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CETANZ
Civil Engineering Testing Association of New Zealand

CETANewZ

The official newsletter of the Civil Engineering Testing association of NZ

Issue 20, April 2014

In this issue...

"NZTA are looking at making a number of changes to TNZ M/4 and M/6 specifications as well as rolling out several new test methodology specifications for indirect tensile strength testing and repeat load triaxial aggregate performance testing."

From the Chair...

Welcome to the April issue of CETANewZ. Summer is starting to slip away and the days will fast become shorter after daylight savings ended on Sunday.

As time moves on this year, I find myself thinking about what I will be busy with this winter. Will I be busy figuring out how my business will adjust to the new Health and Safety regulations and the creation of "WorkSafe NZ"? This is a new government department looking to "reduce the total death and injury toll in workplaces by 25 per cent by 2020". Or will I be dealing with NZTA's new Network Outcomes Contracts (NOC) and how they might affect the laboratory workload and test requirements. If you haven't heard of these, you better do some homework, and quickly! Sooner or later we will all come across these new challenges.

Since our last newsletter much of the activity at CETANZ has centred on the organisation of the forth coming conference. The registration website page is up and working, the committee has started to source speakers from various industry segments and the organiser is sending out regular updates. If you haven't received an email about the conference yet please contact me via email jayden.ellis@stevenson.co.nz

Sponsorship opportunities are selling fast so be sure to get in quick to secure the best cost effective option for you before they get snapped up.

The next AGM will be held at the August conference, and this is where you will be asked as a member to elect our new management committee. In the months leading up to this AGM, CETANZ will be seeking new blood for the committee. This is a great chance for those that want to get more involved in our industry, have their say and network with likeminded people. Don't let your geographic location put you off, CETANZ use phone conferencing services in most meetings and if you are out of town you can phone in from your office. If you're interested please contact CETANZ by email info@cetanz.org.nz

Also on the horizon, NZTA are looking at making a number of changes to TNZ M/4 and M/6 specifications as well as rolling out several new test methodology specifications for indirect tensile strength testing and repeat load triaxial aggregate performance

From the Chair Continued...

testing. The intention is for some of this work to start surfacing in June of this year. CETANZ along with various other stakeholders have been involved in providing feedback along the way.

If you would like to know more, or you want to be involved feel free to get in touch anytime. Contact us here at info@cetanz.org.nz if you would like to learn more

I hope you enjoy this issue.

Jayden Ellis

Chair - CETANZ

Ground Penetrating Radar (GPR)

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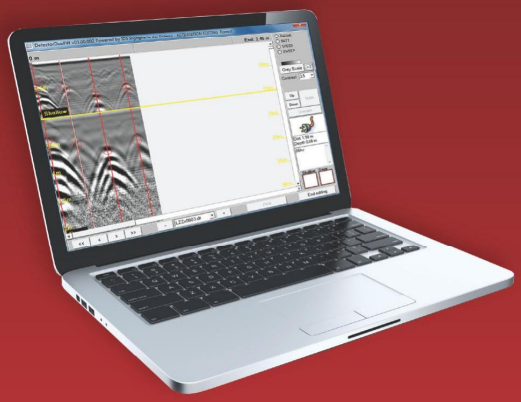

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Technical Group Update

Technical Group

Last Technical Group meeting was on 6th March 2014.

Proficiency Program

Schemes underway

Category	Test	Volunteer Laboratories
Aggregate	Clay Index	Winstone & Stevenson - DONE
Aggregate	ASTM Density and Absorption	Fulton Hogan Nelson - DONE
Soil	Standard Compaction & Triaxial Perm Solid Density	Stevenson & OPUS - DONE
Concrete	Compression & Density Tests	Holcim & Stevenson – 2014
Field	NDM	Stevenson (North Island) - 2014
Asphalt	Binder Content Grading & MTSG	FH Dunedin 2014
Asphalt	Marshall Compaction	Downer – Frank Hu - 2014

Proficiency Program Update

•PSV proficiency report – report getting checked now. Waiting for release.
•Clay Index proficiency – final data distributed. Report to be done.
•Standard Compaction, Solid Density and Permability Proficiency – final data distributed. Report to be done.
ASTM Density and Absorption. Data distributed. Report to be done.
Binder Content Grading and MTSG – Waiting for data from Fulton Hogan. Report to be done.
Group now looking at designing concrete strength proficiency for 2014.
Possible other schemes in 2014 – Cone Penetration PI for aggregate & NDM (North Island)

TNZ T/1 Review

The technical group has handed over the updated draft to the National Pavements Technical Group (NPTG) and the National Pavement Steering Group (NPSG -NZTA). Likely this document will go live later this year.

Roading Testing Standards Steering Group (RTSSG)

•Jayden Ellis is to reconfirm the CETANZ commitment to the funding and the contribution to writing of new standards with other possible stakeholders. This will be to generate discussion now that Standards NZ restructure has started. (NZS 4407 - $15K, NZS 3111 - $5K, NZS 3112 - $5K)

•Group has discussed possibility of initiating a CETANZ review and re-write of NZS 3111 and 3112 in 2014 regardless of Standards New Zealand stakeholder position and concurrent activities.

IANZ /PPAC Report

Keith reported that 17025 is likely to be reviewed and re issued sometime in the next 3 years. Feedback regarding review seemed to suggest at this early stage that 17025 needed more clearly worded requirements i.e. plain english.

Technical Group Update

Accreditation and Reporting of Derived, Assumed and Subsequent Data.
Work continues to develop a guide for members and what CETANZ believes is best practice in terms of reporting conventions.

NDM Guideline
Technical group has produced the first draft and is now reviewing all of the feedback that has been gathered to date and will seek external feedback at some stage in the near future. Hopefully we will have final draft before the CETANZ Conference in August.

Test Pit Guide for Roading Rehabilitation and Design
Work has begun on reviewing and writing a new guideline for those test pitting in the road. The text from the draft document originally came from the NPTG T/19 notes.

Guide for dealing with reporting in LIMS – Significance of decimal points.
The group is reviewing worked examples following the ASTM D6026 standard that covers a standard approach. A guide or recommendation from CETANZ will be produced.

Training Videos
The technical group used LinkedIn to highlight CCANZ's concrete testing training videos. A good model for what CETANZ want to do in the future.

You can view the videos on line at YouTube by following:

http://www.youtube.com/user/cementconcrete

Next Technical Group Meetings
15/05/14
31/07/14
30/10/14

OPUS RESEARCH MOVES

After more than 50 years of commercial operation out of Gracefield in Lower Hutt, Opus Research have recently moved to a purpose-designed laboratory facility at 33 The Esplanade in Petone. The move was prompted by many considerations but one of the key things was to consolidate our operations into a modern, purpose-built facility at a more accessible location. The relocation and construction of the new labs and workshops was successfully achieved in a very tight timeline and we are pleased to report that our IANZ accredited laboratories are now up and running again. Our comprehensive quality assured service includes testing carried out in the laboratory, field and site sampling. To our clients, this means we are able to offer our professional experience, whether it be in-situ site investigations or evaluation and testing of engineering materials in the lab.

We offer a wide range of routine materials testing, covering aggregates, concrete, bitumen, soils and asphalts, plus specialised services such as geotechnical/geomechanics, stabilisation, CPT testing, environmental effects and instrumentation.

Our laboratories are set up for commercial testing but we also carry out research funded by government and in collaboration with industry and private companies.

For further information please contact Sheldon Bruce:
Sheldon.bruce@opus.co.nz; 04 5870607; 027 4510415

Members of Opus Research at their new premises

ENVIRONMENTAL TRAINING CENTRE

The new premises at 33 The Esplanade include a suite of impressive training rooms and co-located with Opus Research in the new facilities is the Environmental Training Centre (ETC) which provides industry training and qualifications for working with water and the environment. Course programmes include:

- Water supply and treatment
- Wastewater and treatment
- Swimming pool treatment
- Resource Management Act
- Confined space
- Polyethylene (PE) pipe welding
- Irrigation
- Backflow Prevention
- Reticulated networks
- Farm dairy effluent systems.

For further information please contact Jonathan Mackey;
Jonathan.mackey@opus.co.nz; 04 5870694; 027 485 5807

CETANZ Conference 2014

On behalf of the Civil Engineering Testing Association of New Zealand (CETANZ) and the organising committee, I would like to invite you to the 4th biennial CETANZ conference "Raising the Standards". This event is the first of its kind to be held outside of Auckland taking place in Hamilton between the 13th to the 15th of August 2014.

A key objective of this event is to raise the standards of our industry and promote progression towards a more professional and widely acknowledged, well respected sector. Since its inception in 2006, CETANZ has made a number of great achievements including updating of standards, proficiency testing and the industry wide qualification framework to name a few. Over these few years our organisation has developed greatly to meet the ever evolving needs of our membership and has quickly become the voice for the civil engineering testing industry in New Zealand. CETANZ and this conference are here to ensure the on-going professional development of our industry and the theme of 'raising the standards' will address this and the significant change to a more professional and widely acknowledged, well respected sector into the future.

The organising committee is already well underway in preparing this event and it's my genuine ambition that the 4th CETANZ conference will become an even bigger and better forum for sharing key observations and experiences, research and discoveries and learning between like-minded people. We are sure you will enjoy and benefit from this fantastic opportunity and are confident this event will be the best and most comprehensive yet.

I look forward to seeing you all in Hamilton in August.

Michael McGlynn
Conference Convenor

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2011 Hawkes Bay landslips: A geotechnical perspective

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Keywords: Landslides, extreme groundwater, earthquake

ABSTRACT
Across Easter Weekend 2011, heavy rainfall affected coastal Hawkes Bay from Mahia in the north to Blackhead Beach in the south with some significant rainfall totals being recorded. This period of heavy rainfall was followed by a magnitude 4.5 earthquake centred off the Central Hawkes Bay Coast at 10:30am on Tuesday 27th April. This combination of saturated ground (caused by the rainfall) and minor earthquake triggered significant landslips in the Central Hawkes Bay hill country. In addition, widespread flooding and debris flows inundated rural communities with Pourerere Beach and Waimarama being the worst affected. Also numerous landslips occurred in the densely populated Napier Hill area due to stormwater run-off. This combination of extreme rainfall and the earthquake represents the unlikely geotechnical scenario, where elevated groundwater is combined with an earthquake. This extreme case was especially evident in the rural communities of Pourerere Beach and Blackhead Beach where many properties are located at the base of steep slopes which historically have been unstable During extreme rainfall. This event triggered 388 Earthquake Commission (EQC) claims with significant costs at a time when EQC was dealing with the Christchurch Earthquakes. The Authors were requested to assess these claims on behalf of the EQC and present possible remedial solutions.

1 INTRODUCTION

This paper sets out the damage experienced from a severe weather event that impacted the Hawkes Bay region in 2011. The Authors firm responded to this event on behalf of the Earthquake Commission (EQC) in the subsequent weeks following the event. Heavy rain affected coastal Hawkes Bay from Easter Sunday through to early Tuesday morning. Areas affected were from Mahia in the north to Blackhead Beach in the south of the region. The scale of this event was striking with huge swathes of farmland affected by shallow landslips in addition to the damage to residential land and property. At the start of this process, a significant lack of stormwater control in steeply sloping built up areas such as Napier Hill was observed. In addition to this, numerous properties were observed to have been sited at the base of steep slopes where signs of historical shallow landslips (probably caused by heavy rainfall) existed.

Official rainfall totals over this 72 hour period were as follows (from North to South).

Table 1: Rainfall Totals

Town/Community	*Rainfall*
Mahia	*300 mm*
Napier	*211 mm*
Hastings	*60 mm*
Ocean Beach	*424 mm*
Waimarama	*322 mm*
Kairakau	*303 mm*
Pourerere Beach	*378 mm*
Blackhead Beach	*301 mm*

To emphasise how the weather event only affected coastal Hawkes Bay, Hastings is 20 km inland from Ocean Beach and only received 15% of the coastal rainfall. Reports exist of some coastal hill country stations recording up to 800 mm of rain in the 72 hour period. In addition at 10.00am on the Tuesday morning, a small (Mag. 4.5) earthquake occurred at a depth of 20 km off Blackhead Beach in Central Hawkes Bay. A combination of saturated slopes and a small earthquake created many landslips and tension cracks on the slopes near in Central Hawkes Bay.

2. EQC Event

The EQC set up a field office in Hastings to deal with 388 claims from the event. Prior to the Christchurch earthquakes, the Napier hill area accounted for the highest number of landslip claims for the EQC on a yearly basis. Fortunately, the Central Hawkes Bay damage was centred on a largely rural community so claim numbers were not excessive in this area. The spread of landslip claims from region were as follows:

Table 2: EQC Claims

Town/Community	No. of Claims
Mahia	2
Napier	120
Ocean Beach	8
Waimarama	40
Pourerere Beach	57
Blackhead Beach	20

It can be seen that even though rainfall totals in Napier were lower than the coastal communities to the south, a significant number of landslip claims were generated due to the higher housing density and lack of storm water control (to be discussed later). Further south whole communities were affected by landslips but the claim numbers were low due to the lower population. The majority of the landslips inspected by T&T were debris flows. These shallow landslips formed due to the fully saturated upper soils sliding on the rock interface. This was particularly evident in Central Hawkes Bay. In addition, T&T observed numerous hillsides where tension cracks formed following the small earthquake near Blackhead Beach. The local farming community noted that these tension cracks appeared directly after the earthquake and further landslips occurred even though the rainfall had eased.

These tension cracks were of concern, especially for properties that were located directly below them as the imminent risks to the properties would likely have been realised with further rainfall.

The damage observed by T&T personnel during the event was as follows:

- Flooding
- Bridge damage
- Erosion of river banks
- High percentage of damage to farmland
- Major inundation of roads and houses.

3 CASE STUDIES

3.1 Case Study 1 - Napier Hill Landslips

Bluff Hill (to the north-east) and Hospital Hill (to the west) are collectively known as Napier Hill and comprise approximately 2000 residential dwellings as well as numerous commercial buildings. Napier hill is an uplifted massif located at the northern extent of the City of Napier, formed from calcareous, cross-bedded sandstone and limestone of the Scinde Island Formation (GNS 2011). This distinct cross bedding is likely to have developed due to strong tidal effects of the Ruataniwha Straight (GNS 2011), and along with the vertical jointing, is a common medium for seismically induced instability in the form of large scale block failures as was witnessed in the 1931 Napier earthquake. During periods of heavy rainfall however, failure of the steep slopes of Napier Hill are typically in the form of translation landslips and debris flows. There is evidence of historical instability in these slopes of translational and deep-seated (block) failure from both, seismic and extreme rainfall events.

The Napier Hill area received approximately 210mm of rainfall over a 72 hour period and this is likely to have saturated the upper residual soils of the Scinde Island Formation.

Following this intense rainfall, significant damage was caused to properties and lifelines on and directly below Napier hill by the land evacuation and inundation that occurred as a result of the landslips. Approximately 100 EQC landslip claims (EQC) were lodged and these landslips were typically of a translational/ debris flow nature, with the most prominent of these being the Guys Hill and Karaka Road Landslips. The main contributing factor to the numerous landslips within Napier Hill were the elevated ground water levels caused by the heavy rainfall and poorly controlled storm water runoff from dwellings and roads.

3.1.1 Guys Hill Road Landslip

A large translational landslip occurred at the top of a slope approximately 30m high and 55° steep at 22 Guys Hill Road. As shown in Figures 1 and 2 below, this caused substantial evacuation of land from the property, causing inundation and damage to the properties below at 19 Chaucer Road. Due to the precariously positioned nature of the dwellings above and below the landslip, these properties were immediately evacuated following the event. The property at 22 Guys Hill Road was ultimately removed because the required solution to ensure a safe and stable building platform (and minimising imminent risk) was deemed to be too expensive and difficult.

Figure 1: 22 Guys Hill Road Landslip

Figure 2: 22 Guys Hill Road Landslip

3.1.2 Karaka Road Landslip

Another large translational landslip occurred at the top of the slopes supporting 22A and B Karaka Road and 24A Seapoint Road above Breakwater Road at the northern end of Napier Hill. As shown in Figures 3 and 4 below, this caused significant retreat of the cliff face supporting these residential dwellings. At the height of the storm, 7 properties were evacuated by civil defence. Inundation of Breakwater Road by this landslip resulting in this major road being temporarily unpassable until the debris was cleared and traffic management was required numerous weeks after this event. As this landslip headscarp traversed three separate properties, the solution ultimately comprised a large 50m long, 15m deep reinforced concrete retaining wall with ground anchors.

Figure 3: Karaka Road slopes prior to failure

Figure 4: Karaka Road landslip

The existing stormwater capacity on Napier is fully allocated and the majority of the older properties on Napier Hill discharge stormwater run-off directly into the ground whilst any new dwellings on Napier Hill discharge stormwater to the kerb. Due to this, a high percentage of the EQC claims on Napier Hill can be attributed to poor stormwater management.

3.2 Case Study 2 – Waimarama

Waimarama is a small coastal community at the south-eastern area of the Hawkes Bay. The developments in this town primarily consist of residential dwellings and a few commercial buildings. The town is formed on Holocene beach and estuarine sediments consisting of unconsolidated sand, gravel, silt and mud deposits. The hills to the north, overlooking the township are tectonically uplifted sea cliffs comprising poorly to moderately cemented sands and silts. There is evidence of historical deep seated and translational landslips in these hills from seismic events.

The Waimarama area received approximately 322mm of rainfall over a 72 hour period, which was the highest officially measured rainfall during the event in the Hawkes Bay. In addition to this, the Kaikopu Stream overflowed its banks due to a coinciding high tidal level blocking the mouth of the watercourse, preventing the ability of the excess water to flow out to sea.

Following this intense rainfall and flooding event, significant damage was caused to properties and lifelines at Waimarama by the deep seated landslips and debris flows originating from the hills above as well as the widespread flooding. Approximately 30 residents were evacuated immediately and the main road into Waimarama was unpassable and closed due to flooding and debris. In addition to this, the bridge into the township was damaged and shortages of drinking water occurred due to damage to local reservoirs. In the weeks and months following this event, 40 landslip and flooding claims were lodged with the Earthquake commission. Figure 5 below shows the extent of the damage to the northern section of the township one week removed from the event.

The authors company were involved in constructing a protective bund around the property at 145 Waitangi Road, to reduce the imminent risk of damage to property and life from a future event of this nature. This 3m high bund was constructed using compacted locally sourced material and tested for 98% of maximum dry density. We understand that a group of residents further along Waitangi Road have combined their EQC payouts to construct a protective bund to safeguard their properties from debris inundations.

Figure 5: Shallow debris flow behind Waitangi Road Properties

Figure 6: Severe debris inundation of fields and roads in Waimarama

3.2 Case Study 3 – Pourerere Beach

Pourerere Beach is a small coastal settlement comprising less than 100 residential dwellings at the southern extents of Hawkes Bay. At the southern end of Pourerere Beach lies a small cluster of approximately 33 residential dwellings. The developments in this area primarily consist of residential beachfront dwellings and a public camping ground. The settlement is situated at the base of a steep hillside running parallel to the coastline. These are late to Middle Miocene deposits and comprise calcareous mudstones and interbedded fine grained sandstones (GNS 2011).

The Pourerere Beach area received approximately 308mm of rainfall over a 72 hour period and this is likely to have saturated the soils of the hills that overlook this section of the settlement. In addition to this, Pourerere Beach is located approximately 5 km to the north of the epicentre of the 4.0 magnitude earthquake, which occurred within close proximity to the town at nearby Blackhead Beach.

Following this intense rainfall and small seismic event, significant damage was caused to properties and lifelines directly in this area of Pourerere Beach by the land inundation that occurred as a result of the landslips. Approximately 57 EQC landslip claims were lodged and these landslips were a combination of deep seated and translational failures. We consider the rare event of elevated ground water conditions being combined with a seismic event to be the cause of the large-scale slope failures with significant debris inundation of dwellings.

An on-going risk currently exists of large amounts of failed material on the slopes above the township. This will require significant stabilisation measures as well and it would be prudent for an early warning system to be installed to protect the lives, properties and lifelines below.

Figure 7: Landslips above Pourerere Beach settlement

Figure 8: Large tension crack in hills above Pourerere Beach

Following the landslips, the hillside above the dwellings was assessed to be unstable, with large tension cracks appearing behind the existing landslip headscarps. The authors company led regional study of this area led to the conclusions that 27 of the 33 residential dwellings and 50% of the camp ground site in this area of Pourerere Beach were considered to be at imminent risk and at "total loss" in accordance with EQC provisions. This was due to these dwellings being located directly below (and within the inundation paths) the unstable sections of the slope (as illustrated in Figure 9) that are expected to fail in the short term. As the dwellings were located at close proximity to the base of the slope, a debris barrier could not be considered due to the failed land being owned by others, EQC cannot remediate land not owned by the claimant.

For the properties that were not deemed at total loss, an early warning system was implemented by the CHBDC and operated by the local fire service to help safeguard lives during periods where the slopes are deemed to be unstable. The local residents have been notified of this warning system, including evacuation procedures following activation of the siren.

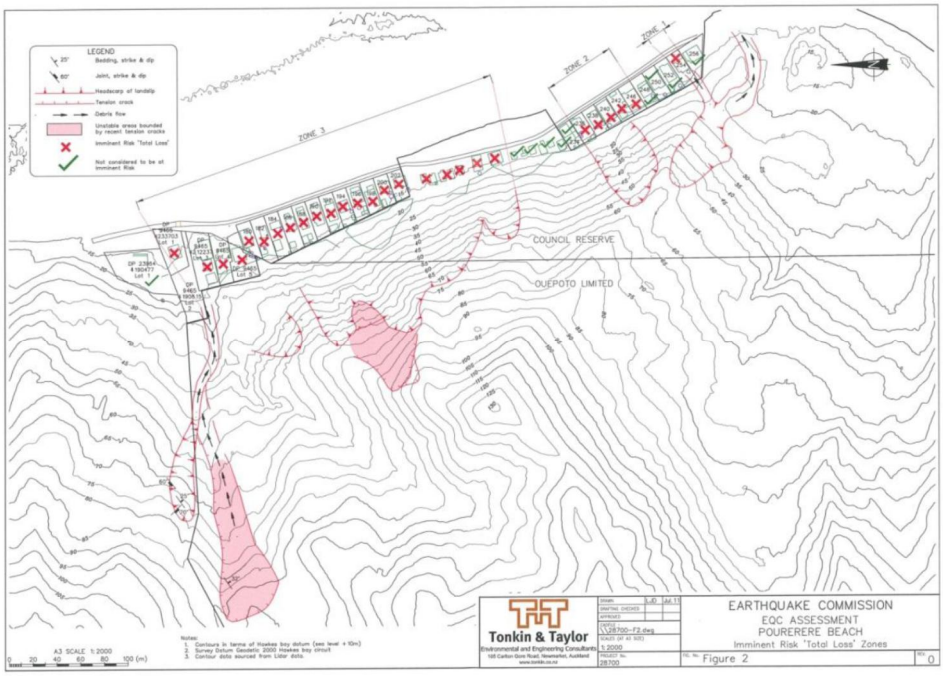

Figure 9: The Properties at Pourerere Beach that were classed at imminent risk – Total Loss for the EQC

4 CONCLUSIONS

Based on the observations from this extreme weather event the following point's conclusions can be made:

- Council's must be proactive in relation to the new stormwater connections and provide suitable disposal areas to prevent further stormwater runoff into the underlying residual soils of the Scinde Island Formation at Napier Hill.
- Prior to the Christchurch earthquakes, the Napier Hill area had the highest average landslip claims year on year for the EQC.
- This event showed that with saturated near surface ground conditions, a relatively minor earthquake can cause severe damage to land and property.
- Rural Councils often allowed properties to be sited at the base of historically unstable slopes without any conditions attached – this is slowly being changed.
- Severe rainfall events can impact on lifelines to rural communities. It is therefore important that strong collaborative efforts be made between local councils and rural communities in ensuring procedures are in place to deal with these events.
- In situations where communities are at future risk from unstable ground, the implementation of early warning systems and evacuations procedures such as the scheme utilised at Pourerere Beach would be an effective means of managing the risk to lives.

ACKNOWLEDGEMENTS

The Author acknowledges the help and contribution of the Earthquake Commission, Central Hawkes Bay District Council and Napier City Council for their input and permission to publish this paper.

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