. The meter will briefly show the temperature, then display the moisture content in %. If the reading is below 10% (very dry timber) the display will flash "0.0". If the reading is more than 100% the display will flash "100.0". When a reading is secured the button can be released and the display will hold the reading for 5 seconds. To display only the temperature give a very short press on the button.

**Recording readings**

To record a reading keep the button pressed for 6 seconds. At this point the meter will beep, display "rXXX" and record the reading number (XXX), the current moisture reading, temperature, timber type and the reading block (group). If you attempt to record beyond 170 readings the meter will not record and will display "FULL". If you wish to change the current block number continue to hold the button down for a further 5 seconds till the display shows "bLX" where X is the new block number with the newly recorded current reading as the first in this block. The number of blocks is limited to 8 and when this number is reached all subsequent readings are in block 8 until the full 170 have been accumulated or the record reset. The temperature is recorded as a matter of course but if the temperature correction is active a marker is attached to the reading for identification. The readings will accumulate and can be down loaded whenever required without affecting the record. A reset will clear the entire record back to the start and can only occur after a down load.

**Down loading the readings**

There are two versions of the meter. One will down load into the MContent<sup>®</sup> program, the other down loads as a .CSV file suitable for spread sheet programs such as Excell. The down load is done via an RS232 dumb terminal COM port set to 9.6kBd, 8 bits, no parity and 1 stop bit with all characters in ASCII. The COM port may be on a computer, printer or display terminal. Plug the data lead into the meter (3.5mm stereo plug) and connect the other end (9 pin D) to the serial port. Connecting the meter to an active RS232 port will activate the down load function on the meter. Hold down the push button until transmission is complete and the display no longer shows "Prnt". After the down load you can reset the memory by continuing to hold the button down. After 5 seconds the meter will start beeping and after a further 5 seconds will reset the memory and will display "rEST" when this has been completed.

**Settings**

The meter can be set to automatically correct the readings for temperature and timber type. These options are selectable on a 4 way DIP switch located in the battery compartment. The positive switch polarity (1) is in the up position.

**Temperature correction**

Putting switch 4 in the up position will activate the automatic correction of moisture readings for temperatures differing from the standard 20°C and place the figure "t" in the left hand side of the display. The recorded temperatures will be prefixed with the character "@" (#64 in ASCII).



### Timber type

Automatic correction of moisture readings for various common timber types can be selected by the setting of switches 1 to 3. The relevant setting will alter the reading to correct for the chosen type of timber and will briefly show a name at the start of the reading and attach a code to the recorded readings. The table shows the required switch positions as well as the displayed name and the recorded code of the main timber type. Other timber types covered by the same corrections are also shown. The corrections are taken from the representative table in the AS/NZS 1080.1 Standard. Whilst these are used in good faith users must be aware that the behaviour of such timbers can be greatly affected by factors such as condition, density, age and the degree of exposure to salts, chemicals and preservatives.

S1	S2	S3	Main Timber	Display	Code	Other Timbers
0	0	0	Standard Relationship AS/NZS 1080	(None)	STD	Balsa Mahogany Maple Oak Philippine Mahogany Spruce Silver Beech
0	0	1	Untreated Radiata Pine	PineE	URP	Alpine/Mountain Ash (Eucalyptus) Kwila Meranti Red Beech Sapele Mahogany
0	1	0	Treated Radiata Pine	H1H2	TRP	Ash (European) Elm Tawa Teak (?)
0	1	1	LOSP	LOSP	LOS	Liquid organic solvent based preservative treated timbers in general (highly variable)
1	0	0	Douglas Fir	dFir	DFR	Jarrah (?)
1	0	1	Macrocarpa	CArP	MAC	Lawsen Cypress Redwood
1	1	0	Blackwood	bLAC	BWD	Blue Gum Kahikatea Matai Walnut
1	1	1	Rimu	rimu	RMU	Kauri Totara Huon Pine King Billy Pine

### Battery

The meter uses a common PP3 (6F22) type 9V battery. The meter automatically senses the battery voltage during a reading. If the battery needs replacing a message "Lo-b" will flash on the display whilst reading. Open the battery compartment by unscrewing the two (flat head) screws on the cover.

### Precautions

The meter will not work correctly if it is in a dirty or damp state. It should not be left in the kiln or outside nor be exposed to liquids or chemicals. This meter is specifically designed to work well in the range 13% to 40% moisture which is the range of interest for most users. It has a reduced resolution from 13% down to 10% and does not read below 10%. Such levels are relatively dry and only of interest to some timber processors. The values above 40% are very wet, are not specified in the AS/NZS 1080 Standard and are only an indication of the approximate moisture content. The ambient temperature is taken from a sensor inside the meter which may differ from the temperature of the timber. A version of the meter with an external temperature sensor is available and will overcome this difficulty.

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## **C400 DIGITAL TIMBER MOISTURE METER**

An affordable digital resistance type moisture meter suitable for timber handlers, inspectors, tradesmen and home owners.

This instrument is simple to use and is also capable of correcting readings for temperature and common NZ building timbers.

The C400 meters measure the moisture content of timber using the electrical resistance method specified in the AS/NZS 1080 Standard.



**Part No. C400-S/34 474**



**Part No. C400-P/34 472**

### **Features**

Calibrated to AS/NZS 1080 Standard (traceable)

Range: 10% to 100% moisture content

Optimum accuracy from 13% to 40% moisture content

Compact size: 130 x 67 x 25mm, weight 160gm

Sealed water resistant case

Long battery life on low cost 9V battery

Low battery indicator

Ambient temperature measurement on built in sensor

Automatic temperature correction of reading (selectable)

Correction scales for Standard, untreated Radiata Pine, NZ H1 & H3 treated Radiata Pine

Supplied with either:

Built in 18mm pin electrodes model C400-P

or

BNC connector for external slide hammer electrode model C400-S

Adaptor available to use pinned meter with slide hammer

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The C400 moisture meters are initially set on the default settings which are:

No buzzer, no temperature correction and the standard scale (AS/NZS 1080 Standard Relationship).

These settings can be changed on a four way DIP switch located in the battery compartment (see below).

The C400-S is supplied with a BNC connector suitable for use with the CSH102 slide hammer electrode and has a battery fitted and is ready to use.

The C400-P is supplied with the electrode pins and battery already fitted and is ready to use.

### Taking readings

**C400-S** Attach the slide hammer electrode unit and insert the pins into the sample. Hold down the button in the middle of the meter. The meter will briefly show the temperature, then display the moisture content in %. If the reading is below 10% (very dry timber) the display will flash "0.0". If the reading is more than 100% the display will flash "100.0". When the button is released the display will hold the reading for 5 seconds. To display the temperature give a very short press on the button.

**C400-P** Carefully insert the tips of the electrode pins into the sample and hold down the button. The meter will briefly show the temperature, then display the moisture content in %. If the reading is below 10% (very dry timber) the display will flash "0.0". If the reading is more than 100% the display will flash "100.0". When the button is released the display will hold the reading for 5 seconds. To display the temperature give a very short press on the button. Please note that excessive force on the pins will damage the meter and that such damage is not covered by our warranty. If you wish to take deeper readings into the sample you must use a slide hammer electrode such as the CSH102 with this meter. For this purpose a version of the meter is available fitted with a BNC connector instead of the pins. If both pins and slide hammer are required then an adapter is available.

### Battery

The meter uses a common PP3 (6F22) type 9V battery. The meter automatically senses the battery voltage during a reading. If the battery needs replacing a message "Lo-b" will flash. Open the battery compartment by unscrewing two (flat head) screws on the cover.

### Settings

The optional functions are selected using the switches in the battery compartment. The function is selected by pushing the relevant switch forward.

Switch 1: Buzzer If the reading exceeds 20% the buzzer will sound, for use where the display is not visible.

Switch 2: Temperature correction The reading is automatically corrected for the difference of ambient temperature from 20°C. The display will flash "t" on the LH side.

Switch 3: Pine correction The reading is automatically corrected for untreated Radiata pine. The display will briefly show "PinE" at the start of the reading.

Switch 4: H1/H3 correction The reading is automatically corrected for H1 and H3 treated timber. The display will briefly show "H1H3" at the start of the reading.

Note Switch 3 over-rides Switch 4. If both are up then untreated Radiata is selected.

### Precautions

The meter will not work correctly if it is in a dirty or damp state. It should not be left in the kiln or outside nor be exposed to liquids or chemicals. This meter is specifically designed to work well in the range 13% to 40% moisture which is the range of interest for most users. It has a reduced resolution from 13% down to 10% and does not read below 10%. Such levels are very dry and only of interest to some timber processors. The values above 40% are very wet, are not specified in the AS/NZS 1080 Standard and are only an indication of the approximate moisture content. The ambient temperature is taken from a sensor inside the meter which may differ from the temperature of the timber. A version of the meter with an external temperature sensor is available and will overcome this difficulty.

MJH

## THE WOOD TESTER

### A SIMPLE TESTER FOR DETECTING MOISTURE IN FIREWOOD



**Part No. Wood Tester/34 469**

Everyone knows that wet firewood is difficult to light and once alight does not burn cleanly or efficiently. Even wood which appears dry can often still contain large amounts of water.

The WoodTester is a hand-held moisture tester which uses the well-proved measurement of electrical resistance to determine the presence of excessive moisture in firewood.

Measurements are based on the AS/NZS1080 Standard for timber moisture measurement.

### HOW DOES IT WORK?

The electrical resistance of wood depends on the amount of moisture present. The WoodTester has two pins which are inserted into the piece of wood. The electrical resistance between these pins forms part of an electric circuit and can be measured. The percentage of moisture in the wood can be interpreted from this resistance reading. The circuit decides whether the resistance is lower than, between or higher than certain values and lights one of three LED lamps.

### USING THE WOODTESTER

Gently push the pins into the sample and press the button. One of the LEDs will light up. If the green LED lights then the sample is definitely dry with a moisture content below 20% and can be assumed to burn cleanly and efficiently. If the red LED lights then the sample is above 24% moisture content and will not burn well and give off excessive smoke and soot. If the yellow LED lights then the moisture content of the firewood lies between 20 and 24% and it should be stored until it drops below 20% however it can still be burnt if so required. If no LEDs or more than one LED light up then the battery probably needs replacing. Do this by undoing the two screws on the back of the case, carefully opening the case and replacing the 9V battery.

### PRECAUTIONS

Keep the unit clean and dry and protect from physical damage. Do not use excessive force or twisting on the pins. The pins are sharp and will easily enter the end grain of most woods sufficiently far enough to take a reading. They are also sharp enough to enter human skin and implant nasty bacteria picked up from the firewood so take care. The WoodTester is setup for untreated pinewood and may respond slightly differently on other types of wood. In general harder woods such as teatree or dense types of gumtree may appear a few percent wetter than they actually are. It is also set to operate at a nominal temperature of 20 deg C so very cold wood can appear dryer than it actually is. However in general if the green light shows the wood is dry enough to burn.

## THE DAMP TESTER

### A COMPACT SIMPLE TESTER FOR DETECTING MOISTURE IN WOOD, WALLBOARD OR PLASTER



Part No. Damp Tester/34 468

The DampTester is a hand-held moisture tester using the well-proved principle of electrical resistance to determine the presence of moisture in wood and other building materials. Measurements in wood are based on the AS/NZS1080 Standard. The DampTester enables users to rapidly test building framing before cladding is applied thereby avoiding problems at a later stage. It is equally useful for detecting the presence of leaks in completed buildings thus allowing corrective action before permanent damage occurs.

### HOW DOES IT WORK?

The electrical resistance of materials such as wood depends on the amount of moisture present. The DampTester has two pins which are inserted into the sample. The electrical resistance between these pins now forms part of an electric circuit and can be measured. Using a accepted standard the moisture content of timber can be interpreted from this resistance reading. The circuit decides whether the resistance is lower than, between or higher than certain values and lights one of three LED lamps.

### USING THE DAMPTESTER

Gently insert the pins into the sample until good contact is achieved. Press the button. One of the LEDs will light up. If the green LED lights then the sample is presumed dry at below 16% moisture content. At this level rot will not occur and cladding can be applied without the danger of shrinkage occurring. If the red LED lights then the sample is above 20% moisture content and is likely to be unstable and may rot if it is kept in this state. If the yellow LED lights then the moisture content lies between 16 and 20% and caution should be exercised. If no LEDs or more than one LED light up then the battery probably needs replacing. Do this by undoing the two screws on the back of the case, carefully opening the case and replacing the 9V battery.

### PRECAUTIONS

Keep the unit clean, dry and safe from physical damage. Using excessive force or a twisting motion is likely to break the pins. The DampTester is designed to be used on the surface of lightly treated pine timber and may respond differently on other timbers or materials. Heavily treated pine or hardwoods may appear a few percent wetter than they actually are. The nominal temperature of use is 20 deg C. It will read 1% wetter for every 5 deg above 20 deg C and 1% dryer for every 5 deg below 20 deg C. Recently wetted or dried timber may have an internal moisture content different from that measured on the surface by the DampTester. If in doubt employ a calibrated moisture meter with sliding hammer electrode and correct it for timber type and temperature.

## C&C TIMBER MOISTURE METER ACCESSORIES



**Part No. CH102/34 447**

### Sliding Hammer Electrode

Fitted with 60mm hardened steel needle probes with insulated shafts for taking gradient readings through a section of timber to a depth of 45mm.

Optional 45mm insulated needle probes will measure to a depth of 30mm

**Dimensions** 315mm long x 45mm dia.

**Weight** 1.5kg



**Part No. Test Card/34 455**

### Calibration Test Card

For checking resistance type timber moisture meter calibration.

Simply place the electrode needles or blades across the test pads and compare the readings with those shown on the card.

**Calibration Reference:** AS/NZS 1080.1:1997

**Dimensions** 76 x 57 x 10mm

**Weight** 55g



### Spare Parts

**Part No. 34 452** - Spare insulated steel needle probes for CSH102(60mm long)

**Part No. 34 453** - Spare insulated steel needle probes for CSH102(45mm long)

**Part No. 34 451** - Spare steel needle probes for C901

**Part No. 72409001** - Carry bag to suit C400, C901, C301 meters



## How To Test With A Moisture Meter

1. Identify the species, whether the wood is heartwood or sapwood, and whether it is treated or untreated.
2. Ensure meter is ready to use according to the manufacturer's instructions.
3. Test a representative range of boards on both faces with most readings at least 0.5 m from the ends. With a resistance-type meter the average moisture content is measured by inserting electrodes to 1/3 the depth of the board. For gradients, take readings at 1/6, 1/3 and 1/2 depth. Capacitance-type meters cannot assess moisture gradients.
4. Correct for temperature.
5. Correct for species or species/preservative .
6. Interpret readings by other tests to check on gradient effects, particularly in thicker timber.

## Factors Affecting Resistance Type Meter Readings

- a) Species: The relationships of resistance to moisture content are different for individual species so meter readings must be corrected for species.
- b) Resins and other wood extractives: In some species, such as rimu, the presence of large quantities of extractives in heartwood necessitates separate correction figures for heartwood and sapwood.
- c) Moisture gradient: Moisture content throughout the cross section of a board is rarely uniform; there is either a "normal" drying gradient with the surface drier than the centre, or a reverse gradient that arises when dry timber becomes re-wetted. Moisture gradients are a common cause of inaccuracy in meter readings, and although their effects must be taken into account, it is not possible to lay down exact correction figures for them.
- d) Temperature: Moisture meters are generally calibrated at 20°C. For greatest accuracy, freshly kiln-dried timber should be allowed to cool before testing. A general rule for temperature correction where the wood temperature is not at 20°C.

For every 5°C above 20°C subtract 1 from the meter reading before applying species corrections, and add a similar amount for every 5°C below. This correction is appropriate at temperatures up to approximately 70°C but is incorrect at higher temperatures.

- e) Presence of preservatives: Water-borne preservatives lower the electrical resistance of the wood, causing the meter to read higher for treated timber than for untreated timber of the same true moisture content. The extent of this effect depends upon the type and amount of preservative present. Fixation of the preservative in the wood, as occurs with copper-chrome-arsenate formulations, renders tin preservative insoluble and thereby reduces its effect or resistance. Only preservatives such as creosote cause the meter to read low.

***The above is abridged content from the FRI Bulletin No. 200***



