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Regulations for the Dam Safety Scheme May 2006

Submission to the Department of Building and Housing
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Background to the New Zealand Society on Large Dams (NZSOLD)

NZSOLD is a Technical Interest Group of the Institution of Professional Engineers New Zealand (IPENZ). NZSOLD is made up of corporate members including the owners of large, medium and small dams; regional, district and city councils; consultants and contractors providing services to the dam industry; and a number of individual members and stakeholders.

The objectives of NZSOLD are as follows:

- To promote best practice in the development, operation, maintenance and refurbishment of dams and their associated impoundments throughout New Zealand.
- To integrate industry best practice into the regulatory processes associated with the dam and impoundment management industry in New Zealand.
- To be recognised as a credible and respected professional body, and the national focus for all matters relating to dams and their associated impoundments in New Zealand.

The following submission represents the views held by NZSOLD in its capacity as a representative of the wider dam industry. However, we understand that many of our members will be making individual submissions to your proposals from their own perspective, and we respect their views. This submission does not represent the position of our regional council members as they have indicated that they wish to make submissions on your proposals separately.

In reference to the indicative timeframes outlined on page 2 of the discussion document, we understand that the regulations are unlikely to be approved until mid to late 2007. We request that further consultation be carried out once the wordings of regulations have been amended as a result of the submission process. As discussed in this submission some of the issues covered by the regulations are technical and the wording can significantly influence outcomes. We also note that DBH has indicated to the dam industry that amendment to the Act is under consideration. The matters covered in this submission may be closely related to any such amendment, and we would welcome the opportunity for further consultation should this situation arise.

This submission is strongly supported by IPENZ, the lead national professional body representing the engineering profession in New Zealand. IPENZ has approximately 10,000 Members, including a cross-section from engineering students to practising engineers to senior Members in positions of responsibility in business. IPENZ is non-aligned and seeks to contribute to the community in matters of national interest giving a learned view on important issues, independent of any commercial interest.

Executive Summary

In reference to the *Regulations for the Dam Safety Scheme: Discussion Document, May 2006*, NZSOLD would like to thank the Department Of Building and Housing (DBH) for the opportunity to make a submission on the current proposals.

In general we support the proposed regulations but have made a number of detailed comments and recommendations that are presented in the body of our submission. These comments are referenced to the relevant sections and questions in your discussion document.

Further to the matters of detail, we have submitted on several substantive points that primarily relate to the dangerous dams component of the regulations, and our concerns with the related wording in the relevant clauses of the Act. In our view there is potential for the credibility of the proposed dam safety regime to be compromised by the use of definitions and terminology that are not consistent with hazard management best practice. We have also identified the need for care to be taken in limiting the roles of technical specialists through inappropriate extension of the newly defined “recognised engineer” role. The need for further consultation and development of the dam owner accreditation system is also highlighted.

Submission

Foreword

Throughout the foreword and document it is stated that the regulations aim to ensure the risks relating to “larger dams” are managed.

It should be noted that any dam safety regime, including legislation and regulations, should focus on those dams whose failure would have significant social, financial and environmental impact on the community. This impact is not necessarily directly linked to the physical size of the dam. We do not think the tone of this section has clearly conveyed this message.

- **Paragraph two**

Paragraph two states: “The risk factors for a dam can change over time, and there are currently no systems in place to recognise this.” We feel that this generalisation is misleading. While the statement may be true in some cases, it should be noted that a significant number of dam owners in New Zealand currently manage their dams under dam safety assurance programmes that specifically consider and respond to changes in risk factors. We believe that this should be clearly acknowledged.

- **Paragraph six**

“The dam safety scheme incorporates elements that aim to limit the regulatory impacts and help to minimise compliance costs.”

We endorse the aim stated above and consider that any regulations must provide an appropriate risk management regime for dams while balancing the imposed costs and practicality of implementation. We also support the concept that, rather than being

prescriptive, regulations should be performance based and reflect the intent of the Building Act 2004 (the Act).

Introduction

While we support the attempt to clarify “what is a dam” as specified in the Act, it should be noted that there are several issues concerning the definition of a dam that should be clarified in the regulations so that there is uniformity of application across New Zealand.

The definition refers to water/fluid three metres or more in depth and 20,000 cubic metres or more in volume. It should be noted in the regulations that fluid could include sediment that would be mobilised in the event of a dam failure.

It should also be noted in the regulations that the definition should include flood detention dams despite the fact that their contents do not subject the structure to constant pressure as specified in the Act.

The regulations refer to “full supply level” in determining the dam height. Full supply level needs to be defined for dams with free overflow spillways as the spillway crest level. For dams with gated spillways the full supply level should be defined as the normal maximum operating level.

Page six of the discussion document refers to regional authorities approving or refusing dam classifications, dam safety assurance programmes and dam compliance certificates. When submitting these items to the regional authority the Act requires the owner to provide a certificate from a recognised engineer. Regional authorities can only refuse to accept the dam classification, dam safety assurance programme and dam compliance certificate if they are unhappy with the status of the recognised engineer. This should be made clear in the regulations.

Page six of the discussion document refers to accrediting dam owners for “the classification and management of dam safety assurance programmes”. The Act refers to owners being accredited for the purpose of classifying the dam and the preparation of a dam safety assurance programme without the need for approval from the regional authority. However, there is no reference in the Act to accreditation for the purpose of ongoing dam safety management.

Question 1

In reference to Question 1 NZSOLD considers that the three month period for the classification and registration of existing dams is too short for the following reasons:

- There are limited technical resources in New Zealand to carry out complex potential impact classifications if significant numbers of studies are required.
- Establishing a register of recognised engineers to audit and approve potential impact classifications will take time. The process is reliant on an IPENZ certification process being in place and operational, and a register being formed and populated. Only then will the people be available to carry out the required functions of a recognised engineer.

NZSOLD considers a timeframe of at least 12 months is more practical.

Competency and Qualifications for Recognised Engineers

During the discussions held with the Dams Working Group it is apparent that the regional authorities were seeking a more targeted criteria than just Chartered Professional Engineer (CPEng) to qualify an engineer as a “recognised engineer”.

While NZSOLD does not object to this approach we recommend that the regulations should specify that the role and use of the term recognised engineer is limited to the specific functions as outlined in the Act. It is not a requirement of the Act that engineers and technical specialists working in the areas of dam design, construction, operation and safety management are recognised engineers. It is NZSOLD's opinion that regional authorities should not require the engagement of recognised engineers for functions other than those specifically stated in the Act. There are a significant number of engineers and other specialists who work in the field of dam engineering who will not necessarily be eligible to become recognised engineers. Their contribution should not be limited by creating unnecessary restrictions.

While wishing to achieve a high level of competency for all recognised engineers, especially those in Category B, NZSOLD is conscious of demands for establishing a "sustainable mass" of recognised engineers, providing a pathway for engineers to upskill to this standard, and for the New Zealand industry to maintain an adequate core of competency.

Given that there are limited opportunities to specialise in dam engineering in New Zealand it would be difficult to structure a career to achieve and attain competency in all areas of dam engineering. However, there was a general view that for an engineer to be a recognised engineer for a large dam with a high potential impact classification (PIC), a significant level of expertise and competence would be required to provide the necessary level of confidence to the regulator and the public at large.

While this consideration may require a recognised engineer assessing a high PIC dam to meet the full competency requirements, other engineers may well be qualified to fulfill the role of recognised engineer for less complex dams (e.g moderate height embankments or concrete dams without gated spillways) which are more likely to be medium potential impact dams. The competency requirements should not restrict either group of engineers practising in their respective areas of competence in dam engineering.

To achieve the objectives as outlined above may require a broad interpretation of the level of experience required to demonstrate appropriate competency and recognition that ethical behavior will govern when recognised engineers are presented with opportunities that may be outside their areas of expertise. The recognised engineer label cannot override this need for professional self management. Therefore, the eligibility criteria will need to place significant emphasis on the engineers self awareness of these matters.

Question 2

In light of the above comments, NZSOLD considers that the list of competencies for Category B recognised engineers should be of a general nature with the subsequent IPENZ processes for assessment covering the more specific competencies, experience and suitability of the candidate.

We note that the tabulated competencies in the discussion document generally reflect civil engineering skills. It should be noted there are more skills essential for addressing issues associated with the audit functions of a recognised engineer. NZSOLD recommends the inclusion of the following competencies:

- Investigation and resolution of potential dam safety deficiencies.
- Critical plant involved in dam operation such as spillway gate systems, alarm systems, control and protection systems

Question 3

Evidence of recognition by IPENZ as a Category A or Category B recognised engineer is all the evidence that should be required to be attached to any certificate provided by a recognised engineer in fulfilling their duties under the Act.

IPENZ, as the Registration Authority for Chartered Professional Engineers and Recognised Engineers, could establish a register for both Category A and Category B recognised engineers, and make this register accessible via the internet. It is also proposed that guidelines be developed for assessing recognised engineers (with input from practitioners working in the field of dams engineering) and training suitable practitioners to be assessors.

Criteria and Standards for Dam Classification

NZSOLD supports in general the proposed methodology for determination of potential impact classifications.

Question 4

From NZSOLD's perspective we consider that the regulations should be no more specific than currently proposed. Detailed interpretation of the regulations should be worked through by industry practitioners and a practice guidance document published.

Question 5

The level of assessment required for dam classification can range from being at a very preliminary level for simple cases to a very detailed level for complex cases.

It should be noted that the classification categories potential impact classification specified in the Act are relatively coarse. For the majority of dams assigning a suitable is likely to be a relatively simple process.

Therefore, it should be recognised in the regulations that not all classifications will require detailed and costly analysis and the recognised engineer can apply professional judgement when assessing whether a classification is adequate.

To promote uniformity of practice across the country and minimise compliance costs the regulations should support the general principle that the simplest level of assessment commensurate with deriving a reliable PIC is acceptable.

Criteria and Standards for Dam Safety Assurance Programmes

In reference to paragraph two on page 17, NZSOLD supports the DBH's view that the *New Zealand Dam Safety Guidelines (2000)* and subsequent editions will be the best practice guideline that recognised engineers will use in preparing auditing and certifying dam safety assurance programmes and annual compliance certificates. This should be recognised in the regulations.

Question 6

NZSOLD generally supports the proposed coverage of the dam safety assurance programme, but we have some concerns with the manner in which any safety deficiencies may be addressed.

NZSOLD disagrees with the wording of the last bullet point "Procedures for safety enhancement investigation, assessment and resolution." This bullet point implies that dam owners are required to continuously enhance the safety of their structures, irrespective of need. Normal practice is for owners to enhance safety only where there is a need driven by change in requirements or in the event of a potential or actual deficiency being identified.

We propose the following alternative wording for this bullet point:

“Procedures for investigation and resolution of actual and potential dam safety deficiencies.”

We note that such deficiencies may fall above or below the defined thresholds for a dam to be classified as dangerous. We also note that a dam safety assurance programme will address potential safety deficiencies through a suitable investigation process. Such investigations can be complex and time consuming, involving several technical disciplines and a high degree of expertise. Failure analysis in some instances is not necessarily a precise science and there are limitations on our ability to predict performance. This matter is generally covered by an appropriately conservative approach to design and analysis. This situation can lead to a position where a dam is not able to satisfy normally accepted design standards, but it may not have a prima facie case established as to the failure mechanism. In other words there can be a high degree of judgment required to reach a decision on the significance of the deficiency and the appropriate resolution method. This matter is covered in the NZSOLD Dam Safety Guidelines, but in terms of the regulation we submit that general recognition of the time period required for this process could be included.

NZSOLD considers that all the remaining elements are covered in the dam safety assurance programme proposed.

Question 7 and 8

NZSOLD considers that regulations on dam safety assurance programmes should be kept at a general level as proposed. This recognises that all dams are unique and is consistent with the intent of the legislation to promote performance based rather than prescriptive regulations

NZSOLD does not consider that checklists or forms are required to assist in developing dam safety assurance programmes or certification processes.

The more detailed requirements of a dam safety assurance programme are particular to each dam and should reference back to the *NZSOLD Guidelines (2000)* and subsequent editions.

Dangerous Dams

It should be noted that NZSOLD has written to the DBH regarding problems with the wording of the dangerous dam clauses in the Building Act 2004. A copy of this letter dated 17 July 2006 is attached.

We have also made a submission to the DBH in the past that in applying the dangerous classification the return period of events such as an earthquake and flood should be consistent with the exposure arising “in the ordinary course of events”. The currently proposed definitions of moderate flood and earthquake do not satisfy this test.

We reserve our position on the interpretation of the return period for moderate earthquakes and moderate floods that would make a dam “dangerous” as opposed to “earthquake or flood prone”. We consider that these categories differ significantly in risk management terms, and the technical basis of the regulations is compromised by the lack of differentiation driven by the wording in the Act.

Given that changes to the Act are outside the scope of this submission we will address issues pertaining to the regulations as currently worded.

Question 8

NZSOLD considers that formal guidance should be included in regulations. We also do not agree that “common sense” is an appropriate means to determine the amount of leakage a dam can experience before it is assessed as dangerous. Our reasons are that each dam is unique, as will be the circumstance under which unsafe leakage could arise. The owner, or regional authority, will need to seek advice from appropriately skilled technical specialists to provide a robust judgement on whether a dam is considered dangerous because of leakage.

Question 9 to 11

We agree with the approach of using readily determinable values such as the 1 in 150 annual exceedence probability (AEP) Earthquake as a basis for determining evaluation criteria.

Question 12 to 14

We agree with the approach of using readily determinable values such as the 1 in 100 AEP Flood as a basis for determining evaluation criteria.

However, with regard to the risk of the occurrence of the loads determined using the proposed moderate earthquake or moderate flood criteria, our investigations have revealed that the multipliers result in loads for floods and earthquakes which can have considerably different probabilities of occurrence for a given dam. We believe that the assessment method should provide earthquake or flood loads with comparable probability of occurrence after preparedness and response factors have been taken into account for the different types of events. We recommend that the multiplier system be revisited to establish consistent criteria throughout the country. NZSOLD is happy to discuss these findings in more detail if requested.

Also, NZOLD is concerned that moderate flood and earthquake loads may be taken out of context, and become regarded as the minimum criteria for a “safe dam”. We recommend that it is made clear in regulations that a “safe dam” is one that meets an acceptable level of tolerable risk to the downstream population and environment, not one that just exceeds the “dangerous dam” criteria. To meet this level of tolerable risk an owner their appropriately skilled technical specialists must assess the dam against recommendations in guidelines such as the *NZSOLD Dam Safety Guidelines (2000)* and subsequent amendments.

Other Matters

During the process of reviewing the wording of section 153 in the context of the draft dangerous dams policies currently notified by the regional authorities for submission, NZSOLD has found that the wording is open to interpretation because of the conditional criteria.

In particular, it is unclear whether the intent is that:

- only a moderate or high potential impact classification dam which is also a leaky dam can be dangerous, or
- all “leaky dams”, including low potential impact classification dams, can be dangerous dams?

In order to minimise uncertainty we recommend that the DBH clarifies its intent in the regulations, and rectify the wording when the Act is amended.

Dam Owner Accreditation

NZSOLD supports the principle of dam owner accreditation. This approach is innovative and has received significant interest from the international dam engineering industry.

The original intent of clauses relating to dam owner accreditation in the Act recognised that some owners, namely a small number of the larger owners, currently had dam safety assurance systems that surpassed the minimum requirements of the Act and met the highest standards both nationally and internationally.

From discussions with these owners it appears that the proposed accreditation regime has been formulated in a way that offers little incentive to obtain or maintain accreditation. We consider that it is in the interests of owners, regulators and New Zealand's international reputation for this situation to be revisited. We submit that recognition of existing best practice in this area and building upon effective existing hazard management systems should be guiding principles. We understand that a number of owners will submit alternatives to the current proposals in the regulations. NZSOLD recommends that the proposed requirements be reviewed, and through consultation with all parties, a practical and cost effective accreditation regime be introduced that is likely to receive general industry support.

Reporting

NZSOLD supports the proposal for information requirements for dams but considers that the information on any registers should be kept to a minimum.

Conclusion

In conclusion, NZSOLD supports the intention of the proposed regulations, but has some concerns as outlined above. We would welcome the opportunity to further discuss the points raised in our submission with those conducting the review.