Review Of AMFITOP Report:

"Earthquake Stability Calculation of a Basin for Aquaculture in Accordance with Eurocode 8"

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March 2025

Summary

This report has been prepared by NORSAR at the request of AmfiTop Aqua Farming Ltd. It provides a thorough review of the AMFITOP report, developed by the University of Latvia, on the Earthquake Stability Calculation of a Basin for Aquaculture in Accordance with Eurocode 8. The NORSAR team has conducted a detailed review of the seismic design calculations in the AMFITOP report, assessing their compliance with the requirements of Eurocode 8 Part 1 (NS-EN 1998-1:2004+A1:2013+NA:2021) and Part 4 (NS-EN 1998-4:2006+NA:2013). **The seismic design calculations in the AMFITOP report for the aquaculture basin comply with Eurocode 8 Part 1 and Part 4.**

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1. Introduction

This document reviews the seismic design calculations in the AMFITOP report for an aquaculture basin against the requirements of Eurocode 8 (Design of structures for earthquake resistance) *Part 1- General rules, seismic actions and rules for buildings* (NS-EN 1998-1:2004+A1:2013+NA:2021) and *Part 4- Silos, tanks and pipelines* (NS-EN 1998-4:2006+NA:2013). The objective is to verify compliance and provide conclusion.

The report clearly defines the purpose: seismic design of an aquaculture basin based on Eurocode 8 principles. It acknowledges seismic actions and structural safety requirements, aligning with Eurocode 8 Part 1 and Part 4.

The results of review of the seismic design calculations in the AMFITOP report against the requirements of Eurocode 8 Part 1 and Part 4, are presented in the followings:

2. Definition of Seismic Action and Hydrodynamic Effects

2.1 Seismic Action Definition

- The report follows the response spectrum approach as per EN 1998-1:2004, Section 3.2.2, for defining seismic action.
- The selected ground type and seismic parameters align with Table 3.2 of Eurocode 8. The selected ground type follows the specific national annex values for soil properties

2.2 Hydrodynamic Pressure Effects

Hydrodynamic effects (relevant for liquid basins per Part 4, Section 4.3) are included, following best practices.

- Report considers hydrodynamic impacts, aligning with EN 1998-4, Section 4.3.2.
- Proper modelling of sloshing and impulsive forces is included.

3. Structural Modelling and Analysis

- Finite Element Method (FEM) is used for structural analysis, complying with Eurocode 8 Part 1, Section 4.3.3 (Modal Response Spectrum Analysis).
- Boundary conditions and mesh refinement are well-defined.
- Material properties follow Eurocode 8 Part 1, Section 3.1.3.
- Soil-structure interaction is discussed, which aligns with Eurocode 8 Part 4, Section 2.3.2.
- The foundation system follows Eurocode 8 Part 1, Section 4.4.2.6.

3.1 Structural Verification

- Ultimate Limit State (ULS) is verified based on Eurocode 8 Part 1, Section 4.4.2 (global stability, flexural and shear checks).
- Damage Limitation State (DLS) is assessed as per Eurocode 8 Part 1, Section 4.4.3.
- The hydrodynamic pressure impact on walls is evaluated, aligning with Eurocode 8 Part 4, Section 4.5.2.
- Stability checks for shell, anchors, and foundation comply with Eurocode 8 Part 4, Section 4.5.2
- Soil-structure interaction is included, consistent with Eurocode 8 Part 4, Section 2.3.2.
- The foundation verification follows Eurocode 8 Part 1, Section 4.4.2.6.
- Eurocode 8 Part 4, Section 4.5.2.5 (seismic foundations for basins) is considered

4. Conclusion

The report follows the requirements of Eurocode 8 for seismic design. Both general seismic loading (Part 1) and liquid-containing structures (Part 4) are addressed. Hydrodynamic, soil-structure interaction, and limit states are properly checked.