DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, WALLA WALLA DISTRICT
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WALLA WALLA, WA 99362-1876

CENWW-ECD-M 01 JULY 2020

MEMORANDUM FOR

MCNARY LOCK AND DAM, CHIEF OF TECH (CENWW-ODM/Bill Dull)

SUBJECT: McNary Lock and Dam Spillway Gate Hoist Safety

1. There are 20 spillway gate hoists at McNary dam, 16 of them were manufactured and installed by Ederer Inc. in 1974, and the remaining four were manufactured and installed by Transco Industries in 2003. Both Ederer and Transco hoists were originally designed for a total load capacity of 350,000 lbs. Testing done in 2003 to 2005 showed that most of the hoists have been operating above their rated capacity. The worst case being 485,000 lbs. (139% of rated capacity). This load is based on the dead end of the wire rope and does not account for sheave friction. If the sheave friction of 96.15% efficiency as specified in EM 1110-2-3200 (Wire Rope for Civil Structures) accounted for, the worst case would be 560,000 lbs. (160% of rated capacity). It is a violation of OSHA to operate a hoist above its designed capacity.

2. The overload condition occurs during hoisting of the gate due to higher than predicted side seal and roller friction forces. Some of the gates have been rehabbed, but testing in 2005 showed that in most cases the hoists were still overloaded after the gates were rehabbed. Worst case was 473,000 lbs. (135% of rated capacity). While lowering and holding the gate in position the hoist is not overloaded because the friction is reducing the load on the hoist. The highest risk of failure is during hoisting, but since the overload has been occurring for so long, failure of the hoist can occur any time that the hoist is under load.

3. Likely modes of failure include brake, gearbox, coupling or wire rope failure. The uncontrolled release of mechanical energy can cause parts of the components to fly in all directions with the potential to cause serious injury or death to anyone on or near the hoist that fails.

4. A project is currently under way to replace the hoists with new hoists that have the required capacity to operate the gates, but it will take several years to complete.

5. Risk Mitigation. The following recommended hazard controls will help to reduce the probability of injury or death to personnel.

a. Recommend inspection of the wire ropes annually. Since the factor of safety of the wire rope is below the required 5:1 safety factor, the condition of the wire rope is critical.

b. Recommend access to the top of the hoist or work in front of the hoist only when the hoist and each adjacent hoist is unloaded and locked out to zero energy state per Hazardous Energy Control Program requirements. The hoist may be unloaded by either dogging the gate in position or lowering it to the sill.

c. Install warning lights and audible alarms to prevent travel in front of a spillway hoist when a gate is being hoisted or lowered. Warning lights and audible alarms should activate in enough time before gate movement to allow a person traveling on the roadway upstream of the gates or the walkway downstream of the gates to move beyond the adjacent spill bay.

6. Residual Risk Assessment: Using the Risk Assessment Code Matrix from EM 385-1-1, the following is the Residual Risk level that remains once the above mitigation measures have been implemented:

a. Severity: A hoist failure with personnel nearby carries the potential of a "Catastrophic" outcome in that can result in serious injuries or fatalities.

b. Probability: The probability of a Catastrophic (serious injury or fatality) event occurring is reduced to "Unlikely" by not allowing employees to work on or near these hoists while they are loaded and requiring employees crossing the spillway to be beyond the adjacent spill bay any time that the hoist is being operated.

c. The residual risk level for this particular exposure with hazards controls in place is assessed as "Moderate."

If you have any questions, please contact David Kloewer at 509-527-7498 or david.j.kloewer@usace.army.mil .

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Chief, Mechanical Design Section

CENWW-ECD-M
SUBJECT: McNary Lock and Dam Spillway Hoist Safety

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EM 385-1-1 Risk Assessment Matrix

Overall Risk Assessment Code (RAC) (Use highest code)					
Risk Assessment Code (RAC) Matrix					
Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L