

Annual Report 2017

Consistently driving
quality & innovation

Contents

Cover

20 Customhouse Quay Wellington - A new 14-level office building due for completion late 2017, the NZGBC 5 Star Green Star rating structure features base isolation and diagrid structure offering greatly improved seismic performance and resilience. HERA members **Dunning Thornton** were the structural engineers and **MJH Engineering** fabricated the 2,000 tonnes of steelwork.

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Serving the New Zealand metals-based industry

HERA creates value by being the industry stimulus for research, innovation and development. Delivering a trusted national centre for design, manufacturing technology and quality assurance.

Our commitment to help our members stay one step ahead is strengthened by our mission to be the leading catalyst for metals-based innovation.

Our specialists in heavy engineering R&D, consultancy, education, advocacy and verification allow us to partner with members and clients across the globe, to create opportunity and to lead bigger picture thinking.

Industry owned. Member driven. Future focused.

Cloudy Bay Winery Project - HERA member **Davidson Group** was lead consultant for this beautiful pinot cellar structure. Bringing together the expertise of architect Paul Rolfe, main contractor Scott Construction, and structural steelwork by HERA member **Sharland Engineering**, with folding and installation of Corten weathering steel cladding by HERA member **Cuddon Engineering**, Nelson.



Report from Chairman and Director

A particularly booming steel construction sector benefited HERA's performance in FY2017.

However attempts to leverage government R&D co-funding for transformative innovation didn't come to fruition. This issue will form a big part of our strategic review going forward.

We've continued to be guided by our vision of a sustainable advantage for our New Zealand metals-based engineering around the world. All achieved by being an innovation catalyst for our members and industry through our key offerings in industry development, information resources, structural systems and welding expertise.

Driving innovation

We consistently strive to place innovation at the core of our R&D activities to help our members find niche markets in an increasingly competitive environment. But admittedly, we have experienced mixed outcomes throughout the year.

On a positive note, we've established very strong industry links in commercially driven R&D that has led to more cost-effective composite steel construction systems for our clients both in New Zealand and abroad. It truly demonstrates the reach of our expertise and the market confidence in the quality of our work.

Our steel construction bread and butter R&D saw the successful completion of several important Australian New Zealand standards, including design of steel and composite bridges together with design of composite buildings. We're particularly proud how this has directly responded to industry needs by providing guidelines, advice and parameters to designers that allow them the confidence to safely push boundaries and innovate.

Excitingly, a fire engineering research workshop, started off the back of our strategy in this area, has piqued the interest

of BRANZ and other stakeholders. As a result, we hope this will garner some serious investment in what we believe is a critical area for expanding our members' multi-storey building market entry going forward.

In a similar vein, our Welding Centre has also reached a milestone with the publication of the new **Fabrication and Erection of Steel** standards to address product conformance to international best practice.

Seismic research also continues to drive us. We're currently working on optimising the design of seismic connections so our fabrication members are able to be more cost-effective and still meet safety performance requirements. This work will not just reward our traditional carbon steel users, but also those using stainless steel when considering exposed structures.

Our clean energy technology research has identified several opportunities in the geothermal energy space, particularly in waste heat assessments for businesses and clean energy system design for those with geothermal resources.

But as experienced in FY2016, an unfavourable Government R&D funding environment has consumed our focus to continue our 10-year **Above Ground Geothermal and Allied Technologies** (AGGAT) program. We placed a massive effort into submitting an Endeavour Fund and a Regional Research Institute proposal, and also into developing a HERA research partnership funding application.

Sadly, we were unsuccessful and are now set to lose highly-valued research engineers as we take steps to close this program down and get as much value back from the developed IP. This was an uphill battle for our largely applied R&D programs with the request for funding, calling for science excellence as its main criteria, and inconsistent company partners buy-in both have taken its toll.

This was especially evident in our Research Partnership funding application which had industry transformation at its core. It answered a key strategy of ours to transform industry from contractors to manufacturers of products for which they hold IP, so that they have better control of their future pipeline. But time and time again, we receive the message from our large SME members' base that they simply don't have the money to partake in R&D at the required level to achieve this.

Moving forward, we know we have to keep members better informed and engaged in R&D proposal development and



Chairman & General Manager Page Macrae, Mike Lehan | Director Wolfgang Scholz

foster an environment where members bring projects to HERA to lead. In a proposed business model research project, we will be investigating how, as a subsector with an industry-owned research association, we can better influence transformational and sustainable development. We're convinced that in the wake of this research, a raft of new initiatives will emerge especially for our non-steel construction metals-based manufacturing sector.

Market development that's key to long-term success

We collaborate closely with SCNZ and industry to maximise the benefits of our joined industry investments. As main drivers to grow steel construction, this approach continues to pay off - no doubt encouraged by a buoyant steel construction sector in FY2017! Regular involvement in each other's strategy reviews and co-ordination of meetings, workshops and seminars has synchronised our efforts to deliver a consistent foundation of information, approach and knowledge for our members as their trusted industry voice.

Outside steel construction, a major effort has been made to develop a joint industry proposal for exploring the viability of an offshore fin-fish farm concept with the vision to bringing our members and NZ aquaculture together. An exploratory market research trip is in the planning stage and it's hoped industry enthusiasm leads to a real pilot application for long-term business streams.

A well-attended Pressure Equipment Workshop has highlighted an industry interest to keep this sector going and supported. However, the message was clear to the end-user - Use it or lose it.

That's why with the departure of former General Manager Industry Development Nick Inskip, our current Manager Dr Boaz Habib is working hard to visit members, exploring their needs and taking up the challenge to devise a new approach that addresses this.

Education & technical advice

Quality engineering is one of three focus areas for us. And although at our core is research, we also place a lot of effort into plugging any gaps in public and private sector engineering education. Driven by the training needs around fulfilling the requirements of the **Steel Fabricator Certification** (SFC) scheme and the new AS/NZ 5131 **Structural steelwork – Fabrication and erection** standard. So far, we've had strong training course attendance and 57 HERA qualifications were awarded.

This was complemented with a strong range of workshops, seminars, member visits and hours of technical advice - underlining the combined value of being a research and technical expertise provider. The industry levy has contributed largely to this effort, and we're pleased to see that the combination of industry investment in training and levy co-funding is producing such consistent industry improvement.

Certification and verification

The outstanding success of our SCNZ/HERA-run SFC scheme continues to demonstrate strong engagement, with the number of HERA certified companies now reaching 80% of New Zealand's fabrication capacity. Ongoing SFC scheme improvements saw us tackle the very difficult product conformance space, where we're proactively responding to the challenges brought about from imported non-compliant products.

HERA Verified continues to provide a key role in product verification. This year assessing a high strength steel blind bolt supplier to meeting local requirements and giving confidence to local structural engineers when it comes to using them in their projects.

Industry promotion and advocacy

Our people have been working hard behind the scenes to follow our Executives' direction to refresh our brand so we're more effectively connected with our members. Although it's different for us, we're starting to see this come alive and we hope that our new look and feel will have been well received.

Implementing our new communication strategy has meant a lot of changes internally, especially in the way we communicate. The feedback so far has been pleasing and confirms we're on the right track - particularly with our more conversational tone. This hasn't always been easy but we've enjoyed the journey, and tweeting is almost second nature for us now!

Along with this comes a new approach to promote our industry's capability where in the past this was captured on our capabilities register. Going forward, we recognise a different approach is needed that clearly reflects members' value proposition.

Phase two of our work looks to fix this and will include launching a great digital platform which will be focused

on sharing your challenges by showcasing your capability through your projects and people instead.

Our policy formulation on third party verified product conformance for all critical building products struck a chord in FY2017 with many, and we continue to advocate with MBIE that this be mandatory once the basic system for compliance is put in place. It's great to see our industry lead by example here.

We also continue to support our industry partners Metals NZ and SCNZ to be the leading voices for our industry. We've also worked harder to deliver a constant stream of industry comments in the form of our newly introduced ThinkTank@HERA insights to consistently remind stakeholders what our valued policy positions are for parliamentarians to turn into practice.

Financial performance and outlook

A significant change in income size and mix due to the ending of government research contracts led to a drop in our income. Our underlying income was \$3.75Million, returning a small surplus of \$78k after the delivery of an additional non-

budgeted \$100k steel construction research package.

This was courtesy of self-generated income from industry training, research and levy income from a humming steel construction sector. It's very pleasing and puts us in a strong position to continue with our mission to be the catalyst for industry innovation.

Looking forward, the construction industry pipeline is predicted to be stable until 2021, and we're confident our industry outlook remains strong even past this date. However, we mustn't forget the challenges faced from international competition - with the recent closure of veteran members A&G Price and Amtec Engineering serving as a warning not to rest in our quest for industry transformation and exploration of new business models.

So watch this space as we're expecting industry feedback to turn into new services offerings during FY 2018.

Our people

HERA is an organisation that wears many hats and as such relies on the input of many - and we'd like to thank all of those who've played a part in keeping us relevant and forward focused throughout the year. It has to be said that within HERA, our strength certainly lies in our staff and the expertise and support they deliver to our members.

We look forward to their continued drive and commitment as we move to explore new opportunities in FY2018.

Mike Lehan
Chairman



Wolfgang Scholz
Director



| 1 | Deputy Chair Dr Troy Coyle, Head of Innovation & Product Development NZ Steel | 2 | Bruce Bonner, Director Integrated Maintenance Group | 3 | Craig Stevenson, Technical Director - Buildings Aurecon | 4 | Darren O'Riley, Manager SCNZ | 5 | David Moore, Managing Director Grayson Engineering Ltd | 6 | Douglas Rodgers, Head of Faculty - Technology Southern Institute of Technology | 7 | Matthew Kidson, Director Kernohan Engineering | 8 | HEERF Chairman Noel Davies, Joint Managing Director Hydraulink Fluid Connectors | 9 | Paul Bryant, Area Manager Mt Maunganui Steel & Tube | 10 | Pragya Sharma, Project Engineer Advance Boiler Services (NZ) Ltd | 11 | Simon Ward, Managing Director A-Ward Ltd | 12 | Thomas Neitzert, Professor Emeritus Auckland University of Technology

Our Executive Board



Our industry in numbers

FY2017 saw us set new records in heavy steel consumption.

Not only improving on last year's numbers, but taking out the top spot since our records started in 1982.

It's a welcome result, supported by a buoyant steel construction sector responding to growing demand for seismic strengthened buildings and an expanding population, particularly in major regional centres.

However, it was not the growth rate some would have expected, and likely the contribution from fabricated welded steelwork imports not captured in this statistics made up for this gap in the expectation.

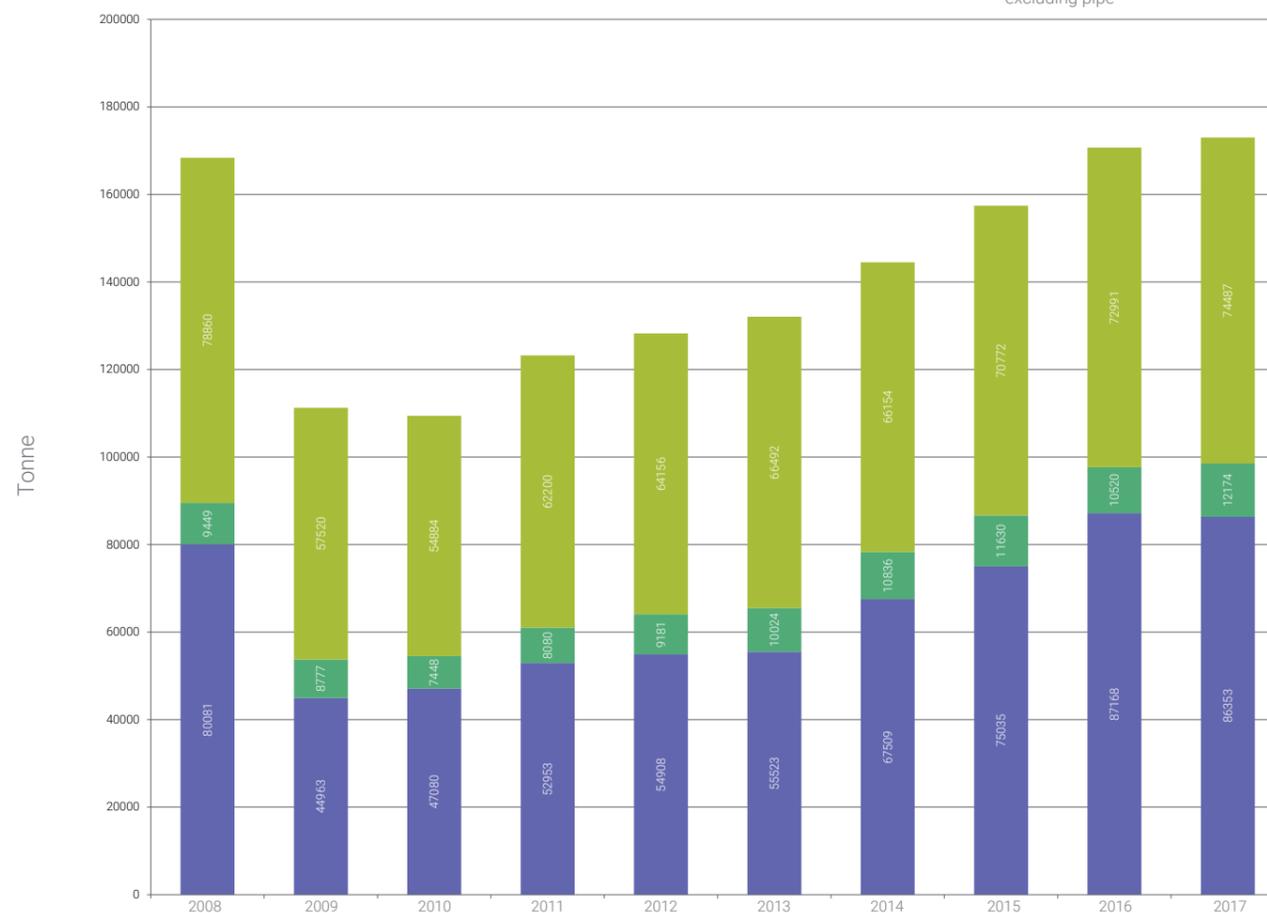
Plate was up 1.03% to 74,487 tonnes, sections by 1.16% to 86,353 tonnes and RHS by 0.9% to 12,174 tonnes compared to FY2016.

This is evenly spread and demonstrates that it is not just growth in sections fueled by the steel construction sector, which is going well, but also general heavy steel-based manufacturing.

Source: Statistics NZ & HERA

- Plate (above 4.5mm thick)
- RHS (above 4.5mm thick)
- Sections (above 4.5mm thick, excluding pipe)

Heavy steel volumes (import and local supply)



This positive local manufacturing trend was complemented by a 19% import value increase to \$204m in tariff category *Steel structures and parts thereof* as compared to the previous year. Assuming an average to the value of \$3,000 per ton of import, this equates to 68,000 tonnes.

We understand that a large proportion of these imports are through members representing new ways of combining cost-effectively imported items with locally fabricated steelwork.

Additionally, we have to note that probably as a result of the strong local market, exports in this category also dropped further by 6% to a total value of \$76m.

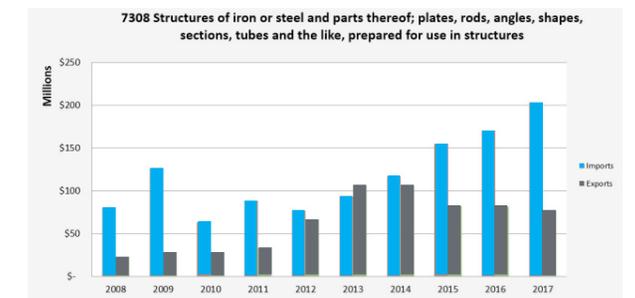
Similarly, our total heavy engineering export collective, which represents a diverse but representative product spectrum including structural steelwork, also shows an increase in imports by 16% to \$768m.

This was countered by positive growth in exports of the same collective by 35% to \$291m, compensating to some

extent for the drop in export values of the previous three years.

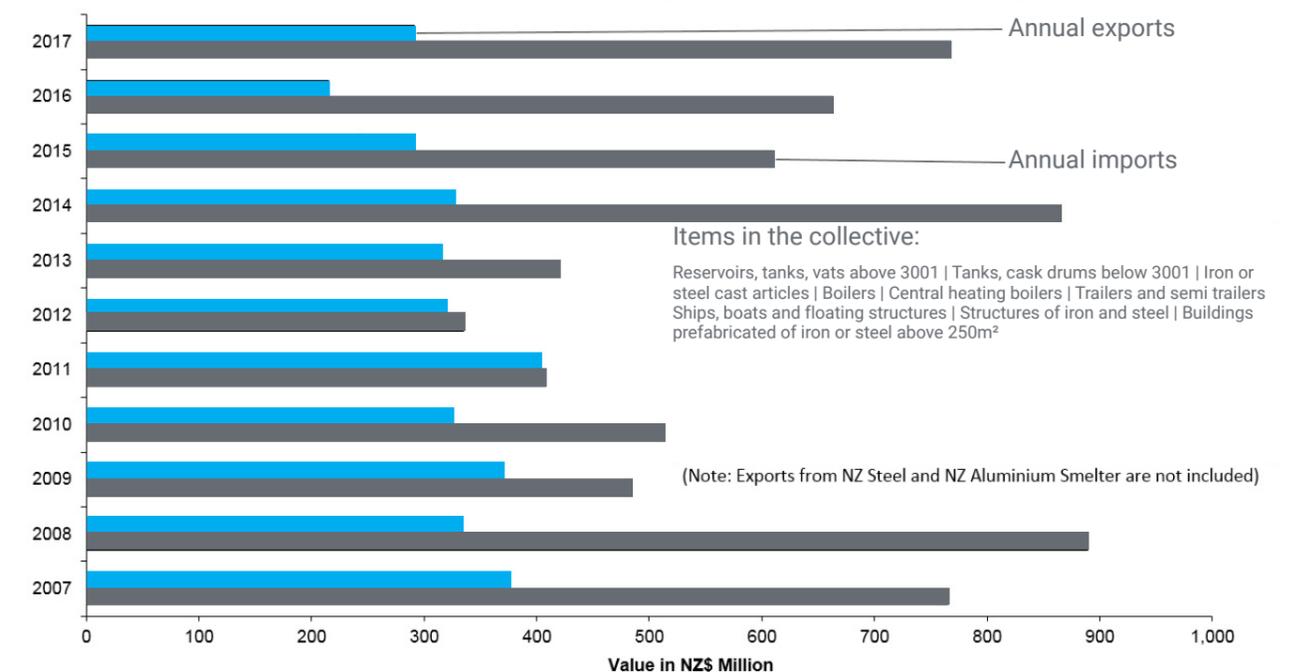
Despite the strong showing in terms of overall local activity, the large increase in heavy engineering imports combined with the downward trending exports has to be of concern, and we need to continue with our focus on international competitiveness.

Changing our business models to complement high value local fabrication with quality-assured imports going through our New Zealand controlled value chain may be part of this.



Source: Statistics NZ

New Zealand Heavy Engineering Imports/Exports Collective (year ending June)



Source: Statistics NZ

HERA in numbers

A sound FY2017 financial result produced a small surplus on the back of a significant income mix change

Our main income streams are derived from our industry-funded heavy engineering research levy, government research contracts and self-generated income from consulting, training, certification, examinations, services and membership fees.

FY2017 saw a significant shift in our funding composition compared to the previous year. The government research funding proportion dropped from 24% to 10% in FY2017. Self-generated income was up from 27% to 36%. Income proportion from industry levy moved from 49% to 53%.

While the levy increase and the strong development in self-generated income is welcomed, the drop in our ability to leverage government co-funding from our industry co-funding is a great concern, and is addressed in our strategy and policy position section.

Staff numbers dropped only by one during the financial year



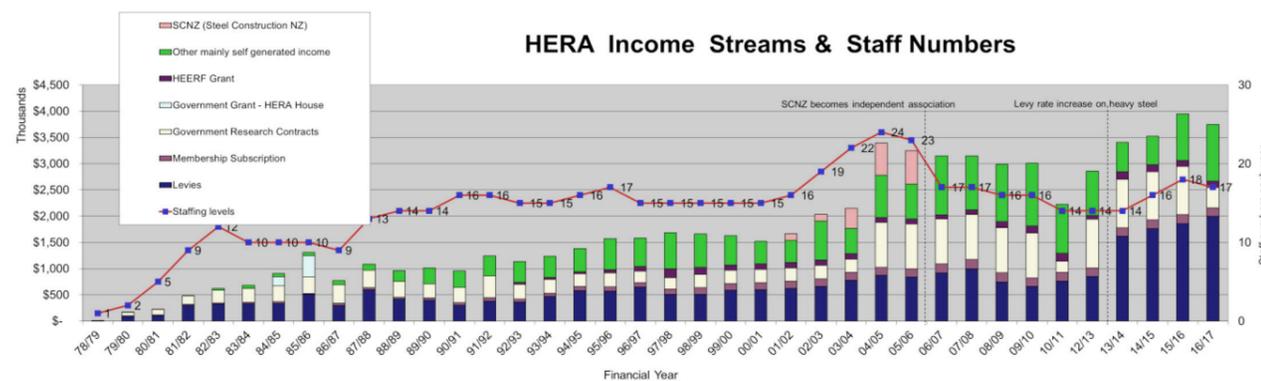
Accountant, Kam Subramani

from 18 to 17 staff, as the full effect of the not-extended government research contracts was delayed due to holding onto our highly specialist research staff in the hope we would be successful in our FY2017 research applications. However, the drop will show in the next financial year.

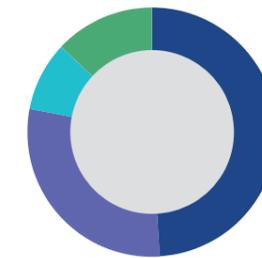
The HERA income stream diagrams shows our income distribution in more detail. Most significant changes compared to the previous year being the growth in research consulting income from 5% to 15%, and the doubling in seminar and course income to 6% - indeed a very positive development.

Our expense stream distribution also saw some major change. The discontinued government-funded AGGAT program affected the Industry Development division mainly, and their share of expenses dropped from 26% to 21%.

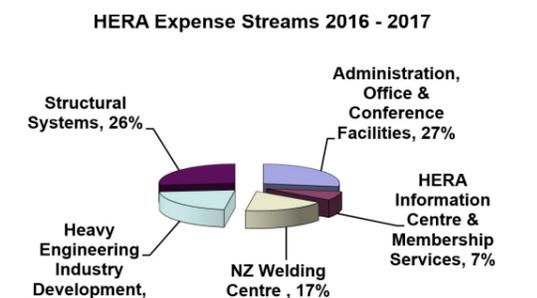
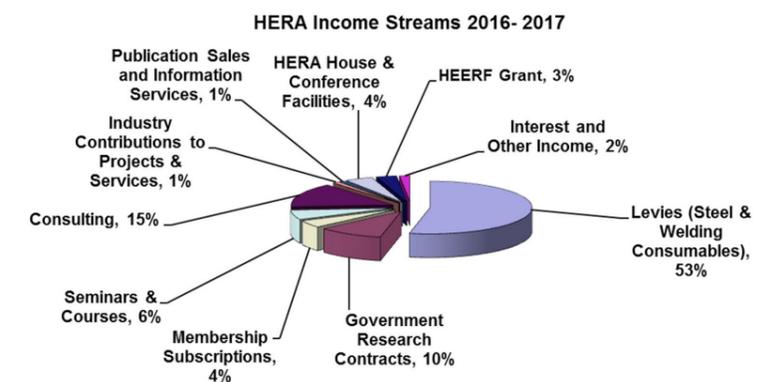
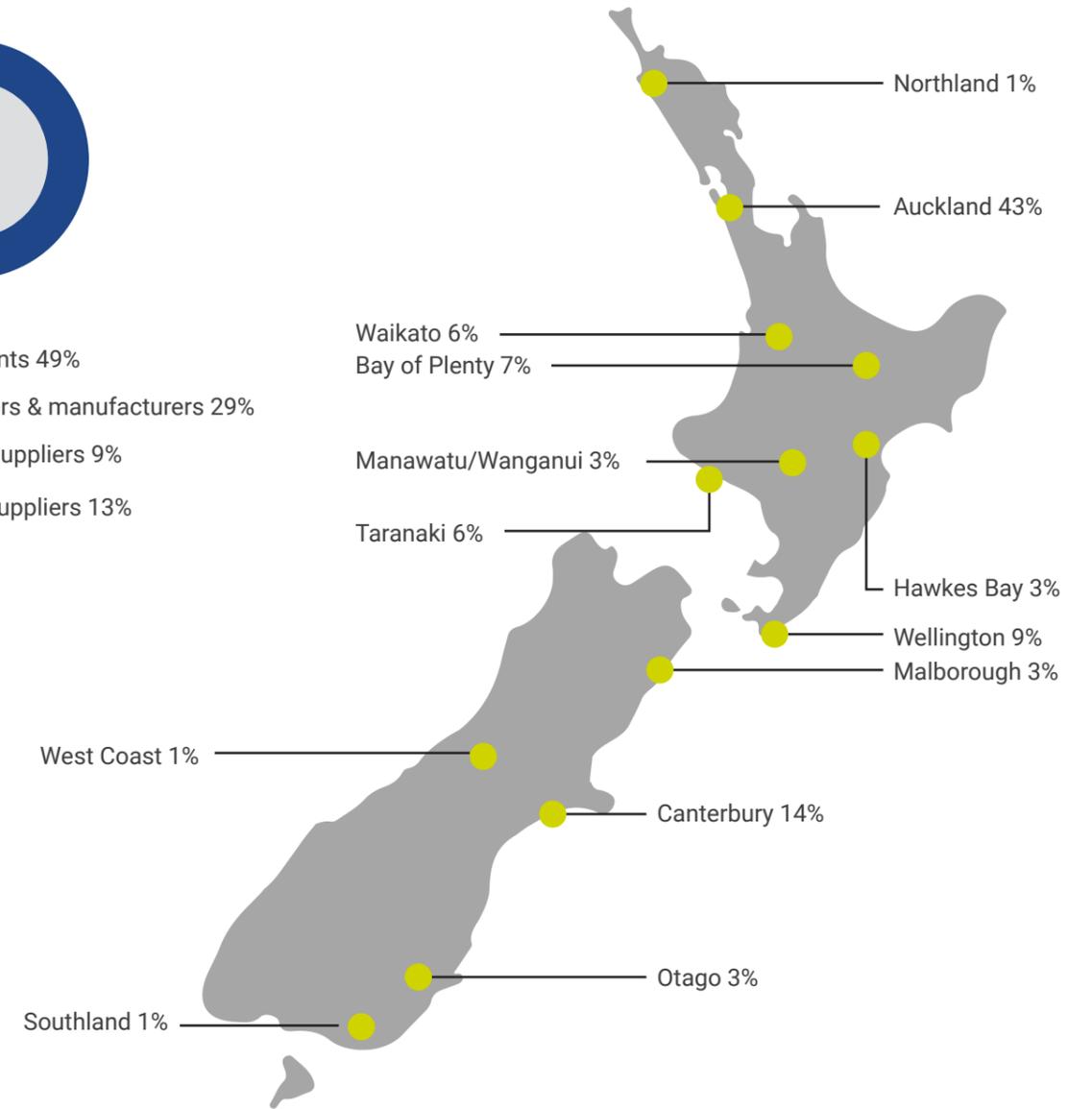
The Structural Systems division grew its share from 21% to 26% due to commercial research contracts, and the NZ Welding Centre grew by 2% to a share of 17% of all expenses.



Representing over 600 metals-based members across New Zealand



- Consultants 49%
- Fabricators & manufacturers 29%
- Product suppliers 9%
- Service suppliers 13%

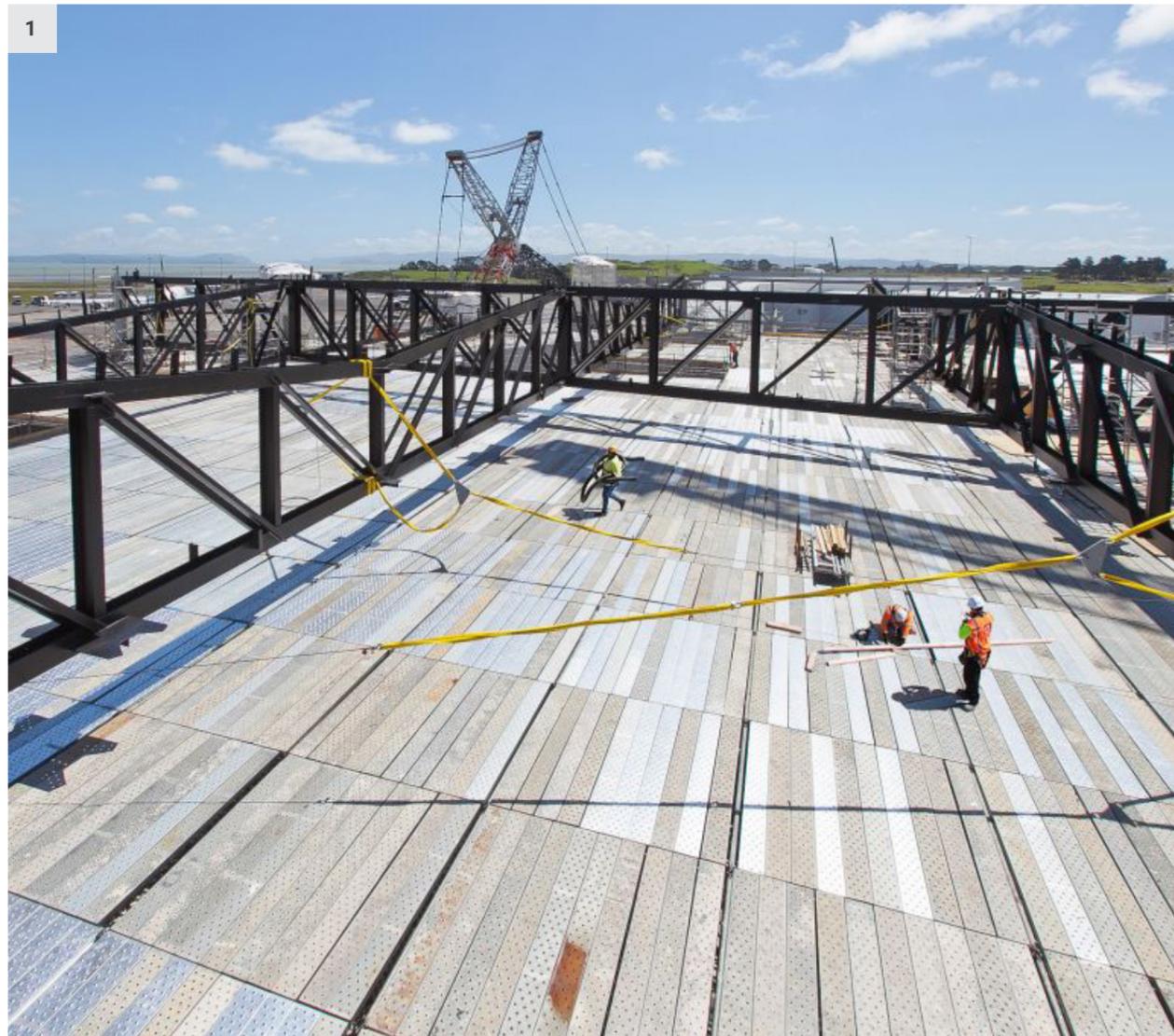


Our members' projects are meeting the needs of an unprecedented construction boom in New Zealand.

And our structures are designed to not only meet the demands of today - but stand the test of time. Delivering value over the long term and into the future.

It's all about strong resilient structures that our industry can be proud of.

| 1 | HERA member CW Beams | Sistema Plastics new factory Auckland - This 50,000sqm building consolidates the manufacturing, storage and distribution operations into an integrated purpose designed facility. At 150m wide, the main structure consists of 820T of long spanning tapered Custom Welded Beam (CWB) portal frames and spine



beams supplied by member **D&H Steel** | **| 2 |** Fresh out of HERA member **RealSteel's** 1,000 tonne 8.2m long press brake is a 7.2m long truck side formed with a single piece of 3.2mm Hardox Wear Plate. **| 3 |** **RealSteel** and their finished truck trailer combination **| 4 |** A regional meeting of the **International Institute of Welding (IIW)** was held at HERA House. Representatives from France, Finland, Brazil and New Zealand took part at the meeting to share the experiences and develop collaboration in areas of research, training and certification, and strategic leadership for the metals industry. From left: Dr Michail Karpenko, General Manager Welding Centre HERA | Prof. Vladimir Ponomarev, IIW Brazil | Dr Wolfgang Scholz, Director HERA | Dr Cecile Mayer, CEO IIW | Jouko Lassila, IIW Finland | Gary Hook, CEO Metals NZ **| 5 |** Visit to HERA member **NZ Steel** mill, Waiuku **| 6 |** Our **General Manager of Structural Systems Dr Stephen Hicks**, speaking on the first joint New Zealand and Australian bridge design standard for steel and composite construction AS/NZS 5100.6 which was launched at the Austroads Bridge Conference, Australia in 2017.





R & D

**Research and development is the
lifeblood that runs through HERA's
veins.**

We work hard to drive innovation in the metals industry to create clear pathways of opportunity for our members. All made possible through the industry contributions we receive through the Heavy Engineering Research Levy Act.

Industry Development

FY2017 was a transitional one for our industry development team.

As we adjust to the end of government funding for the AGGAT program, Dr Boaz Habib takes over the role of former GM Nick Inskip.

Under Nick's leadership, our focus was very much on the future and taking steps towards it. Successfully receiving significant government funding over a four-year period established our flagship research program as a result. New Manager Boaz takes our team forward with confidence as he has leadership capability and a strong grounding in industry development as former leader of the AGGAT program. Our Marketing and Communications **Kim Nugent | 3 |** also steps up to the plate during this time; expanding her role to include management of our ocean engineering project as well.

AGGAT program

Positively, we've made major strides in our clean energy R&D, significantly advancing and completing multiple objectives. We picked up engineering research projects for a **Maori Trust** in Rotorua and **Methanex Corporation** in New Plymouth along the way. However, this program was never meant to be for just four years. That left us with several deliverables for the next phase of development at a standstill due to a lack of funding. This also means the significant loss of technical capability and expertise, with two of our research engineering contracts concluding at the end of 2017 as a direct outcome.

Expert Design Tool R&D

HEERF PhD scholarship recipient Shoulong Dong continues to work on this project in collaboration with Dr. Wei Yu of the University of Auckland for our **organic rankine cycle** research.



Manager Industry Development, Dr Boaz Habib

This year, they advance it to an online demonstration version, incorporating features based off of feedback from research partners, end users and member companies.

Shoulong's thesis proposal is on track for completion and will be a key tool in helping to assess prospective heat sources to better inform ORC technology development, significantly cutting early development costs for project partners in the future.

ORC plant and resource R&D

A shift in priorities saw the commissioning of our member company PFS' 50-100kW ORC plant take a backseat this year. It's a disappointing outcome that has led to the exploration of an overseas option to fill what we hoped would have been a New Zealand and member made technology for our potential end user in Rotorua.

At this stage, we'll assess the feasibility to move this plant to the University of Auckland to progress its testing so this resource isn't lost. As part of building a portfolio of national heat sources, we also had our Research Intern Jenny Knittel undertake a **waste heat mapping study**. Exploring availability of waste heat across nine industry sectors to create a first draft map of it's kind.

Heat exchanger R&D

Our Research Engineer **Dr Haiam Abbas | 1 |** has validated the operating limits for refrigerant R245fa for our member ABS to advance their ORC works forward in FY2017; simulating **R245fa temperature profiles in heat exchangers** to demonstrate its capability to withstand high temperatures greater than 300° C.



Turbo-generator R&D

Our Research Engineer **Dr Lei Chen | 2 |** had significant challenges to overcome in designing a **generator casing** for our turbo-generator that met our international project partner SKF's advanced product features. Several iterations were developed to match thrust loads between the turbine and generator, with our engineering intern Hussein Salman and University of Auckland's Mechanical Engineering Lecturer Dr. Raj Sharma working closely with Lei to progress what would have been New Zealand's first **purpose-built high-speed and efficient radial inflow turbine** had funding been secured to move forward.

Materials test rig

Our **materials test rig | 4 |** hit a major milestone and was installed successfully at Ohaaki this year. Led by our Research Engineer Holger Heinzel in collaboration with many of our member companies including BOP Gear Cutters, Jensen Steel Fabricators, MB Century, Page Macrae, Steel & Tube, Initiative Engineering, Asmuss, Vulcan Steel, Dobbie Engineers and Index Engineering, as well as industry partners Contact Energy and Ohaaki Thermal Kilns. Now undergoing commissioning tests, it's been a game changer for operators in the geothermal environment to better optimise their plants. Excitingly, Victoria University Wellington is also working with us to develop their MBIE funded anti-scaling project via field-tests using this rig as well.

Control systems

Under the supervision of Dr. Wei Yu and Professor Brent Young at the University of Auckland, we investigated **dynamic control in ORC systems** for the first time, looking at directly applicable systems for small scale (<250kW) ORC operations.

Ocean Engineering

Rigorous member and end user consultation has seen us refine our efforts in the ocean engineering space. Swinging our focus from wave and tidal energy to developing robust structures capable of withstanding offshore environments instead.

Offshore fin fish farm

Following our Executive Board requests, Kim Nugent developed several tools to help our members assess their capability to take this project with strong global market potential and uptake forward. HERA successfully delivered a draft **funding application** to our members, and continues to support them in bringing the project to the business case stage.

In preparation, research intern Nine Groeneveld joined us to undertake **analysis of our marine sector capability** as well as help understand project challenges to form the basis of our proposal. Advancement of this project is currently on hold - with identified end users assessing future direction likely in alignment with upcoming Government elections.



Structural Systems

Advancing standards, guidance and rules for structural steel has been our key driver this year.

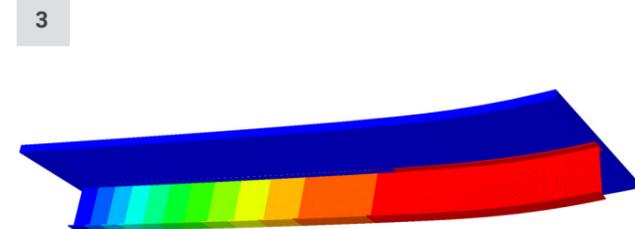
Enabling our members to push boundaries safely and to international best practice

All the while opening up the door to opportunity in what has become a highly competitive global market for our steel construction industry members.

New composite design standard for multi-storey buildings AS/NZS 2327

Started in 2012, we're proud to report the draft standard DR AS/NZS 2327 for this work was published for public comment this year. Extending the existing rules in NZS 3404 for composite beams and providing new design provisions for composite columns, slabs, joints and beams with web-openings, as well as system behaviour for floor design including human-induced vibrations, fire resistance and seismic performance.

With higher strength materials now permitted (concrete compressive strength $f_c \leq 100$ MPa and steel yield strength $f_y \leq 690$ MPa), we also undertook rigorous structural reliability analyses according to AS 5104 and ISO 2394.



| 1 | Senior Structural Engineer, Dr Jing Cao | 2 | Finite Element Analyst, Nandor Mago | 3 | Deflected shape of composite beam with insufficient degree of shear connection (example shown) | 4 | Capacity factor versus reliability index for compact sections composed of EN 10025 steel | 5 | DR AS/NZS 2327 specific push test at University of Auckland



General Manager Structural Systems, Dr Stephen Hicks

Working with the Universities of Sydney and Western Sydney these reliability analyses ensured that the new provisions delivered target safety margins. A collaborative effort that has since led to rules going beyond international standards to give greater flexibility and cost-effective buildings.

Guidance for overseas structural steel

Working closely with SCNZ, and the Universities of Sydney and Western Sydney, we've progressed with our research to investigate the impact on safety margins when steel specified by designers is substituted with products manufactured to overseas standards.

Using structural reliability analyses, we've directly evaluated the required safety factors for steel products with differing geometric tolerances and material strength variability. Some

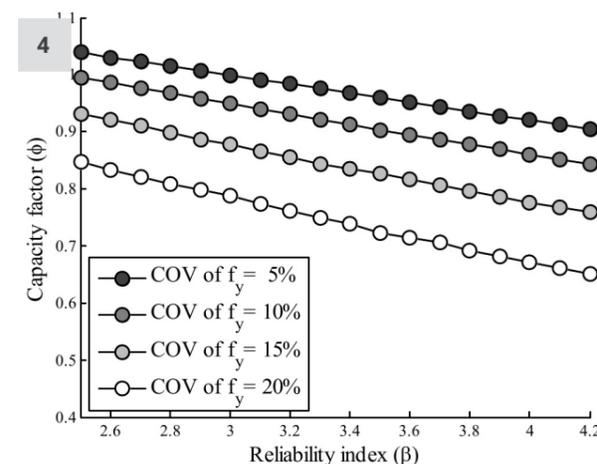


of this work is already forming the basis of the alternative steel materials appendix within AS/NZS 5100.6, which permits the use of steel manufactured to European and Japanese standards. This work was also integral for AS/NZS 5100.6 - providing quantitative evidence to support existing design practice used in New Zealand for the last 35 years.

Shear connection rules for long-span composite beams

The minimum degree of shear connection rules given in composite design standards are provided to ensure that the ductility of shear connectors aren't exceeded.

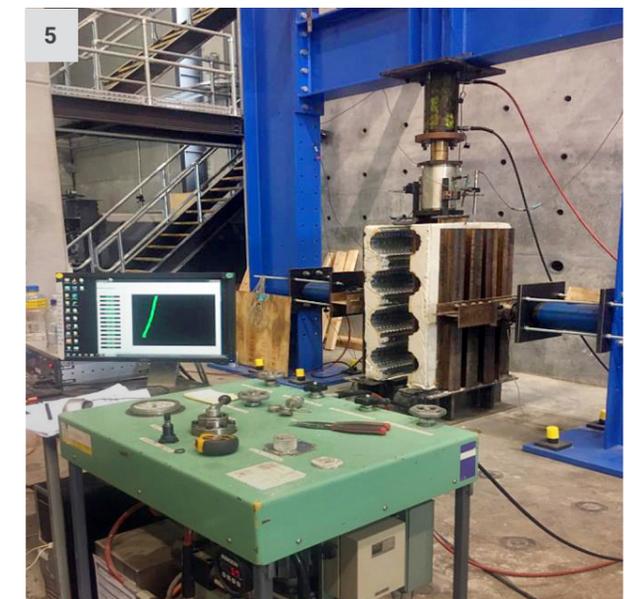
However, existing rules in NZS 3404 are based on relatively short spans which aren't appropriate for today's long-span composite beams. That's why we've been working on implementing international rules into the future composite



design standard for multi-storey buildings AS/NZS 2327 to address this.

Our research is working towards making composite beam designs to AS/NZS 2327 even more efficient by addressing cases when there are an insufficient number of locations available within modern decks to weld the required numbers of shear connectors.

Carrying out advanced finite element analysis to improve the AS/NZS 2327 rules, we hope the results will encourage the uptake of much longer column-free spans that are increasingly desired by developers, as well as create a key point of difference to competitor materials for our members.



Welding Centre

This year has seen us return to some of our core research focuses.

In particular in the areas of seismic research, welding processes and quality control.

Keeping our communities safe in seismic events is something that our nation is committed to achieving following the Canterbury and Kaikoura earthquakes.

For steel structures, we know this means we have to continue to explore ways to strike a balance between quality and safety, with the ability to innovate in design and push boundaries.

Seismic research

We're focused on developing recommendations to optimise design of seismic connections in New Zealand to make fabrication more cost-effective for our members, whilst ensuring they meet safe and adequate performance when used.

Together with our research team HEERF PhD scholarship recipient Hafez Taheri, UoA's Associate Professors Dr Charles Clifton and Dr James Lim, and University of Michigan Professor Pingsha Dong, we're investigating the performance of welded moment-resisting connections



General Manager Welding Centre, Dr Michail Karpenko

(MRC) subject to low cycle fatigue using small and large scale tests. Developing FEA-based models to simulate the behaviour of structural carbon steel and stainless steel connections to achieve this.

Using a sophisticated mechanical setup and extensive instrumentation, including around **100 strain gauges** and **six digital image correlation cameras**, we believe this work will reinforce steel structures as the ultimate and robust answer to earthquake challenges in New Zealand, whilst giving stainless steel the same confidence as it's increasingly considered for design exposed structures.

As we move forward, we'd like to acknowledge the contributions of members D&H Steel Construction and Grayson Engineering who fabricated large carbon steel connections and test support setups, as well as Stainless Structurals Asia Pte Ltd, Vulcan Stainless, Rivet Engineering, NZSSDA and SCNZ.



K area research

Supported by our member OneSteel, we're proud to announce we've completed our research on welding and inspection requirements for **welding and cutting in the k-area of rolled sections to AS/NZS 3679.1**.

Following extensive review of NZS 3404.1:2009, involving welding trials on hot rolled sections and NDT and mechanical testing – collected data led to our recommendation to update the corresponding requirements of this standard. Our data has already been considered in AS/NZS 5131:2016, creating significant economic benefits to fabricators by optimising welding in this area.

NDT and inspection

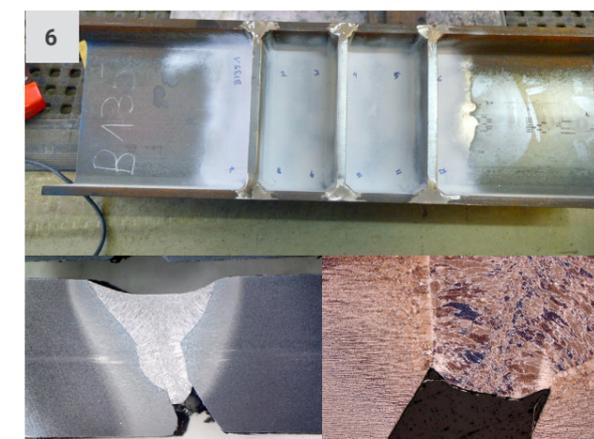
Welding inspection is an integral part of quality control systems in steel fabrication. Where the type and level of



inspection is specified for each project based on the risk factor, complexity and importance of the project.

In order to better estimate the level of defects reported in structural steel projects and identify key impact factors affecting quality of welding, we successfully performed a study involving **eight fabricators and 36 projects**. Now completed, our comprehensive database including more than **12,000 welds** will be used to develop statistical models to link inspection with reliability levels - with a corresponding paper to be presented in FY2018.

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| 1 | Senior Welding Engineer **Alan McClintock** **| 2 |** Research Engineer **Holger Heinzel** **| 3 |** NDT Specialist **Peter Hayward** **| 4 |** Seismic research team: HEERF PhD Scholarship recipient **Hafez Taheri**, University of Auckland Associate Professor **Dr James Lim** & General Manager Welding Centre **Dr Michail Karpenko** **| 5 |** Seismic test set up of SS sample **| 6 |** Examples from our K area research



Certification & verification

We're particularly proud of our efforts to deliver services and quality compliance schemes that ensure safety and reliability of steel structures in New Zealand.

We go from strength to strength as we assess the very diverse needs of our membership, finding new ways to deliver support in this space so that our members are able to declare international best practice and compete confidently in a global market.

SFC Scheme

Steel fabricators' demonstrating product conformance is key to being competitive.

Ensuring they have not only the capability but quality management systems in place to thrive.

Working closely with SCNZ, the Steel Fabrication Certification (SFC) scheme continues to grow strongly. As it works to provide industry-led quality assurance to reduce risk for specifiers and ensure participants are capable of manufacturing products to specified quality standards.

And as an outcome of FY2017, we're proud to report that the steel industry has upped their game. Making quality certification compulsory for SCNZ members by unanimous vote in September 2016. This means new SCNZ fabricator members will have to qualify for SFC prior to their membership approval, and existing members to meet this new requirement by 2020 - a timeframe given to allow the industry to adjust.

It certainly shows the overwhelming support for this scheme and a true commitment from New Zealand fabricators to raise industry standards - and we look forward to the positive rewards this will bring.

HERA Certification Ltd

As the International Institute of Welding (IIW) **Authorised National Body for Companies Certification (ANBCC)** for New Zealand to IIW MCS ISO 3834, we're able to provide New Zealand fabricators with a world class certification system. All activities of HERA Certification Ltd are controlled by an independent Governing Board, including representation from our nations fabrication industry and other interested parties.

ISO 3834 is a key part of the SFC scheme, reflecting the significance of the quality of welded connections for the safety and reliability of structures subject to high-strain earth quake loadings.

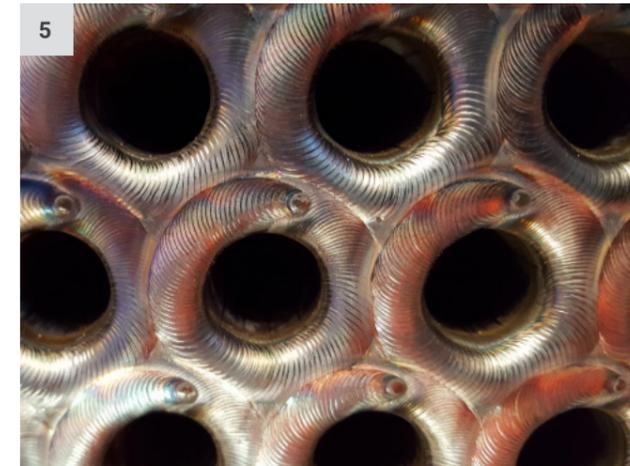
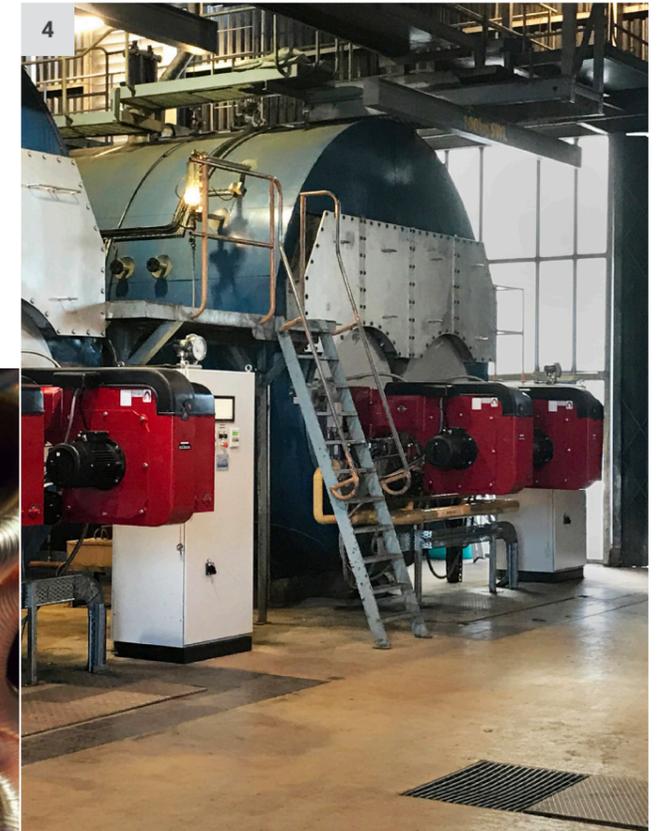
Over SFC's short three years of operation, we're pleased to share we've successfully been able to certify companies that have the appropriate personnel and quality management systems in place. With 27 structural steel fabricators representing around 80% of New Zealand's fabrication capacity now certified.

The latest group qualified recognised at SCNZ's AGM in Napier, where together with Mayor of Hastings Lawrence Yule, we presented SFC certificates to Southern Cross Engineering Ltd | 1 | Steelworks NZ Ltd | 2 | and Fitzroy Engineering Ltd | 3 |.



| 4 | Advance Boiler Services | Upgrade to MCDHB boilers
HERA member ABS provided four new Oilon dual fuel burners and two new fin tube economisers that improve the reliability of steam supply and efficiency of the boilers.

| 5 & 6 | Fitzroy Engineering | Orbital welding in action with Remarkable quality and precision finishing. The welding process has strict parameters that meet the requirements demanded from power plants, chemical plants and refineries.



HERA Verified

The media has been rife with stories of non-compliant steel this year.

Where it's either performed poorly or been utilised despite its inability to meet New Zealand standards.

Not surprisingly, this has become a key concern for many local structural engineers who are sourcing structural components from overseas.

That's why we believe it's important that our members continue to seek independent verification for products and services.

Providing our **HERA Verified** assessment scheme to award a quality mark testifying that the manufacturer's technical data has been independently assessed. And more importantly, HERA Verified confirms reliability over a range of performance data offered by suppliers.

This year, we applied this thinking to several products - most recently to the Grade 10.9 carbon steel high strength Blind Bolt for the UK Blind Bolt Company and their New Zealand distributor and HERA member Steel & Tube. This was a rigorous process where the design equations were justified through extensive structural reliability analysis.

We considered the variation in material properties, geometrical tolerance and variation in the prediction against laboratory tests to ensure the safety margin required for its application in the New Zealand and Australian markets were met.



Project

Putting grade 10.9 carbon steel blind bolts through the verification process.

Clients



Situation

The grade 10.9 carbon steel high strength bolt is excluded from the existing NZS 3404 standards. Despite a high demand for them to be used in New Zealand due to their unique capability to be assembled with access from only one side. Increasingly, this has concerned structural engineers – particularly since they're usually manufactured in higher strength steel materials.

In addition to this, the proprietary Blind Bolt boasts a unique slotted region with reduced cross section, a feature that make them incompatible with our country's requirements.

Solution

We developed final design equations for tension, shear and combined tension and shear capacities consistent with the formats specified in NZS 3404, AS/NZS 5100.6 and AS 4100.

Giving confidence to local structural engineers when it comes to utilising these bolts in projects nationwide, and supplying them with New Zealand and Australian equations they're familiar with in their day-to-day operations to easily incorporate into today's built environment.

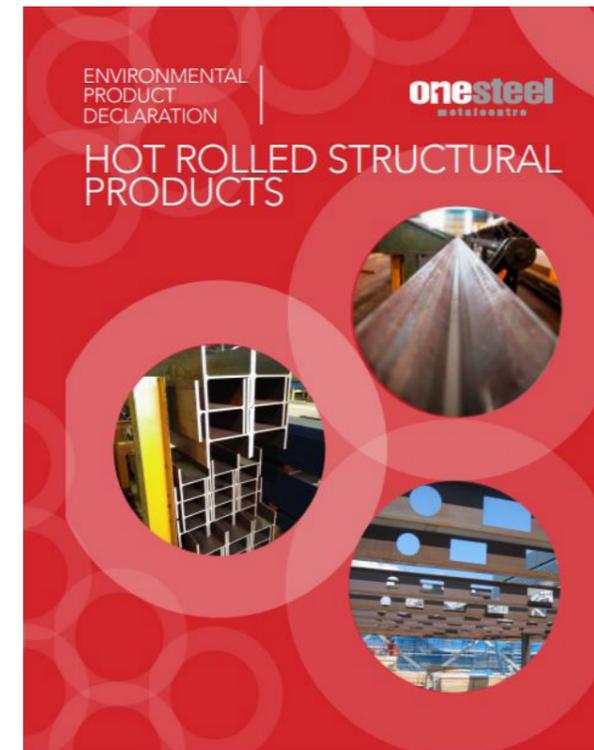


EPDs and Greenstar

Winning work is imperative for business survival – yet often comes at a cost to the very environment we live and operate in.

But what if there was a way to have one without the expense to the other for the metals industry?

The New Zealand Green Building Council (NZGBC) and their revised steel credits promote the use of structural steel in buildings through recognition of **Environmental Product Declarations (EPDs)** and **Environmental Management Systems (EMS)**. This is an initiative that provides international acknowledgment and compatibility to level the playing field, and facilitate access to export markets more effectively for our member companies.



The new Green Star steel credit itself recognises internationally accepted EPDs in their assessment of a products environmental impacts. Furthermore, ensuring that the complete value chain is captured in the ratings, the fabrication and processing of steel products is recognised through members whom possess EMSes.

Also known as Type III labels, EPDs provide a globally accepted format for declaring the environmental performance of a product in a comparable way, with each EPD following the same consistent **Product Category Rules (PCRs)** based on the products use of raw materials, energy, waste generation and emissions to the air, soil and water throughout its life.

In addition, third-party verification ensures all information is credible and consistent, and unlike many self-declared 'green' labels, doesn't claim whether a product is more sustainable or greener than another. Making the choice of selecting products on environmental grounds fall squarely on the shoulders of professionals such as architects, specifiers or procurement managers.

While EPDs are common in Europe, the US and parts of Asia, it's still got a way to come in gaining importance in Australasia. This is something that we at HERA believe needs to happen sooner rather than later if we're to help the metals industry effectively prepare for changing market needs, where sustainability is poised to become a significant driver both nationally and abroad.

That's why as members of the **Sustainable Steel Council (SSC)**, we have a strong history of actively working with NZGBC to ensure New Zealand steel is dealt with fairly in their rating system. Not only continuing to support steel reinforcement, but expanding the scope of the Green Star steel credit to include structural steel within buildings and recognising environmental impacts through the value chain from the fabrication and processing of these products.

As previously reported, we have obtained a concession for SSC members wishing to be early adopters and pursue EPDs for their products through the Australasian EPD program. Member OneSteel recently obtaining five EPDs, including hot rolled structural steel and rail to enable rating points to be awarded when their products are used in buildings.

We understand members **NZ Steel** and **Pacific Steel** made good progress in their EPD process and intends to launch their EPDs shortly.



Education

**We're absolutely focused on
keeping our existing workforce
skilled for the future.**

Because we know that our industry has to constantly evolve if we're to meet the pressures of changing consumer demand and their need for world-class products and services.

Filling the skills gap

This year's courses and seminars were tailored to our industry's needs, creating outstanding industry attendance.

Allowing attendees to improve their technical expertise and keep ahead of the latest industry developments and best practice.

For us, this is all about offering a wide range of training and professional development courses so that our members have a valuable pathway toward career advancement, and the capability to meet client expectations.

Welding training

FY2017 was a busy one for our Welding Centre, with 60 people attending our specialist training courses held throughout New Zealand.

Welding supervisor course | 1 |

In accordance with AS 2214 and International Welding Inspector (IWI) this course was offered twice over the year to motivated industry workers seeking professional development and increased employment value. Uptake was also bolstered by the SFC scheme, which now requires certified fabricators to employ appropriately qualified staff to ensure welding and fabrication operations are cost-effective and to the highest quality standard.

SCNZ's recent announcement of 15 training scholarships is a key mechanism set to drive SFC certification engagement as part of their commitment to support the steel construction industry.

This is certainly something we're proud to be able to support through our welding supervisor course in the area of welding-fabrication. We see it as a great way to drive industry engagement as we work to ensure procurers and specifiers have greater certainty of product quality from New Zealand,

and fabricators' proven procedures and personnel capable of working to international best practice.

Non destructive testing (NDT) training | 2 |

NDT is a key technology supporting quality assurance for our metals-based engineering products. In collaboration with the Australasian industry leader in NDT training - Advanced Technology Testing and Research (ATTAR), we carried out our first round of NDT training in February here in New Zealand.

Combining training in Ultrasonic Testing Level 1, Magnetic Particle Testing and Liquid Penetrant Testing Level 2, a total of 14 professionals took part. Developing core skills underpinned by technical knowledge and training in what is a very dynamic industry with a high degree of innovation.

On the back of such great success, we hope to offer more of these courses. Allowing attendees to be exposed to a wide group of testing and analysis techniques to evaluate the properties of a material, component or system without causing damage. We believe this versatile field holds ample career opportunities for our existing workforce and we're excited to help those interested in pursuing them.

Pressure equipment workshop | 3 |

Following the first industry-organised Pressure Equipment Workshop in 2014 – we're happy to have delivered the sequel in October. Covering a diverse range of industry topics on design, fabrication and operations tied together by the legal framework governing the industry we were able to inform the 108 delegates who attended the event in Auckland.

With our support, this event was organised by an active industry group under the leadership of Chairman Kevin Koorey from MB Century. Giving insight into recent developments in the pressure equipment industry, design pressure equipment, piping seismic assessment, retrofitting of plant and equipment, maintenance, as well as issues around health and safety, regulation and standards.

Of equal benefit was the panel discussion centred on IPENZ Practice Note 19 *Seismic resistance of pressure equipment and its supports* that followed. After such a well received event, we're committed to supporting this workshop biannually moving forward.

Welded connections seminar | 4 |

Following New Zealand's experiences with seismic events in Canterbury and Kaikoura, a growing need to understand welded connections subject to high levels of loadings in bridges and buildings in seismic zones, as well as in construction machinery has arisen.

With the seminar delivered by one of the world's leading experts on weld design issues Professor Adolf Hobbacher, we were able to tap into his expertise and share insights into this space.

Helping attendees understand how they can achieve satisfactory performance in welded joints using appropriate joint design, selection and verification of materials, as well as proper fabrication, inspection and quality assurance techniques.

Taking this design and analysis of welded connections seminar across New Zealand to Hamilton, Auckland, Wellington, Christchurch and Queenstown. Not surprisingly, - securing record attendance of around 120 professionals.

Designers, engineers and fabricators responsible for the integrity of products or structures must consider a variety of issues. Often involving topics that receive little or no coverage in typical engineering education or training. So having a platform like this that gives an overview of the theory of design of welded steel structures and components with plenty of hands-on guidance for structural and mechanical design engineers is invaluable.

HERA ANB

In FY2017 our IIW Authorised National Body for New Zealand delivered examination requirements for international and national welding related certificates.

This year issuing:

 10 International Institute of Welding Diplomas

 47 AS 2214 Welding Supervisor Certificates



Fingers on the industry pulse

We ensure our team is well-informed of market trends, disruptions and advances.

Attending conferences both nationally and abroad that tackle key industry specialties so we can bring learnings to our membership.

This year saw us not only gain exposure to new market technologies and approaches - but also share some of our own innovative research and development outcomes through presentations, papers and posters.

Industry Development

Our conference attendance was strongly focused on better understanding clean energy technology, particularly in the geothermal, waste heat and aquaculture spaces.

We also submitted a paper to the 27th European Symposium on Computer aided Process Engineering in Barcelona.

Engine Organic Rankine Cycle (EORRC) Workshop

Our Research Engineers Dr Haiam Abbas and Dr Lei Chen headed over to Belfast, Ireland in September - presenting two papers while there. They gained valuable insight into the industry sector, as well as securing potential collaboration opportunities in the area of **fluid efficiency, heat exchanger design and turbine performance** for members.

New Zealand Aquaculture Conference

A busy three day event in Nelson - this was a key step in our goal to drive business opportunities for our members in the ocean engineering space. Gaining exposure to a number of key players and potential end users - this conference solidified our market research which indicates **strong market potential for the heavy engineering industry** as well as the interest in combining our expertise with robust offshore fish

farm structures.

New Zealand Geothermal Workshop

We didn't go unnoticed at this Auckland event in November - presenting five papers that showcased our **innovative concepts in the fabrication of technology** to drive our membership forward. Sharing advancements in our prototype AGGAT test rig and it's ability to assist the geothermal industry in achieving longer plant life, reduced maintenance requirements and lower costs for power generation.

Following on from this, our Manager Industry Development also attended the New Zealand Geothermal Association *Pulse of the industry* seminar in Taupo. He presented on **low temperature power generation** and how it can be a part of our clean energy future.

Manufacturing and Design (MaD) for the future Conference

Our AGGAT team shared their expertise in Organic Rankine Cycle technology - presenting three papers. This was a great opportunity for us to **consolidate, connect and collaborate** with other researchers as well. This allowed us to pinpoint ingenuity occurring in the market place to better inform our own works as we move forward.

Structural Systems

This year, developing core standards for our structural members has certainly been a focus for us. And in our consultancy space, delivering finite element analysis expertise to our clients continues to drive us.

Austrroads Bridge Conference

Our General Manager Structural Systems Dr Stephen Hicks headed to Melbourne to connect with attendees from around the world with specialities in bridge engineering.

A great forum to share knowledge and innovation pathways as well as showcase our **design standards and guidance for existing steel-concrete composite bridges** and the publication of AS/NZS 5100.6 - the first joint New Zealand and Australian steel and composite bridge standard.



NAFEMS World Congress

Heading to Stockholm Sweden, our Finite Element Analyst Nandor Mago was one of approximately 630 attendees to learn about the latest in engineering modelling, analysis and simulation for the practical application of numerical engineering simulation techniques.

This was very valuable in informing our own **structural analysis, computational fluid dynamics and multibody simulation** - particularly given how it's increasingly influencing innovation development around the world.

Welding Centre

International Institute of Welding (IIW) Conference

HERA is New Zealand's representative in this international body, providing a platform for **research and technology development, education and training of personnel**, and most importantly networking.

Our GM Welding Centre Dr Michail Karpenko and Senior Welding Engineer Alan McClintock headed to Melbourne for this year's annual congress.

This was a great chance for us to hear about emerging trends, understand industry challenges and how others are overcoming them - and of course where opportunity lies. Michail also represented New Zealand at the IIW Annual Assembly.

Meet our student interns for FY2017

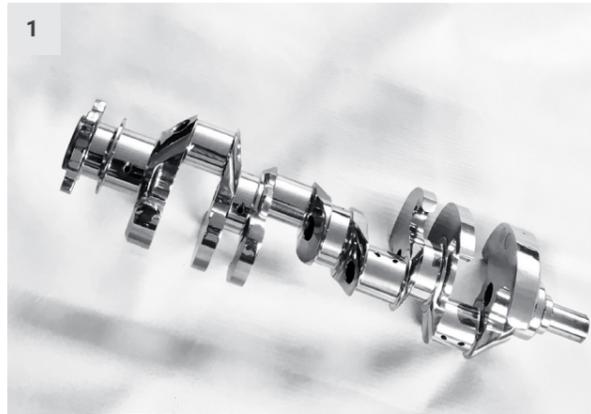


From left: Marlon Helms, Elbcampus Germany | Tobias Kick, OTH Technical University Germany | Jenny Knittel, HTWG Konstanz Germany | Patrick Schneider, Jade University of Applied Sciences Germany | Hussein Salman, University of Auckland New Zealand | Nine Groeneveld, Van Hall Larnstein University of Applied Science Netherlands | Jens Regner, Germany

Our members understand the many complexities and risks present in their clients' projects

Bringing their strong track record and commitment to each client challenge - to solve complex problems and drive innovation in strategy, sustainable design and delivery.

| 1 | Morgan Engineering | This 410 Chevy crank for a race car is isotropically super finished by sister company **Super Finishing Ltd**



| 2 & 3 | HERA member Fitzroy Engineering | 250 tonne offshore, turntable-type catenary anchor leg mooring (CALM) buoy fabricated for Monaco-based Imodco - Delivering full engineering solutions for clients around the world. Inset: Early stages of the fabrication. The central fixed part built to AWS D1.1 and a second rotating part also built to AWS D1.1. Containing all the piping, the majority rubber lined, built to ASME B31.4.AWS D1.1 and a second rotating part also built to AWS D1.1



| 4 | Acme Engineering | Z Energy Fuel Terminal Tank, Seaview Wellington - used for fire water storage, fabricated to 17m diameter x 7.8m high



HEERF Chairman report

HERA's charitable trust has made important steps to drive metals-based engineering research and career growth in FY2017.

As part of our commitment to long term sustainability for our industry.

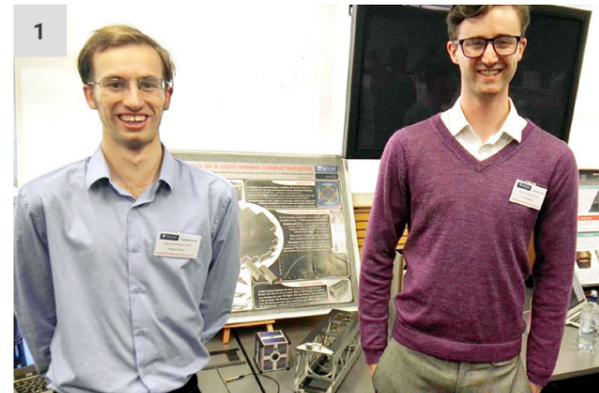
Our quest to promote the study and understanding of ferrous and non-ferrous metals in engineering through the Heavy Engineering Educational and Research Foundation (HEERF).

Our income

Our total income was \$298,615 – obtained through HERA House earnings, donations and interest on an endowment fund offered in support of our key objectives. About 60% of these funds were transferred back to industry via a grant to HERA to run a number of projects and award sponsorships. The remainder go back to administering our assets and loan repayments for the recent HERA House refurbishment.

Our grants

Continuing our efforts to drive research and industry development, we provided a grant of \$122,000 for three HERA research programs.



In steel construction's fire engineering program, PhD student Kingsley Ukanawa is working with Professor Charles Clifton from the University of Auckland (UoA) to explore ways to increase the structural performance of **concrete-filled steel columns under fire applications**. The first results have been very promising and it's hoped will lead to making steel structures more fire safe and cost-effective.

In the seismic research area, UoA PhD student Hafez Taheri has been looking at the **performance of welded connections made from novel laser welded stainless steel sections** as well as research on alternative welded carbon steel connections. His work is hoped to support the competent use of stainless in seismic structural applications and provide more cost-effective ways of making welded carbon steel connections.

In the AGGAT renewable energy program, UoA PhD student Shoulong Dong continues to work on the development of an **Expert Design Tool** which will simplify design tasks within Organic Rankine Cycle (ORC) plants and help assess prospective heat resources for this application.

Supporting professional development

This year we supported seminars run by **Professor. Adolf Hobbacher** from the Jade University in Wilhelmshafen Germany. He is one of the world's leading experts on weld design issues and delivered sessions across New Zealand to around 120 professionals.

We also promoted metals engineering to undergraduates - Supporting **final year student projects** at the UoA and Auckland University of Technology by providing awards for the best final year projects involving metals.



Extending this sponsorship to the **BRANZ ArchEngBuild** workshop brought together students nationwide to encourage cross disciplinary collaboration in architecture, engineering and construction management.

Acknowledging success in our industry

We continue to recognise specialist excellence through our commitment to building a strong technical culture within our industry. This year contributing to the sponsorship of the IPENZ New Zealand Engineering Excellence **William Pickering Award for Engineering Leadership**. Presented to distinguished IPENZ Fellow, Dr Keith Turner for his outstanding career in the electricity industry spanning technical, management and governance excellence.

Our future outlook

We're proactively investing in the future of our industry and are dedicated to supporting its long term success, as we look forward to the inception of an exciting research and scholar program recently outlined to the Trustees for FY2018.

As we pursue top-class research, innovation and understanding of disruptive technologies to boost engagement and innovation within our workforce, I'd like to remind you that you have an opportunity to make a real difference. A small donation can immediately have an impact on the future of our workforce and ability to share and foster expertise. Because if our industry isn't willing to support itself, who will?

And as your Chairman, I'd like to encourage you to make a

living donation now. Not only to be able to see the positive difference your contribution can make, but also so you can benefit from the tax rebates you're given through supporting our charitable trust.

Our people

Our Foundation relies on the generosity of our industry and the support of our board, as we work towards closing the skills gap with agility and impact. I would specifically like to thank longstanding trustee Dr John Meikle for his contributions as he retires from his position at the end of this year.

Together with fellow trustees **Duncan Fraser, Mike Lehan, and Dr Troy Coyle**, I look forward to seeing the rewards of our efforts to promote and grow the metals industry over the next few years.



Noel Davies

Chairman

Interested in donating?

Contact our Secretariat Dr Wolfgang Scholz for further details on +64 21 945 159, or via email on wolfgang.scholz@hera.org.nz



1 | University of Auckland's **Matthew Battley** and **Evan Simmers** in front of their project focused on the design, testing and analysis of a light weight CubeSat deployer for use in Rocket Lab's Electron launch vehicle which won them the best final year project award **2** | From left: Auckland University of Technology Professor Emeritus **Thomas Neizert**, and General Manager Welding Centre Dr **Michail Karpenko** awarding the best final year project in Mechanical Engineering to **Craig Fernandes** for an industrial project focused on steam turbine optimisation **3** | From left: IPENZ President **Elena Trout**, William Pickering Award for Engineering Leadership recipient **Dr Keith Turner**, and HERA Director **Dr Wolfgang Scholz** at the IPENZ Engineering Excellence Awards



Consultancy

With strong advanced expertise on hand, we thrive on taking on the projects no one else has been able to find answers to.

Providing consultancy services to help our clients apply out of the box thinking on their unique projects.

Project support

No matter the size, location or problem, we're able to deliver innovative solutions.

By leveraging our local and international expertise.

And across our teams we use this to better inform the people we work with - so they can get the most from their projects.

Geothermal ORC project with Maori Trust

Through our AGGAT program, we've developed a partnership with the Pukeroa Oruawhata Trust in Rotorua, their interest in commercial applications of their geothermal resources leading us on their journey building a state-of-the-art recreation spa facility complex by leveraging an ORC plant to achieve this.

This demonstrates not only their commitment to clean energy but also their support to advance our research and development work in the geothermal power generation space. This project has relied heavily on our inhouse technical expertise through Research Engineers Dr. Lei Chen and Dr. Haiam Abbas for ORC process design, simulation, assessments and project management.

An ongoing project, we're pleased to report we've had significant progress with five reports submitted on technology assessment and design to meet their facility requirements.

Unfortunately, original plans within the AGGAT program to service this technology requirement through our members designed and developed ORC plants hasn't come to fruition and we're currently meeting with overseas suppliers to fill this gap. The project is to start construction late 2018.

Methanex waste heat opportunities

Our engineers have made several visits to Methanex to investigate the waste heat potential of their site. Developing

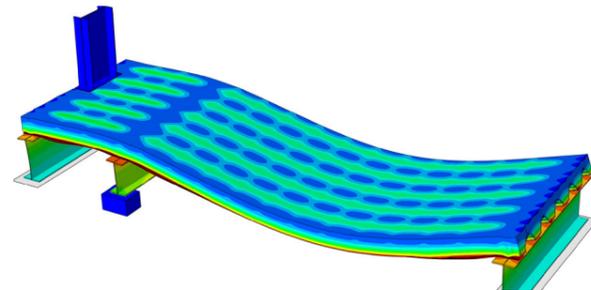
a strong collaborative relationship with their technical team to explore their processes and identify potential waste heat streams to exploit with our developing technology.

So far we've delivered two technical reports outlining waste heat opportunities within this complex chemical engineering process and will be investigating the economic feasibility of ORC installations this year.

Hibond 80

Our structural systems team has been working with Dimond on their new Hibond 80 deck product - specifically on the optimisation of composite slabs using this deck in fire conditions.

Leveraging advanced finite element analyses, we've been able to demonstrate that the bottom reinforcement bars, traditionally included within the ribs of the composite slab, could be eliminated by taking account of the deck in fire conditions to provide the main tension reinforcement. It was also demonstrated that the minimum slab thicknesses given in Eurocode 4 and BS 5950-8 could be reduced by 6%.



Temperature contour plot for Hibond 80 fire performance



Hibond 80 fire test at Warrington Fire Labs in the UK

1 | HERA member Lyttelton Engineering - an 4 MW wet wood waste water tube steam boiler under construction in their fabrication workshop, for a Canterbury timber processing plant

2 | HERA member Page Macrae Engineering - striking day and night view of a new converter installation for Ballance Agri-Nutrients at their Mt Maunganui plant.





Advocacy

We continue to be the voice of our industry.

Positively influencing political, economic, social systems and institutes through robust research, and with actions that inform policy changes for our members.

Advocating through research & action

Our industry landscape is an ever changing one.

So ensuring the best interests of our members remains at the forefront of our Government's mind is crucial.

Our members have asked us to lead the charge on policy change for our industry. And as a research association we've responded by providing the facts needed to help our sector advocate this type of change and also advocate directly where we have the expertise.

Product conformance leadership

This year saw a very public flare up around a lack of product conformance of largely imported products. This included steel based products which are being used in critical applications such as providing structural performance in buildings and bridges.

Our industry consultation led to the formal acceptance of a policy that required products independent of material to have a reliable form of independent third party verification for critical applications. We have widely advocated for this policy and are pleased to note support from a considerable number of industry bodies which have joined forces with us to get the message to the regulator for implementation support.

We have also consequently advocated for the implementation of this policy within our own industry schemes and can report considerable progress although full implementation requires more time due to the complexity of the issue.

Public sector procurement policy implementation remains unfinished business

The public sector is our industry's largest client and hence our effort to maximise our industry winning their projects ahead of imported options featured large on our agenda. Following previous research around New Zealand and international best practice in government procurement

and the implications of New Zealand following free trade principles, we applauded the general principles implemented in our Government's Rules of Sourcing.

This is especially the case for the balanced decision making criteria which mandates to considers economic, social and environmental impact of procurement decisions found our support.

However the weak link is not the Rules but their consistent implementation across the many public sector procurement agencies. In our endeavor to rectify this we supported members in providing data for their tenders with information on their fulfillment of balanced decision making criteria. Something we believe we need to continue to do until balanced decision making is accepted practice.

We also note positively that our request to clarify the current Rule 22 on 'Subcontracting' has been part of the latest review of the Rules of Sourcing and Metals NZ CEO Gary Hook presented our industry position in his submission. It is our strong view that significant subcontracts should not have the option to be excluded from having to comply with the Rules once a contract has been awarded to the main supplier.

Consideration of the Rules in major subcontracts will make local and overseas tenders compete on equal terms on a level trade playing field and will lead to better outcomes for the tax payers in terms of whole life cost and meeting economic, social and environmental goals.

Keeping involved with our stakeholders

To ensure our stakeholders are successful in their missions and understand our industry position, our staff engages with a large number of organisations such as Awatea, Construction Industry Council, NZGA, IABSE, IIW, IRANZ, University and Polytechnic advisory boards, SESOC or WTIA either on their board, committees or in the form of other engagements.

As an example of these activities developing relationships and connections, our Manager Industry Development Dr Boaz Habib has represented heavy engineering interests in the geothermal sector as an active member of the New Zealand Geothermal Association Board of Directors.

As well as promoting industry-led activities, such as the development of the fabrication and erection standard AS/ NZS 5131 and uptake of the SFC scheme, both our GMS Welding Centre Dr Michail Karpenko, and Structural Systems Dr Stephen Hicks worked closely with SCNZ and MBIE to strengthen compliance requirements for structural steel products.

We also collaborated with NZTA to provide input into their Technical Advice Note on verification testing of steel materials. Stephen also continued to represent New Zealand interests in his role as Director on the ACRS Board actively, participating in strategic renewal with other key stakeholders to improve enhanced services and value to our members who are either certificate holders or users.

Metals NZ gets more traction

HERA is a strong supporter of Metals NZ providing office support, Executive representation and sponsorship for their *Securing the Industry Future* project. CEO Gary Hook reports:



The 4th edition of the Government Procurement Rules will be released later this year, and we will amongst other things see edits to Rule 22 that will soften the application of its intent. In advocacy terms, this is real progress!

The local government agencies like Auckland Council have really progressed and developed their strategic procurement processes in line with the Rules at a much faster rate than central government, and this can only add 'moss to the rolling stone'.

Balanced decision making procurement, not lowest price, conforming decisions are predicated on the fact that tender response documents communicate economic, social & environmental attributes. This is real progress but it requires suppliers (our members) to also lift their tender game.

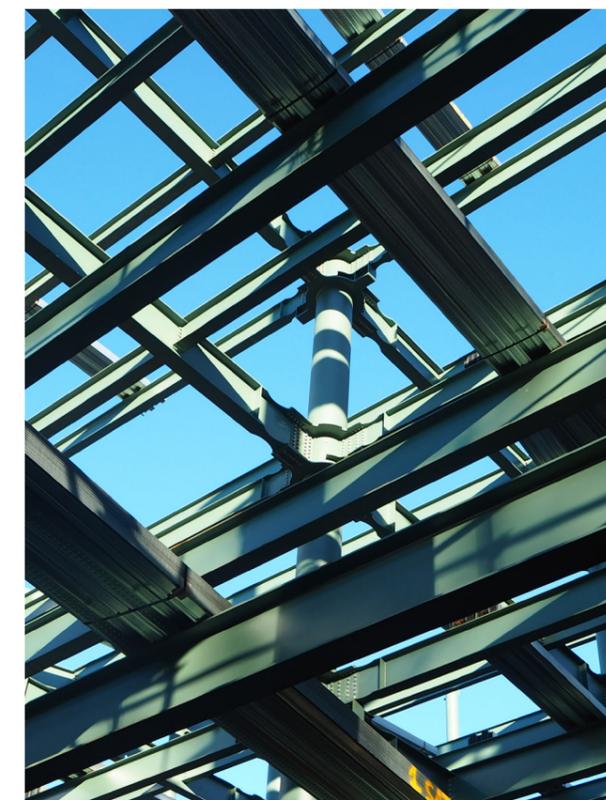
Fair Trade and Non Conformance activities have been supported across the various associations. Metals NZ is collaborating with NZMEA, Plastics, WPMA (wood), and soon to be others on common advocacy priorities affecting most NZ manufacturers, such as Standards and Fair Trade, but also to include Skills and support for Business Development/Innovation.

We believe there is much said in Wellington about our export growth ambitions but not much about creating a fair & encouraging supportive manufacturing environment that would underpin our future trade ambitions

Some of the outcomes of the limited review of the Commerce Act running these last couple of years has been argued hard against by almost all industry bodies, yet we still see a Public Interest Test adopted which we know is not in the best interest of manufacturers. From my perspective, we do need to have a pan sector industry voice and a 'keeper of relationships' in the Policy arena, so the challenge has been funding this work.

After four years, I am stepping down from the CEO role, and also after some 40 years in the metals industry. It's time to pass the baton on and refresh the approach Metals NZ is taking to represent the issues and needs of our industry in public policy matters. This will require a strengthened collective ambition by ALL industry players to help reposition manufacturing in NZ - this remains work in progress, so please keep chasing this objective down.

Best wishes to you and the industry in the future.



Pegasus Engineering Ltd | Outpatients Project - Consisting of 610 chanel sections and 800 welded beam moment frames, this shot was taken from ground floor up to fourth once the structure had been stood. The majority of the footprint went to this level with the centre plant room's additional floor taking maximum overall height to 27.6m for the structural steel.



Resources

We ensure that our members have access to the resources they need.

Sharing our research and development findings, expertise, latest standards and on the ground support to better inform their work.

Information Resources

Our focus is providing a strong communication link and efficient services to our members.

All so you can get your work done effectively and efficiently - with information you can rely on.

Resources mean different things to different people, professions and sectors. So, whether it's a publication, standard, service or product, we try to deliver what is needed to serve our wide and varied membership base.

Geothermal technology

As an outcome of our AGGAT program, we now have several resources available for use in the geothermal sector. This includes a fully certified field-based materials testing rig for geothermal applications which is well instrumented with temperature and pressure measurement devices and data logging capability - allowing users to simultaneously test multiple materials.

HERA member company PFS Engineering also has an ORC plant requiring control and cooling systems validation - presenting a resource now available for R&D uptake by any interested partners.

Member ABS Ltd almost have their heat exchanger test rig ready for commissioning to test heat exchanger performances in commercial settings. It is currently designed to work with R245fa refrigerant fluid which can be modified if required.

Launch of HERA Weathering Steel design guide for Australian Bridges

Commissioned by BlueScope Steel, we worked in collaboration with member company Opus International Consultants to develop the first HERA Weathering Steel Design Guide for Bridges in Australia. Launched at the 10th Austroads Bridge Conference 2017 in Melbourne, it supports the BlueScope Steel REDCOR™ weathering steel product manufactured according to AS/NZS 3678.



Manager Information Centre, Brian Low

Covering an extensive range of areas from design and detailing to fabrication, construction, inspection, maintenance, limitations and even rehabilitation – we were able to leverage our extensive understanding and expertise in what is already a popular cost effective solution in New Zealand. It is hoped that this guide will provide confidence to designers when specifying weathering steel in bridges, driving a similar uptake of this technology in Australia.



NZ Transport Agency research report TAR 14/07

We're pleased to confirm the NZ Transport Agency Research Report TAR 14/07 – Evaluation of Shear Connectors in Composite Bridges is now published.

It's the culmination of extensive research, historic data collection and preparation of worked examples – which reviewed international design rules for composite beam design and aligned them to our local data for the various types of existing composite bridges in New Zealand. This was not only necessary, but a natural step towards helping our members embrace new technological advances in our industry.

AS/NZS 5100.6 now published

New Zealand's standards for bridge design for steel and composite construction have found difficulty in keeping up to date and have relied on using portions of other overseas standards which sometimes haven't satisfied local needs or developments.

In 2011, it was recognised that this would have to change if we wanted to compete on a global stage and remain up to date with a rapidly changing engineering environment and proactively react to the proliferation of smarter technologies and new materials - leading to the promotion of the entire AS 5100 standards suite to be developed as joint New Zealand and Australian Standards.

This was a particularly challenging process requiring extensive consultation - and now six years on we're proud to have this completed.



AS/NZS 5131 now published

A significant milestone for our structural steel industry has been achieved with the approval of the new standard AS/NZS 5131 *Structural steelwork: fabrication and erection of steel*.

This has arisen out of concerns that product conformance doesn't meet specified requirements in an increased global construction market where quality systems vary greatly between competing suppliers from developed and lesser developed countries.

Seeing the need for a fabrication and erection document that could supplement Australian and New Zealand design and fabrication standards with international best practice, we've worked in cooperation with SCNZ and the Australian Steel Institute to fill this gap.

The fabrication part of this publication has also formed the basis for the SFC Scheme. As we work to strengthen this verification offering.

| 1 | Resource Officer, Gillian Casidy | 2 | Reception Administrator, Raewyn Porter

Canada Street Bridge - As the only curved triangular orthotropic bridge in the world, this 160m long, 300 tonne steel structure fabricated by HERA member **PFS Engineering** is formed into horizontal and vertical curves. Featuring haunching, pre-cambers, changing gradient and changing supports and spans.



Publications and papers

Conference papers

- H Abbas, B Habib, M Farid, *Novel heat transfer concepts using R245fa in organic rankine cycle with high temperature exhaust gas* in 3rd EORC workshop, UK 2016.
- L Chen, R Sharma, *Aerodynamic design and stress analysis of 100kW radial inflow turbine for organic rankine cycle system*, in 3rd Annual Engine ORC Consortium Workshop, UK 2016.
- H Abbas, B Habib, M Farid, *New concepts for R245fa direct ORC application in high temperature process heat systems*, Proceedings 38th New Zealand Geothermal Workshop, New Zealand 2016.
- L Chen, R Sharma, *Aerodynamic design and stress analysis of small scale radial inflow turbine for organic rankine cycle system*, 38th New Zealand Geothermal Workshop, New Zealand 2016.
- S Dong, B Habib, H Zheng, H Abbas, L Chen, H Heinzel, M Lie, W Yu, BR Young. *Software integration in the development of expert design tool for organic rankine cycle*, 38th New Zealand Geothermal Workshop, New Zealand 2016.
- L. Chen, R. Sharma, *Aerodynamic design and stress analysis of small scale radial inflow turbine for organic rankine cycle system* 38th New Zealand Geothermal Workshop, New Zealand 2016.
- H Heinzel, *Field based materials test rig for geothermal ORC plant components*, 38th New Zealand Geothermal Workshop, New Zealand 2016.
- H Abbas, M Farid, *Innovative design of air cooled highly finned tube condenser*, MaD for the Future: A National Conference for Innovation in Manufacturing and Design, New Zealand 2017.
- L Chen, *Aerodynamic and structural design of small scale turbine for organic rankine cycle system*, MaD, New Zealand 2017.
- WS Yu, Dong, B Habib, BR Young. *The development of a new design tool for organic Rankine cycles*. MaD for the Future, New Zealand 2017.
- S Dong, B Habib, H Zheng, H Abbas, L Chen, H Heinzel, M Lie, W Yu, BR Young. *The development of an online design tool for organic rankine cycles*. 27th European Symposium on Computer Aided Process Engineering, Barcelona, Spain 2017.
- B Habib, *Pulse of the industry*, New Zealand Geothermal Association seminar, Taupo 2017

- S Hicks, B Uy, WH Kang, AS/NZS 5100.6, *Design of steel and composite bridges*, Austroads Bridge Conference, Australia, 2017.
- S Hicks, J Cao, *Assessment of existing composite bridges*, Austroads Bridge Conference, Australia, 2017.
- B Uy, S Hicks, WH Kang, HT Tai, F Aslani, *Australasian advances in steel-concrete composite bridge and building structures*, 8th International Conference on Steel and Aluminium Structures, Hong Kong, 2016.
- N Mago, S Hicks, A Lovisa, *Fire performance of light steel framed floors in multi-story residential buildings*, NAFEMS World Congress, Sweden, 2017
- M Karpenko, *New Zealand Steel Fabricator Certification scheme - IIW Commission XIV*, IIW Annual Congress, Australia, 2016.
- M Karpenko, T Brodersen, *New Zealand NDT requirements for steel structures - IIW Document V-1723-16; SC-QUAL-234-16*, IIW Annual Congress, Australia, 2016.

Journal papers

- MJ Proctor, W Yu, BR Young. *Dynamic Modelling and Validation of a Commercial Scale Geothermal Organic Rankine Cycle Power Plant*. Geothermics. 61:63-74. 2016
- K Ukanwa, U Sharma, S Hicks, A Abu, J Lim, G Clifton, *Behaviour of continuous concrete filled steel tubular columns loaded concentrically in fire*, Journal of Constructional Steel Research, vol. 136, pp. 101-109, 2017.
- A Fussell, K Cowie, S Hicks, M Karpenko, *Basis for and implications of key changes to 2016 structural steel product standards*, SESOC Journal, vol. 30, no. 1, pp. 38-43, 2017.
- S Hicks, *Conformity of structural steel products and structures*, SESOC Journal, vol. 29, no. 2, pp. 14-18, 2016.
- A Fussell, K Cowie, S Hicks, M Karpenko, *Basis for and implications of key changes to 2016 structural steel product standards*, SESOC, vol. 30, no. 1, 2017.
- A Fussell, K Cowie, S Hicks, M Karpenko, *Ensuring compliance of structural steelwork – Regardless of origin*, SESOC, vol. 29, no. 1, 2016.

Masters thesis

- M Lie, *Dynamic simulation and control design for organic rankine cycle plants*, Master of Engineering thesis, Chemical and Materials Engineering, School of Engineering, University of Auckland 2017

HERA reports

- N. Mago, *Fire performance of light steel framed floors in multi storey residential buildings*, New Zealand Heavy Engineering Research Association, HERA Report R4-149:2016.
- H Abbas, *Small scale experimental test rig for AGGAT program*, New Zealand Heavy Engineering Research Association, HERA Report R5-67:2016.
- H. Abbas, *Design and optimization of operating Conditions of brazed plate heat exchanger condenser in ORC engine*, New Zealand Heavy Engineering Research Association, HERA Report R5-63:2016.
- H Abbas, *Design and optimization of highly finned tube evaporator in ORC*, New Zealand Heavy Engineering Research Association, HERA Report R5-61:2016.
- H Abbas, B Habib, *Refrigerant R245fa - High temperature applications*, New Zealand Heavy Engineering Research Association, HERA Report R5-64:2016.
- L Chen, *20,000rpm turbo-generator research*, New Zealand Heavy Engineering Research Association, HERA Report R5-78:2017.
- J Knittel, B Habib, K Schirmer, *Waste heat resource mapping in New Zealand and recovery using organic rankine cycle technologies*, New Zealand Heavy Engineering Research Association, HERA Report R5-72:2017.
- H Salman, L Chen, H Abbas, *AGGAT turbo-generator design*, New Zealand Heavy Engineering Research Association, HERA Report R5-76:2017.
- H Salman, L Chen, H Abbas, *100kW /20,000rpm turbo-generator design*, New Zealand Heavy Engineering Research Association, HERA Report R5-79:2017.
- H Abbas, *Waste heat sources and methanol production at Methanex NZ Ltd Motunui site*, New Zealand Heavy Engineering Research Association, HERA Report R5-73:2016.

- H Abbas, L Chen, *Feasibility study of geothermal wellbores as heat source in ORC application- PO Trust wellbores*, New Zealand Heavy Engineering Research Association, HERA Report R5-71:2016.
- H Abbas, L Chen, *Revision of Methanex waste heat sources and power output, Motunui Site*, New Zealand Heavy Engineering Research Association, HERA Report R5-81:2017.
- H Abbas, L Chen, *Geothermal resource management for ORC power generation and condenser applications*, New Zealand Heavy Engineering Research Association, HERA Report R5-74:2017.
- H Abbas, L Chen, *Geothermal ORC suppliers review for Wai Ariki Lakefront Spa project - PO Trust*, New Zealand Heavy Engineering Research Association, HERA Report R5-77:2017.
- H Abbas, L Chen, B Habib, *Geothermal site assessment for heating and power generation applications - Wai Ariki Lakefront Spa - PO Trust*, New Zealand Heavy Engineering Research Association, HERA Report R5-80 2017.
- H Abbas, L Chen, B Habib, *Geothermal ORC plant for Wai Ariki Lakefront Spa project - PO Trust*, New Zealand Heavy Engineering Research Association, HERA Report R5-75:2017.

HERA publications

- M Karpenko, S Hicks, A Fussell, P Wilcox, *Welding to AS/NZS 1554.1 of boron containing steel*. HERA Advisory Notice. Revision 1, HERA, 2017.

External publications

- S Hicks, J Cao, C McKenzie, M Chowdhury, R Kaufusi, *Evaluation of shear connectors in composite bridges*, NZTA Research Report 602, 2016.
- R El Sarraf, W Mandeno, S Hicks, *Weathering steel - Design guide for bridges in Australia.*, BlueScope Steel, 2017.
- A Fussell, K Cowie, S. Hicks, M. Karpenko, *Checklist for imported steelwork*, Steel Advisor QLT1002, Steel Construction New Zealand Inc, 2016.

1 | HERA member Farra Engineering -one of ten Building Maintenance Units designed and manufactured for the Barangaroo development of the Sydney Harbour waterfront.

2 | HERA member IMG Group - built this de-watering plant at Vale's Goro Mine facility in New Caledonia. The project site is situated some 1.5 hours drive south of Noumea in a remote location, and completed on time, to budget and with zero LTIs to date.



Report of the Independent Auditor on the Summary Financial Statements

To the Members of
New Zealand Heavy Engineering
Research Association Incorporated

RSM Hayes Audit

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Opinion

The accompanying summary financial statements, which comprise the summary statement of financial position as at 30 June 2017, the summary statement of comprehensive revenue and expense, summary statement of changes in net assets/equity, and summary statement of cash flows for the year then ended, and related notes, are derived from the audited financial statements of New Zealand Heavy Engineering Research Association Incorporated for the year ended 30 June 2017.

In our opinion, the accompanying summary financial statements are consistent, in all material respects, with the audited financial statements, in accordance with PBE FRS-43; *Summary Financial Statements* issued by the New Zealand Accounting Standards Board.

Summary Financial Statements

The summary financial statements do not contain all the disclosures required by Public Benefit Entity Standards Reduced Disclosure Regime ("PBE Standards RDR"). Reading the summary financial statements and the auditor's report thereon, therefore, is not a substitute for reading the audited financial statements and the auditor's report thereon. The summary financial statements and the audited financial statements do not reflect the effects of events that occurred subsequent to the date of our report on the audited financial statements.

The Audited Financial Statements and Our Report thereon

We expressed an unqualified audit opinion on the audited financial statements in our report dated 5 September 2017.

Executive Committee's Responsibility for the Summary Financial Statements

The Executive Committee is responsible on behalf of the Society for the preparation of the summary financial statements in accordance with PBE FRS-43: *Summary Financial Statements*.

Auditor's Responsibility

Our responsibility is to express an opinion on whether the summary financial statements are consistent, in all material respects, with the audited financial statements based on our procedures, which were conducted in accordance with International Standard on Auditing (New Zealand) (ISA (NZ)) 810 (Revised), "Engagements to Report on Summary Financial Statements".

We have formatted the financial statements of New Zealand Heavy Engineering Research Association Incorporated to which our audit opinion relates, based on the trial balance and other records of New Zealand Heavy Engineering Research Association Incorporated. We were not involved in the compilation of those records or the entries they contain. The provision of this service has not impaired our independence as auditor of New Zealand Heavy Engineering Research Association Incorporated. Except in this regard, and other than in our capacity as auditor, the firm has no other relationship with, or interests in, New Zealand Heavy Engineering Research Association Incorporated.

Who we report to

This report is made solely to the members. Our audit has been undertaken so that we might state to the members those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the Society and the members, for our work, for this report, or for the opinions we have formed.

RSM Hayes Audit
Auckland

5 September 2017

Financial notes and statements

NEW ZEALAND HEAVY ENGINEERING RESEARCH ASSOCIATION INCORPORATED

Accounting policies to the Summary Statements Summary Statement of Comprehensive Revenue and Expense For the year ended 30 June 2017

	2017	2016
	\$	\$
Revenue from non-exchange transactions	2,506,019	2,842,493
Revenue from exchange transactions	1,202,962	940,665
Total Revenue	3,708,981	3,783,158
Total Expenses	3,668,746	3,247,599
Finance income	37,595	21,878
Net surplus for the year	77,830	557,437
Other comprehensive revenue and expense	-	-
Total comprehensive revenue and expense for the year	77,830	557,437

Summary Statement of Changes in Net Assets/Equity

	Accumulated comprehensive revenue and expense
	\$
Closing equity 30 June 2015	1,084,885
Total comprehensive revenue and expense for the year	557,437
Closing equity 30 June 2016	1,642,322
Total comprehensive revenue and expense for the year	77,830
Closing equity 30 June 2017	1,720,152

Summary Statement of Financial Position As at 30 June 2017

	2017	2016
	\$	\$
Current Assets	1,874,166	2,046,618
Non-Current Assets	344,623	402,163
Total Assets	2,218,789	2,448,781
Current Liabilities	498,637	806,459
Non-Current liabilities	-	-
Total Liabilities	498,637	806,459
Total Net assets	1,720,152	1,642,322

Summary Statement of Cash Flows For the year ended 30 June 2017

	2017	2016
	\$	\$
Net cash flows from or used in operating activities	(399,411)	857,021
Net cashflows from or used in investing activities	345,963	(919,608)
Net cash flows from or used in financing activities	(271,340)	(219,751)
	(324,788)	(282,338)
Net increase in cash and cash equivalents	(324,788)	(282,338)
Cash and cash equivalents at 1 July	734,239	1,016,577
Cash and cash equivalents at 30 June	409,451	734,239

NEW ZEALAND HEAVY ENGINEERING RESEARCH ASSOCIATION INCORPORATED

Accounting policies to the Summary Statements For the year ended 30 June 2017

1. REPORTING ENTITY

New Zealand Heavy Engineering Research Association Incorporated (the "entity") is an Incorporated Society which was incorporated under the Incorporated Society Act 1908 on the 30th day of August 1978.

These financial statements were authorised for issue by the Board on 14 September 2017.

2. BASIS OF PREPARATION

a) Statement of compliance

The financial statements have been prepared in accordance with New Zealand Generally Accepted Accounting Practice ("NZ GAAP"). Not-For-Profit PBE IPSAS – RDR.

The Society is a public benefit entity for the purpose of financial reporting and the financial statements comply with Public Benefit Entity Standards Reduced Disclosure Regime ("PBE Standards RDR"). For the purposes of complying with NZ GAAP, the Society is a public benefit not-for-profit entity and is eligible to apply Tier 2 Not-For-Profit PBE IPSAS on the basis that it does not have public accountability and it is not defined as large. All reduced disclosure regime exemptions have been adopted.

The financial statements have been prepared on the historical cost basis.

The financial statements are presented in New Zealand Dollars (\$), which is the functional and presentation currency, rounded to the nearest dollar.

The summary financial statements are presented in summary form and therefore do not give all the information required by Generally Accepted Accounting Practice in New Zealand using PBE Accounting Standards (PBE IPSAS) Reduced Disclosure Regime. The Summary Financial Statements have been prepared in accordance with FRS 43 Summary Financial Statements.

Due to the summarised nature, these summary financial statements cannot provide a full understanding of the financial performance and financial position of the Company. The understanding can only be obtained by reference to the annual financial statements of the Company which is available from the registered office.

Notes to the summary financial statements For the year ended 30 June 2017

3. RELATED PARTY TRANSACTIONS AND BALANCES

Related party transactions

Heavy Engineering Educational Research Foundation (HEERF) is a related party to the Society. The Chairman, Deputy Chairman and Executive Members of the Society are HEERF's trustees.

Related party transactions	2017	2016
Management fee received	\$ (6,000)	\$ (6,000)
Administration fee received	\$ (10,000)	\$ (10,000)
Rent paid	\$ 276,220	\$ 276,220
Grants received	\$ (122,000)	\$ (113,599)
Interest income received	\$ (19,156)	\$ -
Repayment of related party loan	\$ 300,000	\$ 63,000

Related party balances

Related party balances	2017	2016
Loan receivable from HEERF	\$ 421,340	\$ 150,000

4. OPERATING LEASE COMMITMENTS

New Zealand Heavy Engineering Research Association has entered into a lease agreement to lease HERA House from Heavy Engineering Research Foundation.

Future minimum rentals payable under non-cancellable operating leases are as follows:

	2017	2016
Within one year	\$ 276,220	\$ 276,216
After one year but not more than five years	\$ 1,104,880	\$ 828,648
More than five years	\$ 1,012,807	\$ 1,519,188
	\$ 2,393,907	\$ 2,624,052



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