**AMP 127 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELLING) HANDLING SYSTEMS (VERSION 2020)**

**Programme Description**

Most commercial nuclear facilities have between 50 and 100 cranes. Many are industrial grade cranes which meet national standards. Most are not within the scope of IAEA Safety Report No. 57, chapter 4.1 [1] and therefore are not required to be part of the integrated plant assessment. Because only a few cranes operate over safety-related equipment, normally fewer than 10 cranes fall within the scope of IAEA Safety Report No. 57, chapter 4.1 [1].

Many of the systems and components of these cranes perform an intended function with moving parts or with a change in configuration or are subject to replacement based on qualified life. In these instances, these types of crane systems and components are not within the scope of this ageing management programme. This programme is primarily concerned with structural components that make up the bridge and trolley. National regulations may provide specific guidance on the control of overhead heavy load cranes.

The programme includes periodic visual inspections to detect loss of material due to general corrosion and wear, deformed or cracked bridges, structural members, and structural components; and loss of material due to general corrosion; cracking and loss of preload on bolted connections.

**Evaluation and Technical Basis**

***1. Scope of the ageing management programme*** ***based on understanding ageing:***

The programme manages (a) the effects of loss of material due to general corrosion, wear, cracking and deformation on the bridge rails, bridge, and trolley structural components for those cranes that are within the scope of IAEA Safety Report No. 57, chapter 4.1 [1], and (b) the effects of cracking and loss of material due to general corrosion of bolts. The programme also manages the effects of loss of preload due to self-loosening of bolted connections.

***2. Preventive actions to minimize and control ageing degradation:***

This programme is a condition monitoring programme and does not contain any preventive actions.

***3. Detection of ageing effects:***

Crane rails and structural components are inspected at a frequency in accordance with appropriate national standards, such as [2-5]. For systems that are infrequently in service, such as containment polar cranes, periodic inspections are performed once every refuelling cycle just prior to use. Bolted connections are visually inspected for loss of material due to general corrosion; cracking; and loose bolts or missing nuts, and other conditions indicative of loss of preload at the same frequency as crane rails and structural components. Surface condition is monitored by visual inspection to ensure that loss of material is not occurring due to general corrosion or wear, deformation or cracking in bridges, structural members, and structural components. In addition, volumetric or surface examinations of the high strength (actual measured yield strength ≥ 150 ksi or 1,034 MPa) bolts greater than 1 inch (25 mm) in diameter are performed to detect stress corrosion cracking at an interval not to exceed 5 years, unless justified.

***4. Monitoring and trending of ageing effects:***

Inspection activities are performed by personnel qualified in accordance with controlled procedures and processes. Deficiencies are documented such that results can be trended; however, the programme does not include formal trending.

***5. Mitigating ageing effects:***

This is a condition monitoring programme and does not contain any mitigating actions.

***6. Acceptance criteria:***

Any visual indication of loss of material due to general corrosion or wear, deformation, or cracking, and any visual sign of loss of bolting pre-load (e.g. loose bolts or missing nuts) is evaluated according to appropriate national standards [2-5]. Volumetric or surface examinations confirm the absence of cracking in high strength bolts.

***7. Corrective actions:***

Repair and replacement are performed in accordance with the pertinent governing requirements or guidance documents for the plant.

***8. Operating experience feedback and feedback of research and development results:***

This AMP addresses the industry-wide generic experience. Relevant plant-specific operating experience is considered in the development of the plant AMP to ensure the AMP is adequate for the plant. The plant implements a feedback process to periodically evaluate plant and industry-wide operating experience and research and development (R&D) results, and, as necessary, either modifies the plant AMP or takes additional actions (e.g. develop a new plant-specific AMP) to ensure the continued effectiveness of the ageing management.

There has been no history of corrosion-related degradation that threatened the ability of a crane to perform its intended function. Likewise, because cranes have not been operated beyond their design lifetime, there have been no significant fatigue-related structural failures. Operating experience indicates that loss of bolt preload has occurred, but not to the extent that it has threatened the ability of a crane structure to perform its intended function.

At the time when this AMP was produced, no relevant R&D was identified.

***9. Quality management:***

Administrative controls, quality assurance procedures, review and approval processes, are implemented in accordance with the different national regulatory requirements (e.g., 10 CFR 50, Appendix B [6]).

**References**

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Safe Long Term Operation of Nuclear Power Plants, IAEA Safety Reports Series No. 57, IAEA, Vienna, 2008.
2. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, ISO 12482: 2014, Cranes - Monitoring for crane design working period.
3. NUCLEAR SAFETY STANDARDS COMMISSION (DER KERNTECHNISCHE AUSSCHUSS), KTA 3903, Inspection, Testing and Operation of Lifting Equipment in Nuclear Power Plants, KTA, November 2012.
4. AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Safety Standard B30.2, Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist), ASME, New York, NY, 2016.
5. NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, U.S. Nuclear Regulatory Commission, 1980.
6. UNITED STATES NUCLEAR REGULATORY COMMISSION, 10 CFR Part 50, Appendix B, Quality Assurance criteria for Nuclear Power plants, Office of the Federal, Register, National Archives and Records Administration, USNRC, Latest Edition.