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CETANZ

Civil Engineering Testing Association of New Zealand

Issue 30, June 2017

The official newsletter of the Civil Engineering Testing association of NZ

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In this issue...

From the Chair...

Welcome to the autumn edition of CETANewZ.

'Summer', which I have on good authority lasted for approximately 27 minutes in Wellington this year, has had a detrimental effect the progress of many large scale projects with heavy rain being common place. The rest of the country has fared marginally better and ironically when Bay of Plenty was getting flooded I was getting sunburnt on the peaks of Fiordland – a place that has an annual rainfall of around seven metres!

Despite the bad and unusual weather, statistics show people still want to live here and immigration is at a high. As a result, the infrastructure projects to cope with the influx of people to our beautiful country are continuing to be rolled out. The Hon. Simon Bridges made a good point when at our last conference he said it was hard for him to get a headline for a 100 million dollar project anymore! This really shows the scale of some of the work that is now being let.

In the natural disaster sector, the combined quake recovery team NCTIR in Kaikoura are soldiering ahead with the mammoth task of reconstructing and opening the SH1 coastal route again. Edgecumbe which has suffered from devastating flooding will be in need of testing and engineering services to help them get back on their feet .

At the full CETANZ committee meeting in March Steven Anderson was elected the new Vice Chair to replace the void that Curwin Boltman left with his move to Australia. Steven is the Regional Manager North for Geotechnics, is a founding and life member of CETANZ and has been in the industry for approximately 30 years. Steven is a very approachable guy and has a wealth of knowledge to offer our association so please join me in welcoming Steven into his new role.

From the Chair cont…

On another note, there have recently been some changes for those of us who use Nuclear Density Meters with some more in the pipeline. This is a reminder that Code of Safe Practice CSP15 Use of Nuclear Density Meters is being updated and will be out for review in June. As always CETANZ will ensure we review this document and put together comments of behalf of CETANZ for submission.

The Careers & events group (C&E) met have plans under way for the 10 year celebration functions and once venues and dates have been confirmed, invites will be sent. We are still looking at August dates for this. C&E are also developing a set of guide lines for the use of our logo alongside your company's logo in email signatures and your marketing and promotional material. Once finalised this will be mailed out to our members. The 'Technical Group' welcome Nataliya Agarkova to the group. Nataliya is from Envirolab Geotest who are the testing laboratory of BECA. We look forward to having another member from an engineering consultancy lab join the team. Proficiency testing is continuing to be organised with Stevenson's Lab once again leading the pack in the volunteering their lab for this. It will be interesting to see how the look into the Vibe Hammer progresses over the coming months which I am sure we will have an update on in the next issue.
Stay Safe!
Regards
Danny

GEOTECHNICS

We are RECRUITING NOW for a Technical Sales Co-ordinator

An Auckland based opportunity has arisen for an outgoing Technical Sales Coordinator on a permanent full time basis. A busy role, you will work closely with the team in a fast moving and loud office environment. Geotechnics Ltd is a specialist company, providing Services to the manufacturing, civil and environmental engineering industries. We provide a friendly and professional environment for quality skilled people who focus on delivering first class, efficient solutions to our clients.

About you:
You will need to have loads of initiative and be extremely motivated to get the job done with high efficiency and accuracy. You will be an outgoing person with exceptional written and verbal communication skills and enjoy working in a fast paced and noisy team.
You will need to have a hands on approach and be able to apply logic to anything thrown at you. You must have excellent telephone skills, great attention to detail, be computer literate and a super-fast learner.
To be successful in this fantastic opportunity you will have a positive attitude and be keen to get involved with any work that is happening in the team. Full on the job training will be provided

Your duties and responsibilities will include:

- Quality control of the ISO Quality Management system and improving processes where required
- Communicating effectively in both verbal and written formats
- Assist with checking orders and making sure they are despatched on time
- Overseeing quarterly stocktakes
- Assist with general administrative tasks, including running reports
- The ability to work under pressure and multi task
- Backup Forklift operator (Training will be provided)
- Assisting with Product development where required

About us:
Geotechnics believe we spend too much time at work to not love your job and the environment you are working in. We have a great reputation within the market place which is created and maintained through our belief in our core values of Health & Safety, Innovation, Empowerment, Knowledge & learning, Honesty & Respect , Fun & work life balance.
We go out of our way to provide an excellent customer experience at every step of the journey and offer our team a highly professional yet fun environment to work in.

To submit your application for this role, follow this link to seek.co.nz and apply online

https://www.seek.co.nz/job/33461048?type=standout&userqueryid=7d49b96928056b45532406ff2214da1f-3792581

AS/NZS Test Methods For Asphalt & Bituminous Binder Testing

Historically, New Zealand based asphalt & bituminous binder testing laboratories have tended to use test methods developed in other countries, due to absence of NZ standard test methods for this purpose. These alternatives have primarily been American Society for Testing and Materials (ASTM), British Standards (BS) or Australian Standards (AS).

In recent years, work has been done to form joint standards with Australia, and we now have a suite of national standards applying to asphaltic and bituminous products used in the civil engineering industry. These are designated as AS/NZS standards.

The regulatory bodies and consultancies seem to be slow to pick up this, but it is pertinent that laboratories consider transitioning to our new national standards instead of ASTM or BS methods.

The CETANZ Technical group believes that it is in the members best interest to promote these standards and for laboratories to consolidate their scopes and use the same processes. This transition should occur as soon as practicable.

It is therefore pertinent that CETANZ should engage with the likes of NZTA and relevant consultancies to ensure these standards are included in specification documents and contract documents. This awareness raising process is underway.

Primarily, these methodologies are very similar to ASTM / BS counterparts and would require minor adaptions, if any, for laboratories to comply.

At the time of writing the current range of AS / NZS standards relating to asphaltic or bituminous civil engineering materials are:

Asphalt Test Methods

AS/NZS 2891.1.1:2013—Methods of sampling and testing asphalt - Sampling - Loose asphalt

AS/NZS 2891.10:2015—Methods of sampling and testing asphalt - Moisture content of asphalt

AS/NZS 2891.11:2014—Methods of sampling and testing asphalt - Degree of particle coating

AS/NZS 2891.13.1:2013—Methods of sampling and testing asphalt - Determination of the resilient modulus of asphalt - Indirect tensile method

AS/NZS 2891.14.1.1:2013—Methods of sampling and testing asphalt - Field density tests - Determination of field density of compacted asphalt using a nuclear surface moisture-density gauge - Direct transmission mode

AS/NZS 2891.14.1.2:2013—Methods of sampling and testing asphalt - Field density tests - Determination of field density of compacted asphalt using a nuclear surface moisture-density gauge - Backscatter mode

AS/NZS 2891.14.2:2013—Methods of sampling and testing asphalt - Field density tests - Determination of field density of compacted asphalt using a nuclear thin-layer density gauge

AS/NZS 2891.14.2:2013/Amdt 1:2016—Methods of sampling and testing asphalt - Field density tests - Determination of field density of compacted asphalt using a nuclear thin-layer density gauge

Continued from page 4

AS/NZS 2891.14.4:2013—Methods of sampling and testing asphalt - Field density tests - Calibration of nuclear surface moisture-density gauge - Backscatter mode

AS/NZS 2891.14.5:2014—Methods of sampling and testing asphalt - Field density tests - Density ratio and percentage air voids of compacted asphalt

AS/NZS 2891.2.1:2014—Methods of sampling and testing asphalt - Sample preparation - Mixing, quartering and conditioning of asphalt in the laboratory

AS/NZS 2891.2.2:2014—Methods of sampling and testing asphalt - Sample preparation - Compaction of asphalt test specimens using a gyratory compactor

AS/NZS 2891.3.1:2013—Methods of sampling and testing asphalt - Binder content and aggregate grading - Reflux method

AS/NZS 2891.3.2:2013—Methods of sampling and testing asphalt - Binder content and aggregate grading - Centrifugal extraction method

AS/NZS 2891.3.3:2013—Methods of sampling and testing asphalt - Binder content and aggregate grading - Pressure filter method

AS/NZS 2891.5:2015—Methods of sampling and testing asphalt - Compaction of asphalt by Marshall method and determination of stability and flow - Marshall procedure

AS/NZS 2891.7.1:2015—Methods of sampling and testing asphalt - Determination of maximum density of asphalt - Water displacement method

AS/NZS 2891.7.3:2014—Methods of sampling and testing asphalt - Determination of maximum density of asphalt - Methylated spirits displacement

AS/NZS 2891.8:2014—Methods of sampling and testing asphalt - Voids and volumetric properties of compacted asphalt mixes

AS/NZS 2891.9.1:2014—Methods of sampling and testing asphalt - Determination of bulk density of compacted asphalt - Waxing procedure

AS/NZS 2891.9.2:2014—Methods of sampling and testing asphalt - Determination of bulk density of compacted asphalt - Presaturation method

AS/NZS 2891.9.3:2014—Methods of sampling and testing asphalt - Determination of bulk density of compacted asphalt - Mensuration method

Bituminous Binder Methods

AS/NZS 2341.0:2002—Methods of testing bitumen and related roadmaking products - General introduction and list of standards

AS/NZS 2341.1:1994—Methods of testing bitumen and related roadmaking products - Precision data - Definitions

AS/NZS 2341.10:2015—Methods of testing bitumen and related roadmaking products - Determination of the effect of heat and air on a moving film of bitumen (rolling thin film oven (RTFO) test)

AS/NZS 2341.13:1997 (R2013) - Methods of testing bitumen and related roadmaking products - Long-term exposure to heat and air

Continued from page 5

AS/NZS 2341.2:2015—Methods of testing bitumen and related roadmaking products - Determination of dynamic viscosity by vacuum capillary viscometer

AS/NZS 2341.20:2016—Methods of testing bitumen and related roadmaking products - Determination of sieve residue for bituminous materials

AS/NZS 2341.21:2015—Methods of testing bitumen and related roadmaking products - Sample preparation

AS/NZS 2341.22:1996 (R2013) - Methods of testing bitumen and related roadmaking products - Determination of particle charge

AS/NZS 2341.23:2002 (R2013) - Methods of testing bitumen and related roadmaking products - Determination of residue from evaporation

AS/NZS 2341.24:1996 (R2013) - Methods of testing bitumen and related roadmaking products - Calculation of non-aqueous volatiles content (by difference)

AS/NZS 2341.26:2002—Methods of testing bitumen and related roadmaking products - Determination of sieve residue

AS/NZS 2341.27:2008—Methods of testing bitumen and related roadmaking products - Determination of sedimentation

AS/NZS 2341.30:1996 (R2013) - Methods of testing bitumen and related roadmaking products - Recovery of residue from bituminous emulsion

AS/NZS 2341.4:2015—Methods of testing bitumen and related roadmaking products - Determination of dynamic viscosity by rotational viscometer

AS/NZS 2341.5:1997 (R2013) - Methods of testing bitumen and related roadmaking products - Determination of apparent viscosity by 'Shell' sliding plate micro-viscometer

AS/NZS 2341.8:2016—Methods of testing bitumen and related roadmaking products - Determination of matter insoluble in toluene

Article thanks to Blair Trousselot
Snr Systems Analyst
Fulton Hogan, Christchurch

Safety Alert

A recent incident occurred whereby a Laboratory Technician suffered minor injury when the handle of a standard compaction hammer came off and struck his face whilst performing a test.

An investigation was carried out and the findings where whilst a more sturdy screw to attach the handle to the hammer may improve design, the main factor in preventing further such incidents is to include such testing equipment in routine maintenance schedules and carry out preventative maintenance such as annual replacement of screws . Maintenance schedules should be designed on a case by case basis suitable for the equipment in question.

Cartoon taken from cartoonsmix.com

Caption Competition

Photo thanks to Alex Beijen from Landtest

Send your favourite caption to info@cetanz.org.nz . The winner can choose a $50 gift voucher of their choice from Farmers, Pak n Save, Hunting & Fishing or iTunes.

Please submit your entries by 31 July 2017. Judges decision is final.

Good luck!!

A New Range of Field & Laboratory Products for Materials Testing

InstroTek, Inc., celebrating its 20th Anniversary in 2017, continues to lead the industry through new product innovation and design. "Our asphalt product testing line grows each and every year with the development and release equipment designed around industry needs, resulting in more comparable results and elevated time savings for contractors and Government agencies," says Matt Wheatley – Export Sales Manager at InstroTek.

In 2016, InstroTek released the AutoRice furthering our commitment to our innovative vision. AutoRice is an automatic control unit for your Maximum Gravity Test which ensures one of the most important tests in the QC lab is performed exactly to standard, every time. AutoRice controls all functions of the test with a push of a button and requires no technician monitoring.

InstroTek was the first company in the industry to introduce vacuum drying of asphalt cores. The CoreDry® quickly became one of InstroTek's flagship products and now the name is synonymous with asphalt core drying. For over 10 years, the CoreDry has been helping contractors and agencies achieve quick drying of asphalt cores, usually in less than 15 minutes. Users agree it is one of the most utilized pieces of equipment in the asphalt lab.

If the CoreDry is InstroTek's flagship product, the CoreLok® is not far behind. First released in 1998, the CoreLok addressed deficiencies of traditional bulk gravity tests. The CoreLok uses a polymer bag to seal asphalt specimens prior to water submersion keeping cores dry and unharmed. Soon after its release, InstroTek introduced the maximum specific gravity, aggregate specific gravity, and porosity tests making the CoreLok one of the most versatile pieces of equipment in the asphalt lab.

InstroTek was also the first nuclear gauge manufacturer to adhere to ISO 17025. "With the popularity of InstroTek's 3500 nuclear gauge, we wanted to give our customers the confidence that all nuclear gauge equipment was calibrated to the highest quality standards," explains Mr. Wheatley. In 2008, InstroTek purchased Campbell Pacific Nuclear (CPN) and alongside its engineers developed the CPN MC Elite Series which was released in 2013. Keeping true to the CPN brand, both MC1 & MC3 Elite gauges are highly advanced featuring a large crisp LCD, backlit display and keypad, 9V alkaline battery back-up and USB port.

InstroTek has recently partnered with The Measurement & Calibration Centre (MCC) in Auckland, www.themcc.co.nz through this valuable partnership, InstroTek products and services are now readily available to a growing client base in New Zealand.

MCC can be contacted by phoning 0800 CALIBRATE or by emailing enquiries@themcc.co.nz. Tara, Tim, Brigitte, and Allan are there to help with your queries.

The Measurement & Calibration Centre

InstroTek® Inc.

From the working groups …..

Technical Group

Nataliya Agarkova from Beca has been co-opted on to the Technical Group.

The proficiency program is as per the table below. Members should have just received a new notification regarding the NZS 4407 Cleanness Value proficiency. Those wanting to take part will need to complete the return form and send it in. There are limited spare samples for those wanting to carry out duplicate testing for UoM, but the numbers need to be confirmed as the first priority is to ensure all participants have at least one sample to start with.

The Wet & Dry Strength proficiency samples are due to be dispatched to participants soon.

Category	Test	Volunteer Laboratories
Aggregate	D&A NZS 3111	OPUS – **2017**
Aggregate	Wet/Dry AS	Fulton Hogan Auk - **2017**
Aggregate	Cleanness Value 4407	Road Science Auckland - **2017**
Asphalt	**Binder Content & Grading**	**Fulton Hogan - 2017**
Aggregate	**Sampling / Grading (North Island)**	**Stevenson - 2017**
Field	**NDM (North Island)**	**Stevenson - 2017**
Concrete	**Compression & Density Tests**	**Stevenson – 2017**
Bitumen	**????**	**2017?**
Asphalt	**????**	**2017?**

If you are wanting to get involved there is funding available for those that want to volunteer their Laboratory as a potential organiser. Please contact CETANZ info@cetanz.org.nz

The NZ Vibrating Hammer proposed research/study is now underway and we will update you on activities and findings when information comes to hand.

Research into the possible replacement of the PSV control stone is competed and NZTA have called a meeting in June to discuss the research findings with stake holders. As part of the discussions the group will also be discussing proposed changes to M/6 specification.

Recent preliminary results from the NZS 3111 density & Absorption proficiency highlighted the need for a "best Practice" guideline for the preparation and assessment of SSD for this test method. The Technical Group will be looking to add this to the work program over the coming months.

The Technical Group is investigating the option of adopting AS Soil testing standards or converting these to Joint AS/NZS standards as a means of replacement of the old NZS 4402.

Working Group Update Cont…..

Technical Group Cont...

CETANZ Technical Guides are being worked on. Keep an eye out for an update of TG3 : Use of NDM's Guide on the CETANZ website. With the updated NZS 4407 standard, the guide needed to be reviewed.

The Technical Group has also produced a new Guide, TG5 : Using Significant Figures in Spreadsheets. Both Guides are available on the CETANZ Website.

Careers & Events (C&E)

We currently have a membership of 146 people and C&E are looking at ways to retain and add value to membership through :

more events in non conference years such as the networking event and tour at Isaacs in Christchurch
Get member base more involved and offer prizes for competitions in the CETANewZ
Increasing discussions on topical issues on LinkedIn to provide more technical assistance
10 year celebrations

The main focus in the next month will be the 10 year celebrations and then the 2018 conference planning will need to start.

If you would like to be involved or have any ideas on how we can add value to you as a member please contact us at info@cetanz.org.nz

CPT Group

The third meeting of the CPT Group is to be held on 1st June 2017.

The meeting will be primarily focused on discussion around the CPT audit document with the intention to agree on the format of this document, discuss who would do the auditing and set a timeframe for audits to be undertaken.

Electronic Upgrade of a Standard Benkelman Beam to Enable Capture of Full Bowl Deflections.

F R Greenslade New Zealand Transport Agency (NZTA), CAPTIF Road Research Centre, 2 McLeans Island Road, Christchurch, New Zealand.

Abstract
The New Zealand Transport Agency (NZTA) decided it should revisit the design of electronic instrumentation that could be attached to standard Benkelman Beams to measure surface deflection. This has been attempted several times in the past but resulting devices were often complex and expensive. A low cost solution would encourage uptake by pavement construction companies that have easy access to the Benkelman Beam apparatus. Information gathered from the Benkelman Beam has been restricted to a few data points that must be read by an operator from a dial gauge and recorded manually. This requires some degree of skill and is prone to subjectivity. By upgrading existing Benkelman Beams with electronic measurement sensors and data recording equipment then full deflection bowl data could be acquired with improved reliability. The Benkelman Beam test requires two measurements to be taken, pavement deflection and distance from the loading vehicle. A suitable deflection sensor was chosen. The criteria for choosing a distance sensor was that there would be no mechanical connection to the loading vehicle. A laser sensor was found with a suitable range and resolution. A low cost data acquisition module with software was successfully developed. The completed kit can be built for under $2000USD in parts. This is a fraction of the cost of purpose built electronic beams .The whole test can be completed by one operator.
Keywords; Benkelman Beam, NZTA, Pavement Deflection Bowl, Electronic Sensors.

1.0 Introduction

The Benkelman Beam was developed at the Western Association of State Highway Organizations (WASHO) Road Test in 1952. It is a simple device that is used to measure the rebound deflection of a flexible pavement. The Benkelman Beam is used with a loaded truck - typically on a single axle (8.2 tonne) with dual tyres inflated to give a surface contact area of 0.048m^2. Measurement is made by placing the tip of the beam between the dual tyres and measuring the pavement surface rebound as the truck is moved away.
The standard Benkelman Beam is supplied with a mechanical Dial Gauge which is suitable for measuring peak deflections but not easily used for measuring deflection bowls. The advantage of a full deflection bowl is that the shape of the bowl can be analysed. Generally, broad bowls indicate that upper layers are stiff with respect to deeper layers. Narrower bowls indicate weak upper layers relative to the sub-grade (Tonkin and Taylor 1998).

NZTA's CAPTIF Road Research Centre investigated various methods of improving the instrumentation used with the Benkelman Beam in order to capture full deflection bowls accurately and easily. The aim of the investigation was to find suitable components that could be easily added to existing in-service Benkelman Beams. This paper describes instrumentation developed at CAPTIF which has proven to be accurate and reliable.

2.0 Method

The method consists of replacing the mechanical Dial Gauge with an electronic displacement sensor (LDS 05). This sensor provides a dc voltage output with pavement deflection. This voltage is amplified with an electronic op-amp circuit. The truck movement is measured with a laser range sensor (DT35). The laser sensor outputs a voltage with distance measured to a reflector on the truck. The signal from each of these sensors is fed into a Data Acquisition module (NI-USB6008). The data acquisition module is read via a USB port on a Windows computer running a NI-Labview software program.

2.0 Equipment

2.1 Displacement Transducer

The displacement transducer chosen was a model LDS-05 manufactured by L D Sensors Ltd. (UK). It has a range of 5mm. When attached to the beam (fig. 1) it will measure a pavement rebound range of 10mm due to the 2:1 leverage afforded by the beam setup. This sensor is a full bridge type sensor and was chosen for its linearity, low noise and ease of integration to the NI-USB6008.

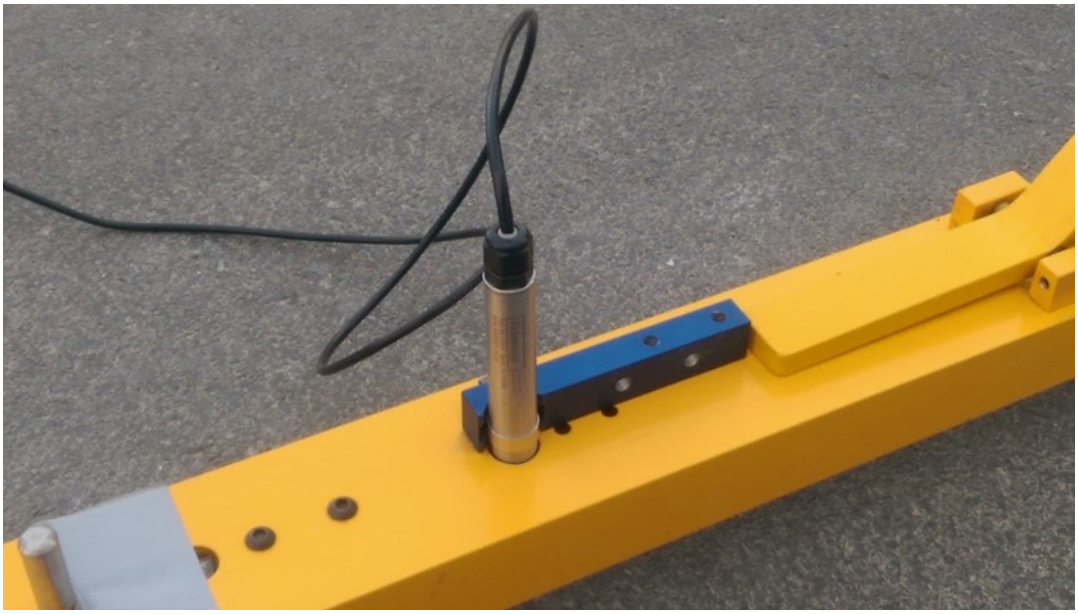

Figure 1: LDS-05 mounted on Benkelman Beam

2.2 Distance Sensor

The distance sensor chosen was a SICK DT35-B15851 manufactured by Sick AG (Germany). This is an infrared laser sensor. It has a range of 12m and an analog output voltage of 0-10Vdc that can be input directly into the NI-USB6008.

A suitable reflector is required to be mounted on the beam truck (fig2.).

2.3 Data Acquisition Module

The NI-USB6008 is a low cost data acquisition module manufactured by National Instruments Corporation.. It communicates via a USB interface. Three analog input channels are used. One for each sensor and one to monitor the power supply to the LDS sensor. Each channel is configured as a differential input channel with a range of 0-10Vdc.

2.4 Signal Conditioning Electronics

The signal from the LDS sensor is amplified using an AD623 instrumentation amplifier (ANALOG DEVICES USA). The gain of the amplifier is set to 67.6 by means of a 1500 Ohm resistor. The LDS sensor is powered from the NI-USB6008 5V supply. The Laser distance sensor is powered from an external 12VDC supply.
The signal conditioning circuit (fig 3) should be constructed by an experienced person with an understanding of electronic circuits. At CAPTIF, a simple circuit board was designed which was integrated into an enclosure with the NI-USB6008. The enclosure included plugs and sockets to allow the sensors, modules and computer to connect to each other. CAPTIF can supply the digital artwork for the printed circuit board.

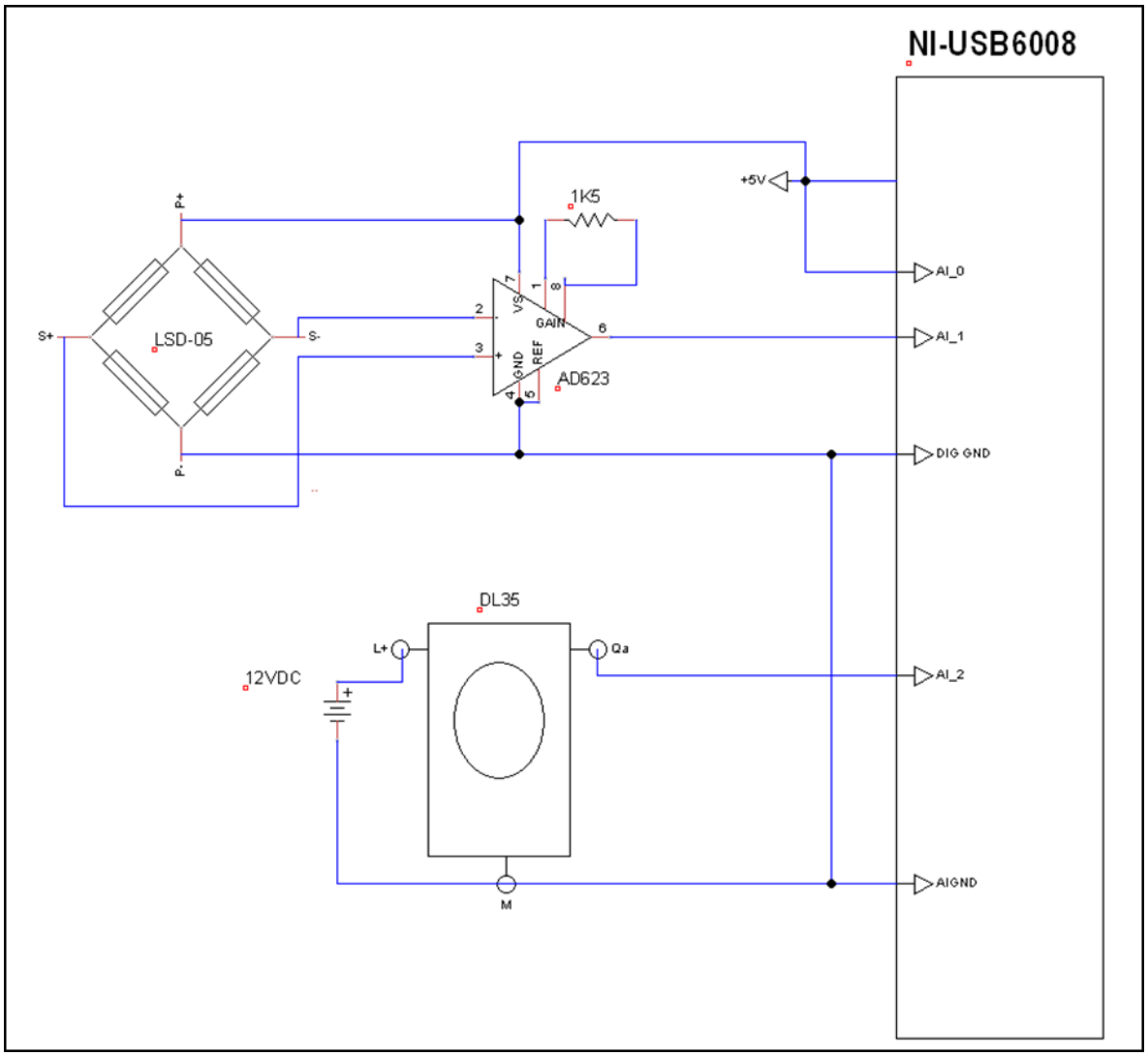

Figure 3: Signal Conditioning Electronics.

2.5 Software

The NI-USB6008 requires the National Instruments driver software NI-DAQ to be installed and setup on the computer. NI-DAQ is available with the purchase of the NI-USB6008. CAPTIF has written a Labview software program to capture and process the data. This software has been compiled as a runtime version and can be installed on any computer running windows. The software is also suitable for running on a touch screen system. The data is recorded as a tab delimited text file (tab1) which can then be loaded into Excel or similar program for further processing.

Table 1: Data file format.

Date:	2-Apr-15
Operator:	Frank Greenslade
Location:	CAPTIF track station 30
Surface temperature C :	13
Max Deflection	0.886
Bowl Corrected	FALSE
Distance (m)	Deflection (mm)
0.0013	-0.1916
0.0113	-0.1995
0.0213	-0.2066
0.0313	-0.2115
0.0413	-0.2136
0.0513	-0.2138
0.0613	-0.2132
0.0713	-0.2124
0.0813	-0.212
0.0913	-0.2118
0.1013	-0.2115
0.1113	-0.2113
0.1213	-0.2116
0.1313	-0.2133
0.1413	-0.2168
0.1513	-0.2217
0.1613	-0.2277
0.1713	-0.2343
0.1813	-0.2409
0.1913	-0.2479
0.2013	-0.256
0.2113	-0.2655
0.2213	-0.277
0.2313	-0.2907
0.2413	-0.306
0.2513	-0.3224
0.2613	-0.339

The runtime software is available for free distribution from NZTA's CAPTIF office. The software has four user interface pages (figs. 4a-4d).

2.5.1 Setup Sensors page

This page is used to set up the sensors. The sensors are monitored live and adjusted to suitable positions. Once the sensors are in position a zero reading is taken.

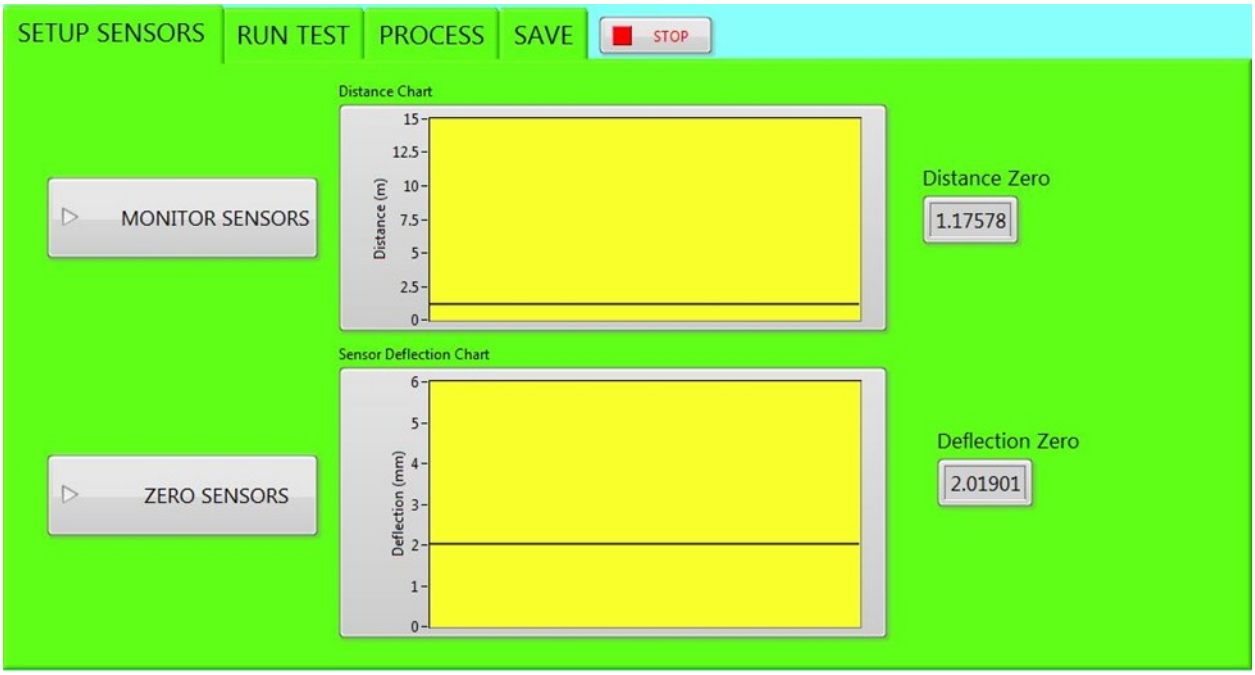

Figure 4a: Benkelman Bowl software 'Setup Sensors' page.

2.5.2 Run Test Page

A stop distance is set then the Run button is pressed. The program acquires data from the deflection and distance sensors until the stop distance is reached.

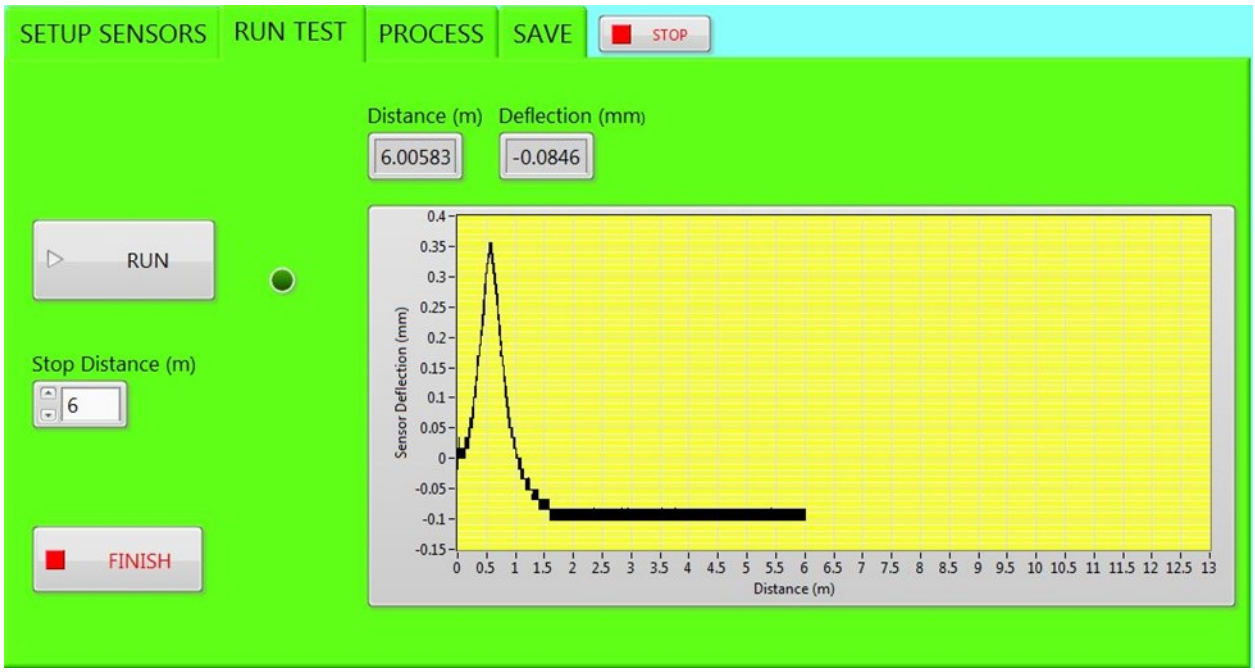

Figure 4b: Benkelman Bowl software 'Run Test' Page

2.5.3 Process Page

Data that has been recorded from the sensors is now processed. The data that has been recorded at fixed time interval of 1000 Samples per second. The data set is the interpolated so that a data point for a fixed distance interval (nom. 10mm) is saved. The interpolated data set can also be filtered using a moving average function. The final metre of data capture is averaged and used as a zero baseline from which the peak deflection is calculated. The 'Bowl Correction' procedure defined in NZTA T/1 (NZTA 2013) is implemented.

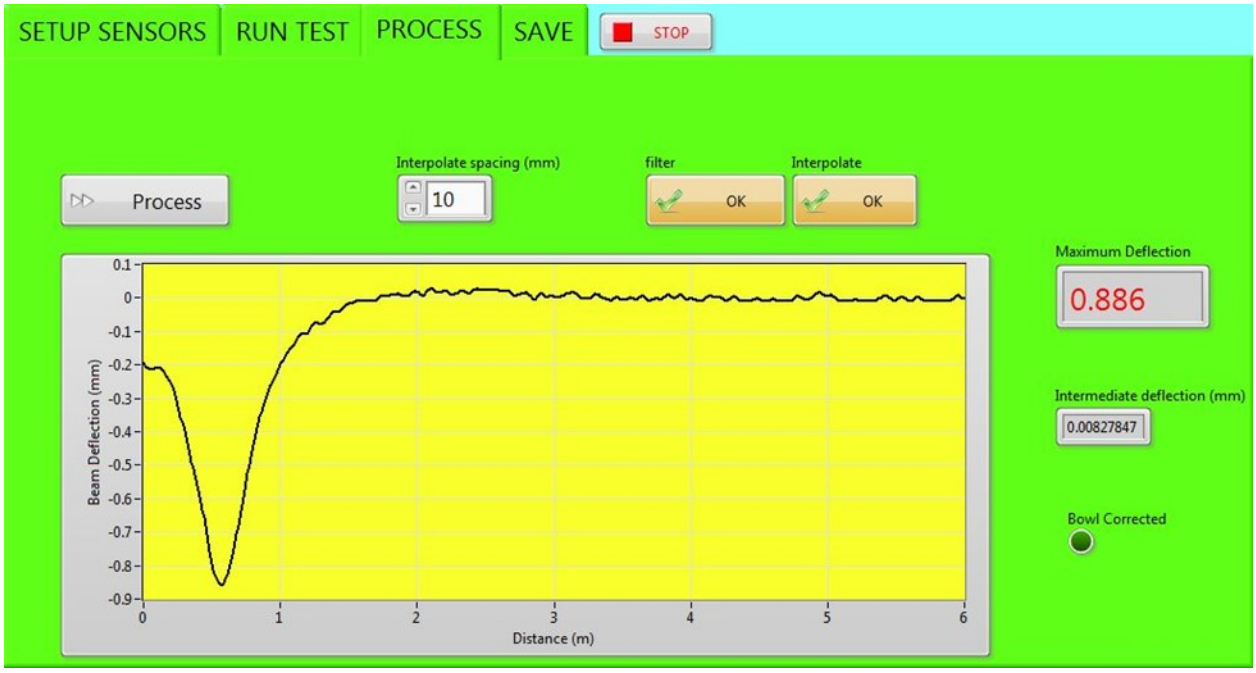

Figure 4c: Benkelman Bowl software 'Process' Page.

2.5.4 Save page

The processed data is now saved. A suitable file name is chosen and any notes can be added here to the file.

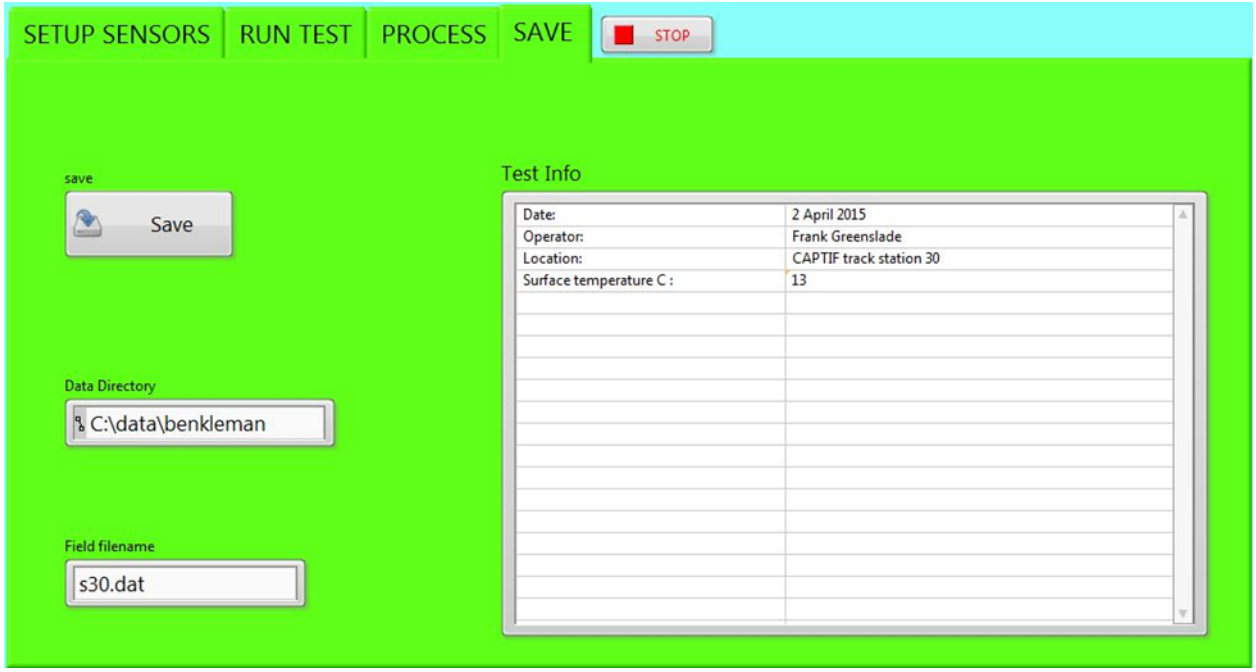

Figure 4d: Benkelman Bowl software 'Save Page'.

2.6 Equipment Parts List and Budget
The equipment, prices and source are tabled below (tab 2).
Table 2: Components.

Part:	NZD (March 2015)	Source
1. LDS-05	535	http://www.ldsensors.co.uk/
2. SICK DT35	720	http://www.sick.com/au
3. NI-USB6008 (OEM)	290	http://nz.ni.com/
4. Signal conditioning and hardware	300	http://nz.rs-online.com

3.0 Equipment Set-Up
The equipment is assembled and connected to the beam and computer (fig 5.)
The beam should be placed between the dual tyres of the truck as far forward of the axles as is practically possible. Normally 300-400 mm is sufficient.
The displacement sensor is set somewhere about mid range. This can be adjusted by looking at the live software graph.
The laser distance sensor is fixed with a tripod or some appropriate type of mounting arrangement so that the sensor is reading a distance of less than 2m from the truck. This will allow approximately 10m of range to be measured. Once each of the sensors is stable a zero position is recorded with the software. The truck is then driven away at a crawl speed. The data is captured until the distance sensor is out of range. The data is then processed and saved.

Figure 5: Sensors, Electronics, Beam and Computer connected.

4.0 Trials
Trials were carried out at CAPTIF with a standard Benkelman truck supplied by a local contractor. Ten consecutive runs were conducted at the same test spot on a section of asphalt driveway (fig 6).

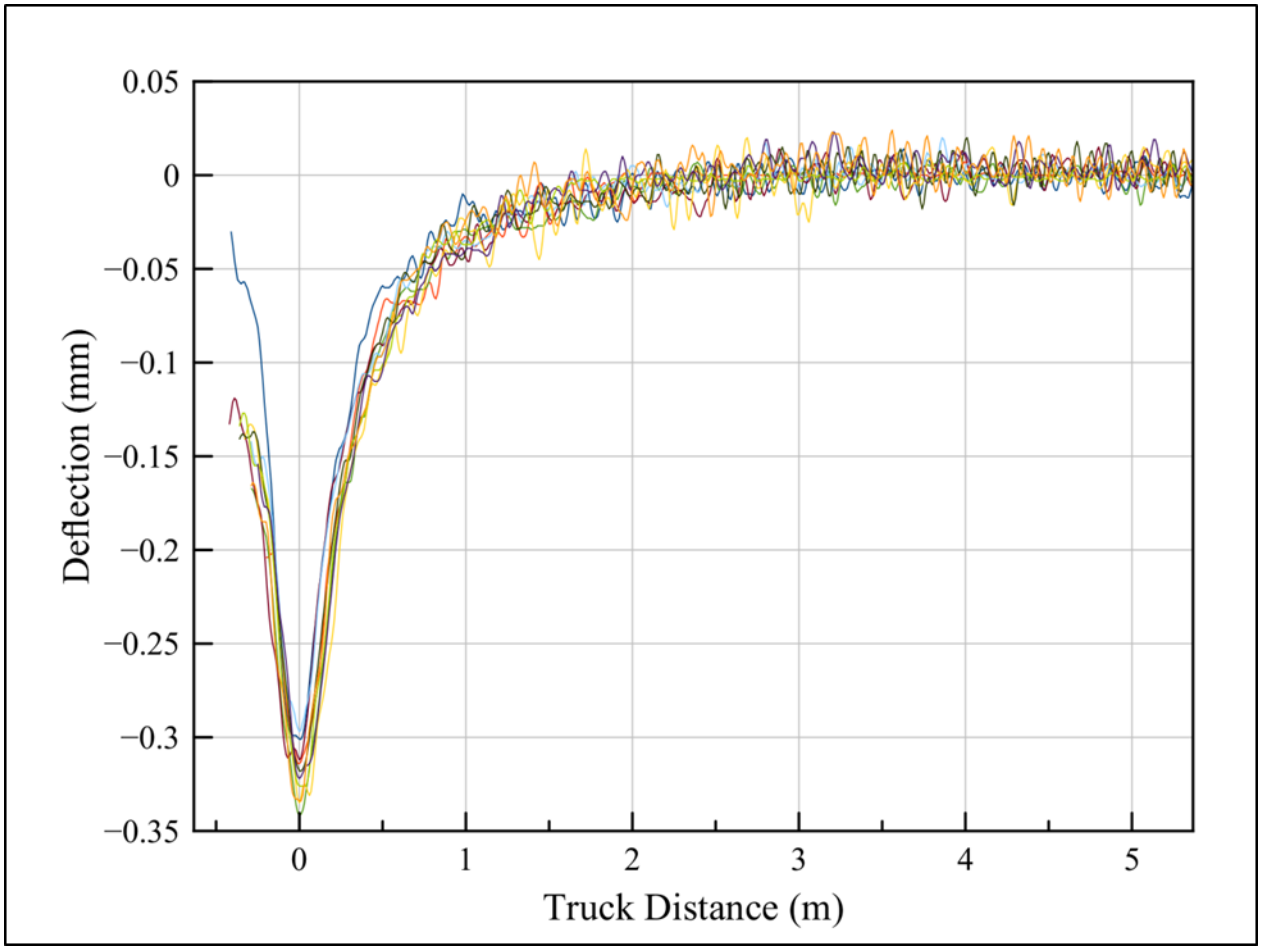

Figure 6: Overlay of 10 Consecutive Deflection Bowls at same Test Point.

All ten runs over the same spot were recorded to a data file. The peak deflections (mm) for each run were processed and compare (tab 3).

Table 3: Peak Deflections from 10 runs over same Test Spot

samples	0.301
	0.314
	0.341
	0.312
	0.297
	0.335
	0.318
	0.326
	0.322
	0.334
Mean	0.320
Standard Deviation	0.015

5.0 Future Enhancements

In order to have a more seamless data set other sensors could be integrated into the hardware and software. A GPS sensor could be attached to the laptop. A temperature sensor could be connected to the Data acquisition module. The software could be modified to read these sensors and the data recorded in the data file. It should be possible to have a remote interface (wireless) that enables the test to be monitored by the truck driver.

6.0 Conclusions

A method has been developed to measure the deflected bowl shape of pavement surfaces using electronic instrumentation that can be added to existing Benkelman Beams. The equipment is relatively in-expensive and will produce accurate reliable data. While the equipment is arguably a bit more time consuming to set up than a standard mechanical beam, this negative attribute is outweighed by ability of a single operator to capture the detail of the full deflection bowl and the removal of dial gauge reading errors.

REFERENCES

NZTA. 2013. *Standard Test Procedure for Benkelman Beam Deflection Measurements.* New Zealand Transport Agency, Wellington New Zealand

Tonkin and Taylor Ltd., 1998. *Pavement Deflection Measurement & Interpretation for the Design of Rehabilitation Treatments.* Road Research Report 117, New Zealand Transport Agency, Wellington New Zealand

A Word From The Editor …..

Once again I would like to do a big shout out to all of you who have contributed to this issue of CETANewZ.

For many, this newsletter is the main contact with CETANZ and keeps you updated on the good work that continues to be done. We therefore put a lot of importance in getting these newsletters out and welcome your feedback and input.

The previous issue saw a competition to rename the newsletter. Thanks to all those who submitted entries and thanks to our judges. After voting the existing name came out the winner so we will be continuing on with CETANewZ.

Queens birthday is fast approaching, our last long weekend for a good few months during the winter long-haul! I wish you all a safe and happy long weekend and look forward to catching up with many of you at our 10 year celebrations which we aim to kick off in August.

Until next time

Brigitte


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