Occupational noise law in New Zealand – Issues and future directions

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ABSTRACT

With the introduction of the Health and Safety at Work Act 2015, many of the existing health and safety regulations in New Zealand are being replaced. The first suite of new regulations supporting the Act was released by the Government on 15th February 2016 but this did not include occupational noise regulations. This discussion paper considers the direction that occupational noise law in New Zealand may take over the next few years. This paper identifies some of the issues in the translation of the Australian model regulations into the New Zealand context and identifies other gaps that the author deems needs addressing. It also considers the approach taken with the new 'Asbestos' regulations and whether or not a similar detailed approach should be taken in addressing occupational noise issues. Finally, it proposes that the development of appropriate Safe Work Instruments may be the best way to address many of the issues identified.

1. INTRODUCTION

Imagine if, in every workplace, in every home, on every street and in every country there was an invisible harm which caused irritation and annoyance at low levels, lost productivity and diminished health at medium levels, and permanent disability at high levels.

Then, you would expect this imaginary harm to be monitored, easily assessed and comprehensively covered by ACC (Accident Compensation Corporation) as well as specified in law.

The harm is real, the harm is Noise Induced Hearing Loss (NIHL).

Yet, for most SMEs[1] in New Zealand, NIHL is not generally monitored. Worksafe New Zealand (the workplace health and safety regulator) barely mentions NIHL it in its 12,500 annual workplace assessments. And the burden of proof is so high that very few people who need support for NIHL actually make a claim.

When a major law reform took place in Health and Safety, leading to the new *Health and Safety at Work Act* 2015 (Parlimentary Counsel Office, 2015a) which has the stated purpose that workers "*should be given the highest level of protection against harm"*, someone forgot to include this particular harm - even though it has been listed in the previous Act for 23 years.

This is a harm that at high noise levels over a period of time causes permanent disability so by the time you retire to enjoy the good life, you have a severe social handicap, can't hear your grandchildren on Skype and struggle to have a conversation in your favourite café.

So what can be done about it?

2. NEW REGULATIONS DUE

Worksafe New Zealand recently released its long awaited 10-year strategic plan (Worksafe New Zealand, 2016). The targeted priorities 2016-2019 section includes the statement "*Complete our Clean Air programme and implement targeted programmes focused on work-related cancers and noise at work*". So replacing the current noise at work programme is a priority for Worksafe over the next three years.

Regulation 11 of the *Health and Safety in Employment Regulations 1995* (Parlimentary Counsel Office, 1995) sets out the current law regarding occupational noise and is due for replacement. Such replacement would likely be drawn from the Australian '*Model Work Health and Safety Regulations 2011*'[2] (Safe Work Australia, 2014), which have already been referenced in the regulations made under the new *Health and Safety at Work Act* 2015 (HSWA 2015).

An example of these regulations is the '*Health and Safety at Work (General Risk and Workplace Management) Regulations 2016'* (Parlimentary Counsel Office, 2016c). This regulation sets out duties and responsibilities for managing general risk in a workplace. A PCBU (a person conducting a business or undertaking) who fails in their duties and responsibilities may be convicted of an offence, leading to a possible fine up to $6,000-10,000 for an individual and $30,000-$50,000 for any other person.

[1] Small and Medium-sized enterprises.

[2] Model regulations in Australia are the basis for the legally binding regulations enacted or passed by Parliament in each jurisdiction of Australia. This means that each State/Territory in Australia has a slightly different version of the regulations but largely they are the same as the model regulations.

In 2016, these fines are significant - but what about in ten or even twenty years' time? Will they lose their impact, particularly if the regulations remained unamended for a long time? The issue of fines remaining current and relevant has been addressed in Australian regulations where fines are stated in terms of the number of penalty units (PUs)[3]. The value of a PU varies between Australian States and Territories and it is adjusted annually based on the Consumer Price Index. Thus, the value of a fine will maintain its significance. However, although New Zealand has followed the Australian model regulations (which serve as a template for the state and territory versions), New Zealand did not adopt the use of PUs for fines. The reason for this is not clear as over the past few years there have been two Bills (the '*Therapeutic Products and Medicines Bill*' and the '*Patents (Trans-Tasman Patent Attorneys and Other Matters) Amendment Bill*') put forward for consideration and they both include the use of PUs. Also, the New Zealand 'Legislation Design and Advisory Committee' whose '*mandate is to promote quality legislation in its guidelines*' states that:

> *New Zealand has not adopted the inflation-adjusted "penalty unit" system found in many other jurisdictions. Therefore, when comparing offences in different statutes, the penalties may be unduly low simply because of the age of the statute, and not provide an accurate guide*.

In the '*Health and Safety at Work (General Risk and Workplace Management) Regulations* 2016' (Parlimentary Counsel Office, 2016c), Part 2 *Management of particular risks*, identifies a number of specific risks, including: 'Remote or isolated work', 'Raised and falling objects', 'Substances hazardous to health', and a range of other risks. But occupational noise is not listed in the set of general risks to be managed. Given noise is an issue in many workplaces; it ought to have been included in these general regulations.

Chapter 4 of the Australian model regulations, 'Hazardous work', begins by defining the "*exposure standard for noise*" in Part 4.1, with reference to the joint Australian New Zealand Standard, AS/NZS1269.1:2005 *Occupational noise management—Measurement and assessment of noise immission and exposure* (Joint Technical Committee AV-003, 2005). The next section covers '*Managing risk of hearing loss from noise*' where it is mandatory for a PCBU to manage the risks to health and safety relating to hearing loss associated with noise. However, the appropriate part of the AS/NZS1269 *Occupational noise management, 'Part 2: Noise control management'*, is not referenced. The next section covers '*Audiometric testing*', but again does not reference the appropriate part of the AS/NZS1269 *Occupational noise management, 'Part 4: Auditory assessment'*. A potential reason for this is these regulations state that audiometric testing must be done "*at least every 2 years*" whereas in the current version (updated in 2014, almost three years after the model regulations were first released) of this standard does not provide clear guidance on the frequency of testing. However, the forward of this standard acknowledges this by saying:

"Most jurisdictions have… laws with general requirements for health monitoring workers exposed to hazards and specific regulatory requirements for regular audiometric testing of workers whose noise exposure is such that they need to rely on hearing protectors from risk management".

The final section of Part 4.1 of the Australian model regulations titled '*Duties of designers, manufacturers, importers and suppliers of plant'*, is a very worthwhile section as it attempts to address the issue noise at the source by ensuring "*that the plant is manufactured so that its noise emission is as low as is reasonably practicable*".

2.1 Exposure standard for noise

As above, Part 4.1 of the Australian model regulations sets out the "*exposure standard for noise*". As stated, it gives the impression that action should only be taken when the sound level exceeds 85 dB $L_{Aeq,8h}$ or 140 dB L_{Cpeak} for a worker. Contrast this with the United Kingdom where Section 4 of the '*The Control of Noise at Work Regulations 2005'* (UK Legislation, 2005), has two exposure action values:

> 1) The lower exposure action values are—
> a) a daily or weekly personal noise exposure of 80 dB (A-weighted); and
> b) a peak sound pressure of 135 dB (C-weighted).
> 2) The upper exposure action values are—
> a) a daily or weekly personal noise exposure of 85 dB (A-weighted); and
> b) a peak sound pressure of 137 dB (C-weighted).

The advantage of having a lower exposure action value is that it provides PCBUs (and workers) with clear guidance on when they must take action. This is more than a practical issue, as often when noise surveys are completed and levels are shown to be in the range 80-84 dB $L_{Aeq\ 8h}$, the PCBU will say it is less than 85 dB, 'so I don't need to do anything'.

[3] Is an amount of money used to compute pecuniary penalties for many breaches of statute law. Fines are calculated by multiplying the value of one penalty unit by the number of penalty units prescribed for the offence.

2.1.1 Measurement uncertainty

The issue of the accuracy of the sound level measurements is important, especially when measurements are close to the exposure criteria. In AS/NZS1269.1:2005, Section 7 'Instrumentations and calibration', it states that "*if Class 2/Type 2 meter is used, allowance should be made for the reduced accuracy of this type of instrument*". Then in Section 8.4 'Measurement period' it says:

> *The choice of measurement time intervals shall be such that the measurements result is determined by the desired accuracy and is representative of the person's long-term noise exposure*

Then finally in Section B6 'Evaluation of noise', it says that training courses on noise assessment should include "*standing waves in rooms and their effect on measurement accuracy*". None of this deals directly with the issue of the accuracy of the measurements and provides no real guidance on working out an uncertainly budget for the measurements. Straight out of the box, a Class 1 sound level meter is going to have about $\pm$ 1.1 dB tolerance at 1 kHz (International Electrotechnical Commission, 2013) before any measurements are made. Environmental and operational effects are likely to increase this by approximately another 3 dB, producing a tolerance and thus uncertainty of about +/- 4 dB[4]. The practical impact is that when the measured exposure is say, 83 dB $L_{Aeq,8h}$, the real value could be as high as 87 dB. Knowing that it could be this high puts greater pressure on the PCBU to take action to reduce the noise exposure risk.

2.2 Approved code of practice

The Australian regulations are supported by the Approved Code of Practice (ACoP) from Safe Work Australia, titled '*Managing noise and preventing hearing loss at work*' (Safe Work Australia, 2015). The introduction to the ACoP begins in a holistic way by stated that "*Hazardous noise can destroy the ability to hear clearly and can also make it more difficult to hear sounds necessary for working safely, such as instructions or warning signals*". It then goes on to say that managing risks related to noise will assist in:

- protecting workers from hearing loss and disabling tinnitus (ringing in the ears or head);
- improving the conditions for communication and hearing warning sounds, and
- creating a less stressful and more productive work environment.

However, the opening sentence in Section 3.1 'How to find noise hazards' says, "*You may not need specialist skills to identify sources of hazardous noise*". 'The authors interpretation of this is to give the impression that any person can do noise risk assessment by simply following the ACoP guidance, which in most cases is unlikely to be true, except perhaps at a 'screening level'.

Later on the ACoP introduces '*noise exposure points*' with 85 dB $L_{Aeq,8h}$ equal to 100 points. It then provides various tables with point values for different combinations of time-averaged sound level ($L_{Aeq,T}$) and their corresponding duration, T. In reality these points are just percentage dose ($L_{Aeq,8h} \equiv 1.0$ Pa^{2}h = 100 % dose) and in the authors view, most people would be much more competent and comfortable with idea of percentage noise dose (% dose) than what appears to be a somewhat arbitrary points system. A key advantage with using the % dose or the points system is they are both linear units and partial doses can simply be added together to give the total noise dose or exposure.

At this point the question should be asked: Who is the ACoP aimed at? In the ACoP, the answer is clearly the PCBU. But do they have the equipment and expertise to measure the sound pressure levels required in order to use the 'noise exposure points' tables? For most SMEs, the answer will most likely be 'No'. So by following the ACoP, a PCBU may be taking on duties and responsibilities that are likely to be well outside their competence, unless they engaged someone with appropriate expertise. However, an important purpose of the ACoP is to get the PCBU to think about possible noise hazards in their workplace and using a risk management approach, take appropriate action to address the risk even before measurements are taken.

3. WHERE ARE THE GAPS?

Assuming New Zealand follows the Australian model regulations and addresses the issues identified above, what other gaps are there?

3.1 Duty

One of the first regulations released by the Government under the HSWA 2015, is the '*Health and Safety at Work (Asbestos) Regulations* 2016' (Parliamentary Counsel Office, 2016b). These regulations are based on the Australian model regulations. The reason this set of regulations needs consideration is as follows, there is a:

[4] The tolerance would double if extended to a 95% confidence as would normally be the case for environmental noise assessment.

1. Duty to ensure it is identified at workplace;
2. Duty to ensure presence and location is indicated;
3. Duty to prepare a management plan;
4. Duty to review the management plan;
5. Duty to provide health monitoring;
6. Duty to ensure that appropriate health monitoring is provided, and;
7. Duty to train workers about the risk.

So rather than having a minimalist section titled something like '*Managing the health risk of asbestos*', they have chosen to, in significant detail, spell-out all the duties this entails. Although handling, storage and disposal of asbestos containing materials, potentially represents a much greater hazard to workers compared to noise exposure, in the author's option, a similarly detailed approach should apply to occupational noise.

3.2 Cost

Clearly asbestos is not in every workplace, in fact it is rather uncommon nowadays and issues tend to only arise during renovations, demolition and disposal work. Asbestos has certainly gained prominence as a result of the rebuild work after the Christchurch earthquakes of 2010 and 2011 in particular.

Many of the diseases associated with asbestos exposure do not develop for 15 to 40 years after first exposure and they lead to severe disability through to death. The timeline for NIHL is similar, with early signs of NIHL showing up after about 10 years exposure and severe symptoms occurring after 30-40 years exposure. People do not directly die from NIHL, as noted above, but the severe social handicap that results means that an individual's quality of life is significantly diminished which in turn leads to a significant public health burden.

In regards to asbestos, about 10,000 (0.003%) Americans die each year of asbestos-related diseases and a further 200,000 (0.06%) are living with asbestosis (Mesothelioma Cancer Alliance, 2010). In contrast with NIHL (NIOSH, 2013), where in 2007, 10 million (3.1%) people in the United States had NIHL and 22 million (6.8%) workers were exposed to potentially damaging noise each year. Furthermore, reported cases of hearing loss in the United States accounted for 14% of all occupational illness.

"Worldwide, 16% of the disabling hearing loss in adults (over 4 million DALYs[5]) is attributed to occupational noise, ranging from 7% to 21% in the various subregions" (Nelson *et al.*, 2005). Closer to home the Australian authors of the provocatively titled paper 'Occupationally-Acquired Noise-Induced Hearing Loss (ONIHL): A Senseless Workplace Hazard' (Kurmis and Apps, 2007) states that:

> *Data suggest that excessive noise attributes to ≈37% of all adult causes of hearing loss and remains a significant contributor to employment-related morbidity internationally.*
>
> And then goes on to say:
> *…impact of ONIHL on the global transition toward dominant communication-rich white-collar employment roles is difficult to quantitate, but is likely to be substantive upon the afflicted individual.*

Using the Australian author's estimates of the burden associated with hearing loss, the cost of ONIHL is in excess of AU$4.3 billion or about 0.5% of the gross domestic product (GDP) and thus represents a significant burden on health and social services. For New Zealand the cost of ONIHL as a percentage GDP, is likely to be similar to Australia, meaning the real cost is closer to NZ$900 million per year. Contrast this with the $40 million per year in new claims it costs ACC and the few million dollars per year allocated by Worksafe NZ to occupational noise and you can see there is a huge gap that needs addressing.

3.3 Competent person

Throughout the Australian model regulations, the phrase "*competent person*" is used, typically with guidance that jurisdictions will insert in paragraph a reference to a licenced or required authorisations or membership.

When the asbestos related sections of these Australian model regulations were enacted in Australia, and in New Zealand turned into regulations (Parlimentary Counsel Office, 2016b) under the HSWA 2015, it was clear that:

1. Focus is on removal of the contaminant by a practitioner holding a current certificate;
2. Licensing of removalists and assessors;
3. Register of removalists and assessors.

[5] Disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

This means that professionals working in this area must be certified and registered and probably belong to a professional organisation. The author's opinion is that the same should be required for people working in occupational noise.

3.4 Peak limits

For many years' regulations specifying limits on occupational sound exposure have had two-part criteria; one criterion for the continuous exposure and another criterion for instantaneous exposure from impulsive sound. The origins of having a separate peak sound pressure level criterion date back to the work of the United States Army Aeromedical Research Laboratory (USAARL) on the role of peak pressure in determining the auditory hazard. In the report (Patterson *et al.*, 1986) they state:

> *…results indicate that peak sound pressure level is not sufficient indicator of auditory hazard; however energy alone is not a sufficient indicator either.*

On the basis of the Australian model regulations "*exposure standard for noise*", a single exceedance of the 140 dB L_{Cpeak} criterion by a worker could result in fine. However, measuring peak levels robustly and accurately can be quite difficult, especially when dosimeters are used, as false peaks can easily occur simply due to the microphone being bumped or coming into contact with a hard surface. Also, most sound level meters (or dosimeters) for occupational assessment are limited to maximum peak range of 143 dB. This means that with a limit of 140 dB, this leaves little measurement over-range margin. As shown earlier in section 2.1 of this paper, the United Kingdom has two exposure action values in their regulations, with two different peak criteria; 135 dB L_{Cpeak} for the lower action value and 137 dB for the upper value. Using these lower limits means that there is now significantly greater measurement over-range margin. Also, by having a lower and upper exposure action value, this provides PCBUs (and workers) with clear guidance on when they must take action. This is especially true when measurement uncertainty is taken into account.

3.5 Access to standards

If regulations refer to a Standard (New Zealand Standards in particular) and there is a reasonable expectation that in order to meet the regulations, the PCBU has read and understood the Standard, then it seems reasonable that access to the standard, like access to the regulations, should be at minimal cost. Currently to purchase the AS/NZS1269 occupational noise management series would cost more than $630 from the Standards New Zealand web-store. However, this might change now that Standards New Zealand is part of Ministry of Business, Innovation and Employment (MBIE) as a result of the new '*Standards and Accreditation Act 2015*' (Parliamentary Counsel Office, 2015b), which came into full force on 1st March 2016. One of the stated purposes of the new Act is "*make provision for access to New Zealand Standards*".

3.6 Non-Auditory effects of noise

Non-auditory effects of noise on human health are widespread and significant. The excellent article (Basner *et al.*, 2014) published in the Lancet reviews the literature on both the auditory and non-auditory effects of noise on health. In an occupational setting, the '*exposure standard for noise*' is primarily focused on the hazard of hearing damage (NIHL), but a wide range of other undesirable effects can occur at levels well below the damage criteria. Section 8.3 of the joint Australian - New Zealand Standard, AS/NZS 2243.5:2004 *Safety in Laboratories Part 5: Non-ionizing radiations – Electromagnetic, sound and ultrasound* (Joint Technical Committee CH-026, 2004), provides some guidance on this issue. As well as covering exposure to light and electromagnetic sources (of various types), it covers sound and ultrasonic radiation. In the general section 8.3.1 *Effect of noise*, it states that health effects can include: a) Temporary or permanent loss of hearing acuity; b) Interference with speech and communication; c) Disturbance of concentration tasks. This section then goes on to say that "*…infrequent, single, extremely loud sounds can cause instantaneous, permanent hearing damage*". Section 8.3.4 *Disturbance of concentration tasks* states that:

> *...various levels of background noise can disturb concentration… the more complex the task the greater the disturbance… keep levels below AS/NZS 2107, these problems will not arise.*

The referenced joint Australian - New Zealand Standard above, AS/NZS 2107:2000 Acoustics - *Recommended design sound levels and reverberations times for building interiors* (Joint Technical Committee AV-004, 2000) specifies maximum design sound levels, defined as the "*level of noise above which most people occupying the space start to become dissatisfied with the level of noise*". The recommended maximum design sound level for industrial buildings is 70 dB L_{Aeq} for a general assembly lines and drops to only 50 dB L_{Aeq} for precision assemblies. Workers exposed to levels above these limits (which are much lower than the auditory hazard limits) are likely to show reduced productivity, increased stress and increased risk of accidents.

3.6.1 Sound and vibration

The use of A-frequency weighting for continuous exposure noise criterion has been used for many years and is appropriate in the context of auditory damage. However, because this weighting significantly attenuates the contribution of low-frequency sound to the measurements, using an A-frequency weighted descriptor is likely to substantially underestimate the non-auditory effects of low-frequency sound on worker health. Section 8.3.5 *Low-frequency sound and infrasound non-auditory effects* of AS/NZS 2243.5:2004 summarises these effects as:

- Low-frequency sound, up to 200 Hz can have non-auditory effects on the body
- At low levels, can lead to an individual feel unwell and can include feelings of nausea and headaches
- At high levels can result in physical damage
- Infra-sound is sound below 20 Hz and has similar non-auditory effects on the body to those of low-frequency sound

And then goes on to say:

To address these non-auditory effects, action should be taken with reference to appropriate OHS vibration exposure standards and procedures.

Currently in New Zealand there are no exposure standards and procedures that would cover this, and most international standards relating to vibration are '*damage criteria*' based, not health effects based. Such standards are typically designed to prevent 'Vibration-induced white finger (VWF)' and/or 'Hand-Arm Vibration Syndrome (HAVS)' (Anonymous., 2008), as opposed to other health effects.

It is interesting to note that the somewhat artificial division between sound and vibration is not present in the New Zealand Resource Management Act 1991 (Parlimentary Counsel Office, 1991), where the definition of noise includes vibration and there is a "*duty to avoid unreasonable noise*" and thus vibration.

3.7 Safe work instruments – A possible direction?

The HSWA 2015 contains new language and concepts that were not used in its predecessor. In particular it includes "*legislative instruments*" (LI)[6] of one form or another. The glossary to New Zealand Legislation (Parlimentary Counsel Office, 2016a) states "*Legislative Instruments generally deal with technical details that may be subject to frequent change*." The method of their making is what sets the LI apart from its empowering legislation. While Acts are passed by Parliament, the LI is made by Order in Council (not Parliament) and signed into law by the Governor General. Before 5 August 2013, LIs were most commonly known as regulations. Acts which came into force before that time still refer to regulations, and LIs released to date under the HSWA 2015 are also called regulations.

In addition, the HSWA 2015 provides for 'Safe Work Instruments' and 'Codes of Practice'. A safe work instrument (SWI) has legal effect (it is legally binding). However, it is not a LI, and should not be described as law. Its legal effect is also constrained solely to "*the extent that any regulations made under the relevant health and safety legislation refer to it.*" As the SWI is a vehicle by which the regulations are applied, it would seem that the instruments could be enforced in a similar manner to the regulation. That is, a Court could state that failure to comply with the safe work instrument is unlawful.

The HSWA 2015 states that SWIs:

- Are developed by regulators;
- Have limited purposes;
- Must not be approved if consultation is required to be done;
- Must be approved by the Minister;
- Must be presented to the House of Representatives within 16 days of the Minister making the SWI;
- Must be notified and made available.

Section 227 of the HSWA 2015 states that:

The purposes of safe work instruments are to define terms, prescribe matters, or make other provision in relation to any activity or thing, including (without limitation) listing standards, control of substances, and competency requirements.

Currently there have been no SWIs made under the HSWA 2015. One of the appealing features of SWIs is that they are developed by the regulator (Worksafe New Zealand in this case), are likely to be developed in consultation with the effected parties and only require final approval by the Minister. This potentially makes them far more agile and able to change to meet the needs of all parties, compared to LIs (or regulations), which usually do not change for many years and sometimes decades. The scope of the purpose of SWIs includes; listing standards, control of

[6] The term "legislative instrument" is defined in the Legislation Act 2012, section 4. It includes "Orders in Council, regulations, rules, notices, determinations, proclamations, or warrants."

substances, and competency requirements. Thus, developing a comprehensive set of occupational noise SWIs to support the new regulations (when developed) may be the best approach to address some of the technical and practical issues raised in this paper.

4. CONCLUSIONS

This discussion paper has attempted to identify where the noise legislation in New Zealand is likely to go over the next few years. Along the way, issues have been identified in the translation of the Australian model regulations into the New Zealand context. A number of other gaps in the legislation have been identified that the author thinks needs addressing and has proposed some solutions.

It will be interesting to revisit this in 3 years' time when Worksafe New Zealand has replaced the current noise at work programme, and reflect on the direction occupational noise law took and whether or not safe work instruments were developed as the preferred legally binding tool to support changes in noise legislation.

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