

FIRE SAFETY GUIDE FOR SMALL SCALE HYDRO INSTALLATIONS UP TO 1000KW OUTPUT



This document is designed to assist NFU Mutual customers in managing fire risks associated with small scale hydro-electric installations up to 1000kw output



NFU Mutual
RISK MANAGEMENT SERVICES

INTRODUCTION

The sector has experienced plant damage and loss via a number of scenarios, including fire in the machine hall / engine room, failure in the stator winding of the generator, failure in switch control room or cables, failure in control equipment, disappearance of auxiliary and power supply, failure in transformers, cracks and breakage in turbine shovels, failure in bearings with lubrication and cooling systems and flooding in areas housing machinery and equipment.

This Guidance Note is intended to provide risk management advice on small scale Hydro installations with an output of up to 1000KW and will assist in minimising the potential for similar losses to occur.

The following information is provided for guidance purposes only.

INSTALLER

Ensure the installer is a member of the British Hydro Association (BHA) and also Microgeneration Certification Scheme (MCS) Registered. Smart Export Guarantee (if applicable) agreements require that installations are certified to Microgeneration Certification Scheme (MCS) or equivalent standard.

Installers to also be registered with the Renewable Energy Assurance Ltd (REAL).

REAL is a wholly-owned subsidiary of the Renewable Energy Association (REA) and undertake a range of certification and consumer protection activities to ensure accredited companies are complying with the relevant standards.

Further details are available at realassurance.org.uk

INSTALLATION

Only proprietary equipment with a recognised brand name and appropriate CE markings and declarations of conformity to be used.

Reference should also be made with the local authority as regards any planning permissions or local bye laws that may need to be considered. Planning permission will typically be required for most hydro developments, and micro hydro systems must have hydro licensing issued by the environmental regulator, which is the Environment Agency (EA) in England and Wales, Scottish Environmental Protection Agency (SEPA) in Scotland and the Northern Ireland Environment Agency (NIEA) in Northern Ireland.

If the system is to be connected to the National Grid, approval is required from the District Network Operator. Any decentralised generation, including micro hydro, must conform to standards set for connection to an electrical distribution system (the grid). Revised standards were implemented from April 2019, following enactment of European legislation: **Engineering Recommendation G98** (formerly **Engineering Recommendation G83**) covers up to 16 amps (A) per phase and **G99** (formerly **G59**) all other installations.

The installation to be designed, installed and maintained in accordance with the requirements of the current Building Regulations. Planning requirements to be discussed with the local Buildings Control Officer prior to work commencing.

The suitability of any building housing the turbine to be professionally assessed by a qualified Structural Surveyor and any strengthening work carried out in accordance with the Surveyor's requirements.

All work, and working practices, to be in compliance with relevant Health and Safety regulations, and appropriate Risk Assessments to be conducted before work on site is commenced.

Care to be taken to ensure that the siting of the unit does not expose any persons to the danger of moving parts when in operation.

Any installation by approved persons to include full commissioning and testing with a suitable compliance certificate issued and retained. Further a formal record of all receipts, manuals, certificates, warranties and maintenance planning to be kept

ELECTRICAL REQUIREMENTS

Electrical testing of the fixed installation to be undertaken in accordance with the current edition of **BS7671 Requirements for Electrical Installations. IET Wiring Regulations**, by a member of the National Inspection Council for Electrical Installation Contractors (NICEIC) or SELECT for sites based in Scotland, and who are regulated for commercial installations. The frequency of electrical inspection of the premises to be every 3 years in accordance with the recommendations of BS 7671 or Electricity at Work Regulations, or more frequently if advised by your electrician and any remedial action to be corrected without delay and appropriate certification issued.

Wherever possible electrical equipment including wiring, switchgear and controls to be located within secured housings or cabinets and appropriate stop switches or emergency shut-off facility to be fitted in accordance with the manufacturer's instructions.

Transformers should be subject to regular Dissolved Gas Analysis (DGA) testing, with the frequency of testing to be determined by the Manufacturer / Installer dependent on load. The transformer should be located away from main Powerhouse and the requirement for a bunding to be considered.

AUTOMATIC FIRE SUPPRESSION

Consider fitting a direct, low pressure application, fixed fire suppression system to electrical control cabinets. Any such system to comply with **LPS1666: Requirements and test procedures for the LPCB approval of direct low pressure (DLP) application fixed fire suppression systems** and upon activation isolate

the power supply and activate the fire alarm system via a relay switch. Further guidance can be found at redbooklive.com/download/pdf/LPS1666-Issue-Direct-Low-Pressure-Application-Fire-Suppression-System-Standard.pdf

SERVICING / MAINTENANCE

1. The turbine and associated equipment to be subject to formal servicing and maintenance provided by an approved installer which should continue after expiry of any installation warranty period. Maintenance and inspection should only be carried out by suitably qualified professionals. This should be via a formal maintenance agreement with the manufacturer, or a specialist company working to the manufacturer's recommendations. Repairs by other non-approved persons should not be permitted, as this can affect manufacturer's warranties.
2. Condition Monitoring Systems to be in place to cover aspects such as online vibration monitoring, analysis of high-speed rotating equipment, hydraulic oil sampling and analysis. Use of SCADA or similar systems recommended. Vibration monitoring will flag up early signs of damage due to cavitation on shovels. Disturbances of lubrication and supply of oil can rapidly lead to damage of the bearing due to the huge pressure on the bearing.
3. Formal maintenance records to be retained. These ideally to be controlled and recorded via Computerised Maintenance System (CMS). This should have the capability of logging all incidents or variants to normal operational parameters which will assist in the early identification of potential issues.
4. Where applicable, holding on site of routine maintenance spares and critical / key spares to be undertaken.
5. Remote Monitoring Capabilities to be in place related to performance-monitoring, faults, fire, flood and auto shutdown. As part of this, water level monitoring systems should be in place which will shut-down all plant should the water level reach defined limits.
6. Any recommendations made during servicing/repairs to be fully implemented and adhered to.
7. Proprietary replacement parts and approved lubrication materials to be used for all repairs.
8. Stop controls to be clearly labelled and employees trained to use the system in the event of malfunction.
9. The machinery and plant to be fully isolated during routine maintenance.
10. Intake gates to be monitored (e.g. cameras) and inspected regularly.

GENERAL RECOMMENDATIONS

1. The housing equipment to be ventilated to ensure operating temperatures are not excessive and consider the risk of ice build-up in cold weather
2. Thermographic Inspections - it is recommended that the existing system of periodic electrical inspections be supported by an annual thermographic survey. This type of survey can provide valuable additional safeguards which may not be apparent using traditional test methods alone. This could focus on electrics but also motors, bearings etc. for any signs of plant running improperly.

CONTROL OF CONTRACTORS

Only bona fide contractors to be employed and a designated person appointed to ensure they adopt the necessary safety procedures.

Any contractors 'Hot Works' to be controlled by a strict permit to Work system.

Contractors to hold Public Liability insurance with an adequate indemnity limit to reflect the potential exposure but of at least £5 million.

Further guidance can be found in the Health & Safety Guidance Note: Contactors & Visitors.

HOT WORK

Welding or cutting/grinding equipment, blow lamps, blow torches or similar equipment not to be used for repairs to combustible elements of construction or within 2 metres of them unless they are:

i) protected by non-combustible fire blankets, drapes or screens, and

ii) subject to a strict 'permit to work' system, unless undertaken by own staff in accordance with documented safe hot working procedures/policy.

Further guidance can be found in the Fire Safety Guide to Hot Works.

HOUSEKEEPING AND WASTE CONTROL

External storage of combustible goods or waste materials to be at least 7 metres (but where possible 10 metres) from the fabric of the building out of business hours, preferably within fenced or enclosed areas.

Internal storage of combustible or waste materials to be kept to a minimum.

Designated smoking areas to be at least 10 metres from the buildings and external combustible storage such as pallets. Suitable disposal facilities for spent smoking materials to be provided and emptied frequently.

AUTOMATIC FIRE ALARMS

Consider installation of, or upgrading existing fire alarm system, to an automatic fire alarm system conforming to **BS5839: Fire Detection and Alarm Systems for Buildings: Part 1: Code of Practice for Design installation, commissioning and maintenance of systems in non-domestic premises**, specifically designed to provide early warning fire detection within control, plant & turbine rooms environments where conditions and technology permits.

If the Hydro installation is often unmanned, the fire alarm system to also give a warning remotely to nominated staff via an auto-dial facility or an approved alarm receiving centre. A programme of testing, servicing, checking and maintenance in accordance with the installer's recommendations to be in place and documented.

PORTABLE FIRE EXTINGUISHERS

Adequate fire extinguishers to be located throughout the premises and staff to be trained in operation.

Regular inspection and maintenance to be undertaken by an approved supplier and recorded.

IMPORTANT NOTE:

The information contained herein is designed for guidance only and NFU Mutual cannot accept responsibility for any errors or omissions arising from its use. Should further guidance be required please contact our local NFU Mutual Regional or Branch office, or telephone Risk Management Services on 01789 202425.



NFU Mutual

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