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To
 AFQ Inspectors
 Specialist Inspectors (Construction)
 Railway Inspectors (Band 2)

RESERVOIRS AND HSW ACT: INSPECTION POLICY

This OC explains the current demarcation of responsibilities for reservoir safety and the likely changes proposed by the Water Bill. It also provides guidance on safety at smaller reservoirs which come under HSE jurisdiction.

BACKGROUND

1 The OC replaces existing instructions in FIC IN 282. The Reservoirs Act 1975 includes the requirements for the inspection and maintenance of reservoirs capable of holding over 25 000 m³ (5.5 million gallons) of water above natural level of any part of the land. Currently enforcement powers for such larger reservoirs rest with local authorities (LAs). As part of the proposed Water Bill these powers will be transferred to the Environment Agency which also manages reservoirs. There is no proposal to change enforcement duties in Scotland.

2 Reservoirs below 25 000 m³ are inspected in accordance with the Health and Safety (Enforcing Authority) Regulations 1998 providing a work undertaking exists which means many of the smaller reservoirs will be inspected by HSE. Mine lagoons do not fall within the Reservoirs Act 1975 but are dealt with by HSE under the Mines and Quarries (Tips) Act. Lagoons associated with quarries are now covered by the Quarries Regulations 1999. For the purpose of these regulations a lagoon containing 10 000 m³, having an embankment higher than four metres and being within 50 metres of an excavation is considered as presenting a significant hazard.

3 Reservoirs form parts of many undertakings, not only water companies and hydro electric companies but also industries such as textiles, paper, dyeing, chemicals, the British Waterways Board and in agriculture for irrigation/fish farming as well as being part of flood defenses.

4 The information in this OC only applies to reservoirs where a body of water is retained by a dam whose failure could lead to injury. The definition of reservoirs also includes ornamental lakes. A lake formed by water filling a depression in the ground surface without needing a dam is not a reservoir. It will still apply if the reservoir is no longer being used for its original purpose such as an old mill pond attached to a textile mill, as a risk may still be present.

RESERVOIRS containing MORE THAN 25,000 M³ OF WATER

5 The Reservoirs Act 1975 places a duty on LAs to maintain a register of large raised reservoirs which can contain more than 25 000m³ of water above the natural level of any part of the land adjoining the reservoir. The Secretary of State appoints specialist engineers to panels set up under the Act - hence the engineers are referred to as 'Panel Engineers'.

6 Undertakers, as defined in Section 1(4) of the Act, are required to employ from these panels a Supervising Engineer to keep the dam under expert regular observation - this is a continuous appointment. Also an inspecting engineer has to be employed to carry out a detailed inspection at least once every ten years - more frequently if the supervising engineer requests it. A supervising engineer must be employed at all times except when a construction engineer is employed to construct a new reservoir, enlarge a reservoir or bring an abandoned reservoir back into use.

7 Inspections are normally required:

- (1) within two years of final certificate of construction;
- (2) after alterations or repair;
- (3) at any time recommended by the supervising engineer; and
- (4) within ten years of the last inspection.

Where an Inspecting Engineer makes recommendations in his or her report as to measures to be taken in the interests of safety, the undertakers must carry this into effect as soon as practicable. The enforcing authority will become aware that remedial work recommended in the interests of safety has not been undertaken because they will not have received a completion certificate from a panel engineer appointed under Section 10(6) of the Act. Failure to comply may lead to the enforcing authority carrying out the safety works and charging the undertakers.

8 A copy of any advice to the undertakers by a Supervising Engineer drawing attention to a breach of the Reservoirs Act, generally used for matters which may affect reservoir safety, must be sent to the enforcement authority. The enforcement authority has the powers to ensure that any works required are carried out in a reasonable period of time and in default of the undertaker can carry out the work and then charge the undertaking.

9 In the case of reservoirs falling within the Reservoirs Act, HSE inspectors should not cover matters relating to structural integrity nor matters which could affect structural integrity. Other matters relating to employee safety and risks to members of the public should be allocated according to the Health and Safety (Enforcing Authority) Regulations 1998.

10 Concerns have been raised recently over the possibility of single mode failure leading to catastrophic failure of the dam. An example of this was the locating of a small water tank over the electrical equipment controlling the sluice gates. The dam was in a known earthquake risk area and was unmanned. Leakage of water could short out the sluice gate controls allowing the water level in the reservoir to over top the dam wall. Depending on the design of the dam over topping can lead to catastrophic failure.

11 Panel Engineers are required to advise the undertakers on any aspect of the behaviour of the reservoir which might affect safety. This could include identifying and advising that remedial works are required on process control systems whose failure could lead to

catastrophic failure of the reservoir.

12 In the event of a HSE inspector becoming aware of obvious features which give rise to concern ([see para 17](#)) regarding the structural integrity of a large raised reservoir which could be an imminent hazard the supervising engineer should be immediately contacted. The supervising engineer may already be aware of the problem and have remedial measures in hand. The undertaker should be able to provide the contact details for the supervising engineer. If a satisfactory response cannot be obtained then the LA should be informed. If the Water Bill has been enacted the enforcement powers will rest with the Environment Agency in which case the Utilities National Group (UNG) in Nottingham will be able to provide an appropriate contact.

13 The Environment Agency owns and operates flood storage reservoirs which come within the scope of the Reservoirs Act. The proposed organisational arrangements within the Agency will allow for clear, separate lines of responsibility for the operational and enforcement roles.

RESERVOIRS containing 25,000 M³ OR LESS

14 Such reservoirs are outside the scope of the Reservoirs Act 1975. Where they form part of an employers undertaking the HSW Act provides the only enforcement powers available and inspectors should therefore concern themselves with all aspects of reservoir safety. Inspectors should try to obtain an estimate of the size of the reservoir from the owner to confirm the most appropriate legislation.

15 The water in such reservoirs may have the potential to present a serious hazard, in particular if there have been new developments nearby. An example would be a new housing estate or access roads downstream of the dam. In the event of a dam failure which is not close to a development, the likely consequences may only be minor flooding. It should be noted that local features such as the profile of the ground and presence of any vegetation downstream will have an effect on the consequences caused by a dam failure. The flow of water may be slowed by a wooded area or increased by an inclined roadway.

16 Inspectors should try to identify if the reservoir is impounding or not. An impounding reservoir is one fed by a natural water course which may only run in times of heavy rain. Failure could occur due to over topping of the earth embankment during heavy rain.

17 If possible the inspector should try to ascertain the physical construction of the dam. The most common type of small dam likely to be encountered is the earth embankment type. This type of dam may be entirely constructed of a clay type soil or have a clay core within the earth embankment. Alternatively the dam could be constructed with an impermeable membrane. This could be clay overlaid by surface protection or it could be a concrete or asphaltic concrete membrane.

18 Leaks through or under the dam may eventually cause instability of the dam embankment. Indications of distress in the structure, possibly resulting from leakage include:

- (1) soil movement/slippage on the downstream face, at the foot of the embankment or as depressions on the crest of the dam;
- (2) visible water seepage out of the embankment;

- (3) increased or unusual growth of vegetation on part of the embankment;
- (4) muddy run off water at the base of the dam which could indicate leakage through the dam structure, at water draw-off points, spillways and at any other discontinuities in the dam structure.

19 There may be other aspects of the design and construction of the dam, eg scour protection, spillways, emergency overflows, needing remedial work and which may not be so obvious to an inspector. It is difficult to give specific advice other than to look for poor maintenance of such features including:

- (1) blockage of spillways;
- (2) silting of overflows;
- (3) spoiling of pointing between stone blocks;
- (4) rusted/seized sluice controls;
- (5) burrows into the soil embankment (rabbits, badgers); and
- (6) intrusion of vegetation, eg tree roots, into structures.

20 If sluice gates are being used to control water level they should be well maintained and functionally tested from time to time. The control handle should not normally be left in place but be available to a responsible person who is competent at controlling the water level. Arrangements should be in place to provide access to the control handle and other operational aspects of the installation in the event of an emergency. An impounding reservoir with sluice gates to control water level should also have an emergency overflow spillway.

21 If the water levels are being controlled only by spillway, functional sluice gates may not be required. Spillways which direct water away from the dam should be free of obstruction and maintained so as to prevent water seepage. For example if water can penetrate between the stone blocks of a spillway or flow over the sides it may start to erode the embankment of the dam. It is unlikely that poor maintenance will be an immediate risk however it demonstrates the level of management of the dam.

22 In such cases of poor maintenance once it is confirmed that the capacity of the reservoir is less than 25 000 m³ and that HSE is the enforcing authority, the operational inspector should seek the advice of the SG in order to assess the condition of the dam and the requirements for remedial works prior to deciding on enforcement action.

23 In assessing the exposure to risk the condition of the dam and other equipment together with the consequences of its failure need to be considered. This will include an assessment of the structural integrity, modes of failure and an assessment of numbers of persons at risk.

24 If the specialist group inspector has any concerns regarding the structural integrity of the dam, the owner should be asked for any documentation concerning the construction of the reservoir and its capacity, together with any reports or recommendations for alterations, repairs and maintenance which may be relevant to the safety of the reservoir. If no satisfactory documentation is available the owner should be advised to have an inspection

done by a suitably qualified person such as a panel engineer. A list of such engineers can be obtained from the Institution of Civil Engineers, 1-7 Great George St, Westminster, London SW1P 3AA. Similar information can be found on the [DEFRA website](#).

25 If the owner does not consider such an inspection necessary enforcement action should be considered having regard to the most appropriate legislation. Operational inspectors will need from the specialist inspector an estimate of the maximum volume of the reservoir.

26 An undertaker may decide to reduce the capacity of the reservoir to below 25 000 m³. Any such reductions should be carried out based on the advice provided by a suitable qualified person. A rapid reduction in water level can lead to slippage of the upstream slope.

DISCONTINUED OR ABANDONED RESERVOIRS

27 A large raised reservoir, even if abandoned, still falls within the scope of the Reservoirs Act 1975. It must still be inspected and maintained unless it is permanently altered to store less than 25 000 m³ of water. The term undertaking used within the Act is wide enough for such a purpose as it includes owners and lessees. The capacity of a large reservoir can only be altered to take it below 25 000 m³ under the supervision of a panel engineer.

28 The HSW Act only applies where a reservoir forms part of an employer's undertaking. This is not the same as 'undertakers' as defined in the Reservoirs Act 1975. As regards HSW Act it is not thought to be affected by the employer's undertaking ceasing to use the reservoir for its original purpose. For instance section 2 & 3 duties could still apply to the owner of a mill pond at the side of a mill building now used for multiple factory occupancy as the pond was part of the amenities of the site enjoyed by the tenants. Whereas a mill pond now in the grounds of a private house would not come within HSW Act. Any requirements placed on the person in control of the undertaking regarding the safety of the reservoir would be subject to being reasonably practicable.

29 In cases where an inspector, after consultation with a specialist inspector, considers there to be danger but the HSW Act is not applicable, eg lack of employment or an undertaking, the LA should be informed immediately. Under the Local Government Act they have powers to deal with an imminent emergency by carrying out remedial work to deal with the destruction of or danger to life or property. This does not give enforcement powers to the LA but allows them to remove the danger.

GENERAL SAFETY

30 Other activities associated with the reservoir may fall to either HSE or the LA. If the main activity of the reservoir is the collection of potable water then it falls to HSE. An ornamental lake used for public recreation will fall to the LA unless they are the owners when it defaults to HSE. Any premises/activities associated with the reservoir will be allocated according to the Health and Safety (Enforcing Authority) Regulations 1998.

31 As well as employee safety, public safety must also be considered. A risk assessment is required taking into account high risk areas and the likely actions of persons using the reservoir. For example high risk areas such as spill ways may require fencing. Further precautions may also be required to discourage approaching deep water such as by the use of fencing or natural barriers (hedges). Fishing platforms can be provided and anglers directed away from areas where they could slip into the water. The provision of rescue aids should be considered within the risk assessment. This will be dictated by the likely access

to the reservoir. For instance in the case of a remote reservoir only visited by water company employees rescue aids such as throw lines only need to be taken to the site. Where members of the public regularly gain access, eg visitors centres, rescue aids must be located at suitable points. Warning signs should also be posted at suitable locations such as entry pathways and high risk areas.

FURTHER INFORMATION

32 The UNG has a coordinating role on reservoir issues involving HSE and should be contacted should an inspector experience difficulty following this guidance.

33 Inspectors should be aware of the requirements laid down in Supplement 29 (Inflatable Lifejackets) of the FOD Health & Safety Policy Statement. In general inspectors should be able to do a rough assessment of the condition of the dam avoiding any approach to an exposed edge from which they could fall into deep water.

34 The following are useful publications on risk reduction measures that can be adopted at reservoirs:

(1) *Public Access to Open Reservoirs*, published by Water UK. (subject file 847);

(2) *Safety at Inland Water Sites*, published by ROSPA. ISBN No 1 85088 092 1; and

(3) *Risk Management for UK Reservoirs* CIRIA Report C542.

Cancellation of instructions

35 Code circular FIC IN 282 - **cancel** and **destroy**.

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