NHS National Services Scotland

Notes for Boards: IPC Risks associated with Water Ingress during construction of a Healthcare Built Environment

Version 1.1

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Antimicrobial Resistance & Healthcare Associated Infection (ARHAI) Scotland
An NHS Scotland Assure Service

Version history

Version	Date	Summary of changes
V1.0	30 March 2026	Document published
V1.1	7 April 2026	Footnote added to Appendix 1 around using the measurement of 1.2m. *1.2m is an industry standard and should be aimed for, however there may be situations where this is not achievable

Approvals

Version	Date Approved	Group/Individual
V1.0	March 2026	Clinical Assurance OAG

Contents

Introduction

There are NHS Scotland technical standards, and national guidance available to support construction teams with safe management of building materials. However, there is limited guidance to support the assessment and management or need for monitoring requirements should water ingress occur during a healthcare construction project to prevent infection, prevention and control (IPC) risk.

For the purpose of this document, a healthcare construction project refers to either a new healthcare build or a major refurbishment. Scottish Health Facilities Note 30 (SHFN 30) defines this as a type 4 project[1]. These are regarded as high IPC risk if appropriate IPC barriers are not applied.[1] A healthcare construction incident is referred to within the context of this document, as an incident that has occurred within a pre-occupied space within either a new build or within an existing healthcare estate during a major refurbishment that may or not also affect an occupied space within the existing healthcare premises.

This document aims to support NHS Scotland boards by providing a set of questions and answers to help IPC teams understand the key construction requirements to prevent and safely manage IPC risk should water ingress occur. Relevant guidance and standards signposted to will include:

- British building construction standards
- Relevant available guidance

NDAP/KSAR and HAI-SCRIBE processes are in place to support safe construction of the healthcare build until commissioning and handover. A robust plan requires to be in place to protect building materials and meticulous care taken to prevent IPC risk from the outset. Clear project governance structures and involvement of IPC during construction and at each stage throughout the project, are key to ensuring a safe environment for patients is delivered.

Questions and answers

Question 1: What is the definition of water ingress in healthcare construction projects?

Answer:

The definition of water ingress in healthcare construction projects is not explicitly defined in current UK guidance.[1,2] BS 8102:2022 provides the UK standards for construction teams involved in the design, construction and maintenance of below ground structures to support design and basement waterproofing and prevent risk from water ingress.[3] Water damage is recognised as the prime cause for deterioration in building materials and during constructions.[4,5] National lessons learned from healthcare construction projects has identified that the unintended consequence of the penetration of water or moisture into the building structure, envelope (that is, external), internal or adjacent spaces can occur during construction. Both the design and the builds' ability to maintain the integrity of the fabric structure as well as maintenance and access are all important to prevent risk from water leaks and resultant possible microbial proliferation[1] Severity may vary, dependent on the source, duration, construction stage and risk to adjacencies. Building materials subject to moisture and water ingress may include but are not limited to insulation, dry plasterboards, ceiling tiles, wall board and associated timber framework, wall and floor coverings.[1,5]

External sources

Water ingress health care construction failures may arise due to lack of HAI-SCRIBE barrier controls or non-compliances.[1] Risk may arise if the construction is not weathertight from wind and rain. Inadequately protected building materials can occur resulting in moisture, fungal and mould growth.[6] Substructure moisture and damp risk may arise when ground water penetrates the building fabric below causing rising damp that can be visible from basements. Understanding ground water and environmental risks at the design and planning stage are fundamental to mitigate against such risk.[4,6]

Internal sources

Poor construction, design, or product selection (for example, pipework fittings, flooring, waterproof splashbacks) may result in water leakage and subsequent ingress from the ability to maintain seamless joints.[1,6]

Relevant technical standards and guidance:

1. HAI-SCRIBE (SHFN 30). Scottish Health Facilities Note 30 Parts A B and C: HAI SCRIBE manual, implementation, assessment question sets and checklists. October 2014
2. SHTM 56 SHTM Building Component Series. Partitions. December 2006
3. BS 8102:2022. Protection of below ground structures against water ingress. Code of practice
4. World Health Organization. Water safety in buildings. March 2011
5. Centres for Disease Control Guidelines for Environmental Infection Control in Health-Care Facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. 2019.
6. The Scottish Government. Building standards technical handbook. January 2025: non domestic . November 2024

Question 2: What British guidance exists for the use of building materials subject to moisture in healthcare construction projects?

Answer:

Relevant technical standards, codes of practice and UK guidance should be followed to ensure building materials are correctly selected for the intended room purpose, stored with the protective barriers applied, safely managed and compliance monitoring in place to provide an assurance of controls to prevent IPC risk. These include but are not limited to the following:

Health and Safety Executive (HSE)[1] in construction provides statutory guidance that employers must follow to achieve health and safety on constructions sites which includes the correct application and use of personal, protective equipment.

Health Building Note (HBN) 00:01[2] General Design Principles for healthcare buildings provide emphasis on the importance of moisture control in construction materials to prevent issues such as mould growth and material degradation.

Scottish Health Facilities Note 30 (SHFN 30)[3] highlights all the relevant guidance documents and information pertaining to the planning, design and operation of the health facilities in Scotland. CNO DL(2015)19[4] mandates NHS boards adoption and implementation of SHFN 30. The HAI-SCRIBE risk matrix should be assessed by a multi-disciplinary group and followed to prevent IPC risk. Core components including necessary standards, barriers and storage requirements relevant for building materials include the following:

- **Scottish Technical Health Memorandum (SHTM) 56**[4] provides guidance on performance characteristics for wall partitions and defers to manufacturer's suppliers to provide written instructions on the repair and maintenance of their products.
- **British Standard BS 8000**[5] **– Workmanship on construction sites series** provides all the relevant standards pertaining to construction materials, these include but are not limited to:

- **British Standard BS 8000-8:2023**[1] Workmanship on construction sites. Design and installation of dry lining systems. Code of practice.
- **BS EN 520:2004+A1:2009** Gypsum Plasterboards – Definitions, requirements and Test Methods used in construction. It includes performance characteristics inclusive of water vapour permeability.
- **BS 8000-0:2014** Workmanship on construction sites. Introduction and general principles (+A1:2024)
- **BS 8000-16: 1997 (A1: 2010)** Workmanship on building sites. Code of practice for sealing joints in buildings using sealants.
- **BS 8102:2022** covers UK standards for construction teams involved in the design, construction and maintenance of below ground structures to enable design and basement waterproofing and prevent risk from water ingress.

Relevant technical standards and guidance:

1. Health and Safety Executive. Health and safety in construction. 2006
2. HBN 00-01. General Design Principles for healthcare buildings.
3. Scottish Health Facilities Note 30. Part B: HAI-SCRIBE. Implementation strategy and assessment process. 2014
4. CNO DL(2019)23 Healthcare Associated Infection (HAI) and Antimicrobial Resistance (AMR) Policy Requirements. 2019
5. SHTM 56 SHTM Building Component Series. Partitions. December 2006
6. British Standard BS 8000-8:1994 Workmanship on building sites – Part 8: Code of Practice for plasterboard partitions and dry linings.

Question 3: What are the healthcare associated infection risks linked with water ingress in the healthcare built environment?

Answer:

Water ingress or moisture poses a significant risk for environmental healthcare associated infection risks as follows:

Airborne Transmission from mould and fungal proliferation

Damp buildings can support mould growth and fungal risk.[2] Dry finishings that are subject to moisture when they become wet or moist, create optimal conditions for fungal spores to settle, leading to development of mould and result in local or airborne spread within the healthcare built environment including through heating, ventilation and air conditioning systems (HVAC).[3,4] Aspergillus species found naturally in the environment are a particular risk as spores can be disturbed during renovation work.[3] Preventative management is key through application of HAI-SCRIBE controls to mitigate risk of spore dispersal and risk of water ingress. Immediate management of water ingress is required to prevent fungi and mould development and subsequent risk of HCAI that can be a major cause of morbidity and mortality. [1,2,5]

Waterborne Pathogen risks

Burst pipes, flooding ,water ingress into HVAC systems, contamination to the water delivery system or direct splash risk within the healthcare environment can all provide reservoirs for the proliferation of environmental pathogens outlined in Appendix 13 of the National Infection Prevention and Control Manual (NIPCM).[2,3] Preventative measures and immediate remediation of water ingress is necessary to prevent biofilm formation and environmental reservoirs.

Relevant technical standards and guidance:

1. Health Building Note 00-09: Infection Control in the Built Environment. March 2013
2. WHO. WHO guidelines for indoor air quality: dampness and mould. 2009.
3. CDC Guidelines for Environmental Infection Control in Health-Care Facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. 2019.
4. The Scottish Government. Building standards technical handbook .January 2025: non domestic. November 2024
5. SHFN 30. Part B: HAI-SCRIBE. Implementation strategy and assessment process. 2014

Question 4: Are there any clinical groups of patients that are considered at higher IPC exposure risk from water ingress?

Answer:

Clinical patient groups that are considered a higher IPC exposure risk from water ingress include those who have immuno-suppressive conditions. This is referred to within the context of construction-related nosocomial fungal infections and not limited to water ingress risk.[1.] The National, Infection, Prevention and Control Manual (NIPCM), Chapter 4 provides a general overview of high risk patients however this is discussed in the wider context of the water system whilst the CDC considers a wider view of clinical groups in terms of their treatment in relation to air and water where risk can arise from airborne fungal spores or colonisation of wet surfaces resulting in transmission events.[2] The following clinical groups should be considered as a minimum at higher IPC risk from water ingress:

- Immunocompromised or immunosuppressed through disease or treatment.[12,3.]
- ICU patients – neonatal, paediatric, adult.[2]
- Transplant/Burns patients [2]
- Haemato-oncology.[2]
- Cardiac[2]
- Cystic Fibrosis [2]

Relevant technical standards and guidance

1. SHFN 30. Part B: HAI-SCRIBE. Implementation strategy and assessment process. 2014
2. National Infection Prevention and Control Manual 2025, accessed September 2025
3. CDC Guidelines for Environmental Infection Control in Health-Care Facilities. Recommendation of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). 2019

Question 5: How long does water ingress pose an IPC risk in the healthcare built environment?

Answer:

Currently there are no quantitative healthcare guidelines values to confirm acceptable levels of contamination with micro-organisms as a result of water ingress.[1] The WHO[1] reports that construction materials that have been previously wet continue to pose a hazard within the building. Even after visible water is removed any dampness can maintain a risk for microbial growth and biofilm formation. The CDC states that either repair or drying of building material should be undertaken within 72 hours or removal if drying remains unlikely within 72 hours.[2]

Relevant technical standards and guidance:

1. WHO (2009) WHO guidelines for indoor air quality: dampness and mould.
2. CDC Guidelines for Environmental Infection Control in Health-Care Facilities. Recommendation of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). 2019

Question 6: How should construction teams safely manage building materials subject to moisture during a healthcare construction project to prevent IPC risk?

Answer:

Construction teams should follow all the relevant standards, codes of practice and guidance and preventative measures for IPC risk outlined in Question 2.

Storage of building materials should be in a weathertight, clean, dry environment to protect from wind, rain and external contamination and to prevent moisture, contamination and rising damp. If this is not possible, construction materials should be protected and fully enclosed within a weatherproof sheet. Similarly, prior to installation of building materials subject to moisture, working areas should be weatherproof with entrance and exits to areas adequately sealed to prevent water ingress. HAI-SCRIBE[1] should be applied to prevent fungal spores contaminating the healthcare built environment. Negative pressure conditions should be applied during renovation, construction or maintenance when construction generates dust, spores or aerosols, the work is near vulnerable patient populations or when water or mould damage is present and during the rectification process.

Pre-construction Requirements.

Prior to any construction project commencing the following Initial Agreements should be established with roles and responsibilities assigned.

- Boards must follow the requirements outlined in the Scottish Capital Investment Manual (SCIM)
- Risk Management Processes must be in place as part of the Initial Agreement Stage to safely manage risk that includes a defined period post commissioning as mandated by CEL 19(2009)[1]
- Risk Management should include a digital process with monitoring proportionate to the area of risk to easily identify high risk patient zones should a water

incident occur within the parameters of these areas. A zero tolerance to defects should be applied.

- Boards should have a fully integrated IPC governance structure with a communication strategy in place to prevent, monitor and manage and document IPC risk through application of HAI-SCRIBE and evidence of rectifications throughout the lifecycle of the project[1].
- All healthcare staff, maintenance and construction workers should have a heightened awareness of IPC risk associated with constructions.

Relevant technical standards and guidance:

1. SHFN 30. Part B: HAI-SCRIBE. Implementation strategy and assessment process. 2014
2. British Standard BS 8000-8:1994 Workmanship on building sites – Part 8: Code of Practice for plasterboard partitions and dry linings.
3. Health and Safety Executive. Materials storage and waste management.
4. Health and Safety Executive, 2006. Health and safety in construction.
5. NHS Scotland Scottish Capital Investment Manual. Scottish Capital Investment Manual – Health Infrastructure and Sustainability

Question 7: How should NHS Boards recognise a healthcare incident associated with water ingress during a healthcare construction project?

Answer:

NHS boards should recognise that a healthcare incident associated with ingress is not just a construction project/estates issue but a potential IPC or patient safety issue.

IPC alert surveillance

Any suspected or confirmed single case of healthcare acquired fungi, outlined in the National Infection Prevention and Control Manual, Appendix 13[1] identified after commissioning of a healthcare construction build or during construction within an adjacent occupied space should be considered and investigated for an IPC environmental source transmission risk linked from water ingress. Water ingress may also be implicated in outbreaks of waterborne or Gram-negative bacteria and should be considered during their investigation.

HAI-SCRIBE controls

Monitoring of project HAI-SCRIBE controls has reported that presentation of any of the following in the healthcare construction pre-occupied space and/or adjacency, may suggest water ingress risk:

1. Unexplained or unexpected visible water leakage of any volume from any source and/or pooling of water.
2. Visible unexplained defects that may present with environmental staining, surface condensation or damp materials, for example ceiling tiles, plasterboard and sawdust relevant to the construction stage.
3. Inspection of an area identifies fungal growth and/or damage, rotten environmental construction material such as wood and/or fungal growth on interior support structures.

Relevant technical standards and guidance:

1. National Infection Prevention and Control Manual (NIPCM). Appendix 13 - NHS Scotland Minimum Alert organism/Condition list.

Question 8: How should NHS Boards safely manage a healthcare incident associated with water ingress during a healthcare construction project?

Answer:

Currently there is no published UK guidance on the processes required to safely manage a healthcare incident associated with water ingress during construction projects. Preventative measures are key outlined in Question 2. Expert opinion has been used from lessons learned during NHS board construction projects to inform the following:

Detection: Recognise and immediately report any water ingress and assess whether it has affected a high-risk adjacency or any other clinical area to prevent risk of exposure to any fungal growth.

Patient Safety: Any risk to patients in adjacencies should be assessed for IPC and clinical risk. High risk vulnerable patients should trigger immediate protective IPC controls with signage in the area indicating it is not to be used for patient care**.**

Governance: Local governance with clear roles and responsibilities should be agreed and defined in advance of healthcare construction projects that includes an Incident Management Protocol should a water adverse event occur, and one that activates an immediate response and managed through a Problem Assessment Group or Incident Management Team in line with chapter 3 of the National Infection Prevention and Control Manual.[2] This should include as a minimum, representatives from the IPCT, Senior Management, Estates Department and designated water safety representative. All processes must include a documented action log for adverse event record keeping.

Response Assessment: Contractors should risk assess the severity of the incident and evaluate any hazards (for example mould spores, microbial aerosols, in discussion with the IPCT. The installation of further construction materials should be stopped. All HAI-SCRIBE assessments should be reviewed, and control measures applied including to any affected adjacency. The risk to other building components should be considered, for example air handling units and ductwork. Any other

building components that may be subject to water ingress risk should be reviewed and protected. Refer to appendix 1 Standard Operating Procedure (SOP). The local adverse incident escalation plan should be enacted if necessary.

Management:

Clinical Staff: Dispose of affected consumables. Request a terminal clean of the environment and decontaminate any reusable equipment to contain IPC risk in affected patient spaces.

Multi-disciplinary approach: Review and consider any risks arising from HAI-SCRIBE controls in conjunction with construction teams to prevent ongoing risk. Method statements should be developed and agreed prior to commencing all essential works.

IPCT should:

- Advise on the use of personal, protective equipment and waste management for construction/estates staff.
- Direct necessary cleaning requirements to contain IPC risk.
- Evaluate the need for and direct further investigations, dependent on the stage of construction and informed by clinical evaluation of patient risk groups occupancy, for example the requirement for damp moisture measurement readings.

Construction Teams and/or Estates Teams relevant to the affected space should:

1. Don Personal Protective Equipment prior to any site visit
2. Review and relocate current storage of building materials if necessary.
3. For external sources, carry out essential works to ensure the site is weather tight.
4. For internal sources, isolate water supply to prevent further water leakage.
5. Discuss IPC assurance measures with IPCT prior to commencement of any remedial rectification.

6. Close and seal off area with appropriate signage in place
7. Drain any excess flood water immediately to prevent further damage.
8. Confirm negative pressure is in place within the construction zone to prevent airborne risk or spread from any microbial contamination from fungal spores.
9. Clear associated debris and remove all wet/damaged building materials.
10. Undertake mechanical methods to ensure wallboard and other porous structural materials are dry.
11. If dry wall finishings are affected, construction teams should perform and agree acceptable moisture reading parameters (<20%) within 72 hours, and discuss with IPCT [3]

Relevant technical standards and guidance:

1. SHFN 30. Part B: HAI-SCRIBE. Implementation strategy and assessment process.
2. National Infection Prevention and Control Manual
3. CDC Guidelines for Environmental Infection Control in Health-Care Facilities. Recommendation of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). 2019

Question 9: What ongoing, if any, monitoring requires to be undertaken following healthcare incidents associated with water ingress?

Answer:

HAI-SCRIBE

Ongoing application, monitoring and review of all HAI-SCRIBE controls should continue until construction commissioning and handover is complete.

IPC alert surveillance

Boards should continue to monitor for any new suspected or confirmed reported cases of fungal HCAI outlined in the National Infection Prevention and Control Manual, Appendix 13[1] and investigate any possible linkage with local construction works.

Microbiological air quality

Routine air sampling is not recommended for all areas. For theatres, air sampling should be undertaken as part of the standard commissioning process for any build or where any adverse incident has resulted in remedial works to the ventilation system, air handling unit or associated ductwork.[1]

Targeted air sampling should be undertaken as directed by the local ICD and results reviewed by microbiologist or the ICD (locally agreed responsibilities). Air sampling may be considered for use as a quality assurance method during major construction to detect breaches in environmental controls or following remediation of water ingress. Agreed methodology should be followed and if possible, should include comparative sampling to provide useful analysis.[2 3]

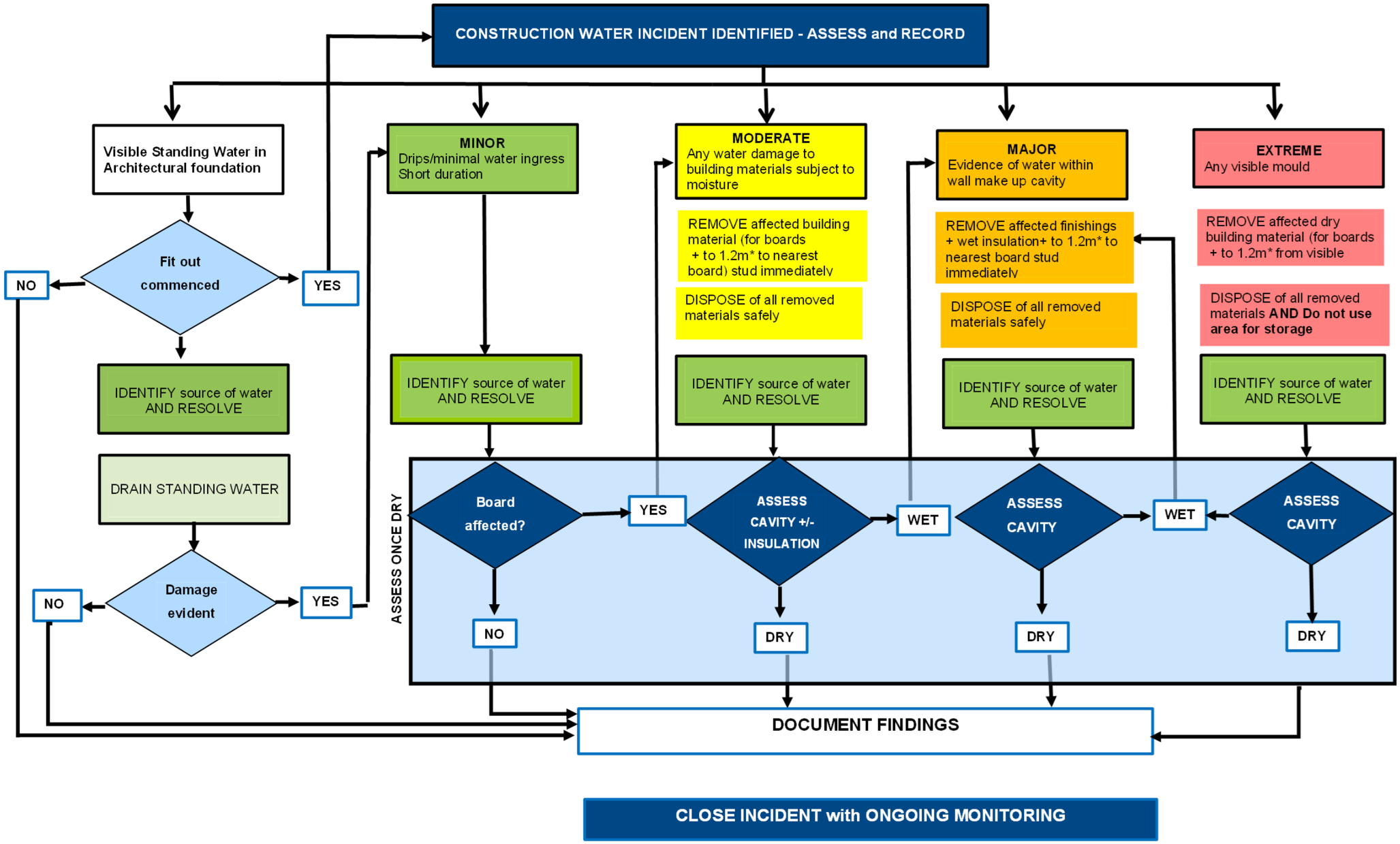
Digital Monitoring

Boards should consider a digital process to capture and monitor IPC risk proportionate to risk as part of the IAS.

Relevant technical standards and guidance:

1. ARHAI Scotland. Notes for Boards: Air sampling within operating theatres. 2024
2. National Infection Prevention and Control Manual (NIPCM). Appendix 13 - NHS Scotland Minimum Alert organism/Condition list.
3. CDC Guidelines for Environmental Infection Control in Health-Care Facilities. Recommendation of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). 2019

Appendix 1 – Construction Water Incident Flowchart



*1.2m is an industry standard and should be aimed for, however there may be situations where this is not achievable.