

From: [Carolyn Lauron](#)
To: [Justin Hawkins](#)
Cc: [Greg Cranston](#); [Andrew Brenner](#)
Subject: NRC Staff response to Follow-up Question re: Polar Crane Analysis for the SMR-160 design (Project Number 99902049)
Date: Friday, March 31, 2023 7:53:00 AM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)

Hi Justin –

Please find the NRC staff response to the subject question below.
Please let me know if you have questions or need additional information.

Thanks,
Carolyn

Background:

3-8-23 - Email to J. Hawkins, SMR (Holtec) - NRC staff response to SMR-160 question re: Polar Crane Analysis (Project 99902049)(ML23067A011) in ADAMS:
<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML23067A011>

Follow-up question:

Did the NRC staff mean to state the guidance for determination of mass to be included in a model for dynamic seismic analysis is provided in Paragraph **II.3.D** (not II.1.D, which does not seem to exist) in SRP 3.7.2, Revision 4?

To further clarify, our reading of SRP 3.7.2 Revision 4 Paragraph II.3.D and ASCE 4-16 Section 3.4 (see below) does not include explicit guidance for considering live loads of the crane, only floor design live loads. This leads SMR to believe the SSI analysis does not need to consider the scenario that the polar crane is performing a heavy lift load. The seismic load determined by the SSI analysis will be used in conjunction with crane live loads for the appropriate Service Condition analyses as described in SRP 3.8.2 Paragraph II.3.B.iii.

SRP 3.7.2 Revision 4 Paragraph II.3.D:

- D. Representation of Floor Loads, Live Loads, and Major Equipment in Dynamic Model. In addition to the structural mass, mass equivalent to a floor load of 50 pounds per square foot should be included, to represent miscellaneous dead weights such as minor equipment, piping, and raceways. Also, mass equivalent to 25 percent of the floor design live load and 75 percent of the roof design snow load, as applicable, should be included. The mass of major equipment should be distributed over a representative floor area or included as concentrated lumped masses at the equipment locations.

ASCE 4-16 Section 3.4:

3.4.2 Determination of Mass

- (a) The mass included in the model used for dynamic analysis shall include all mass expected to be present at the time of the earthquake and shall not include added conservatism. This mass will include, for example, the effects of dead load, stationary equipment, piping, and the appropriate part of the live load and snow load.
- (b) The mass shall account for the expected live load, but not less than 25% of the specified design live load for design loads 200 psf and smaller and not less than 50 psf for design live loads greater than 200 psf.
- (c) Design flat roof snow loads of 30 psf or less need not be included. Where flat roof snow loads exceed 30 psf, 25% of the uniform design snow load shall be included.
- (d) Include the mass from building elements not included in the structural model, such as secondary members, siding partitions, etc.

NRC Staff Response:

Yes, the NRC staff meant paragraph II.3.D “Representation of Floor Loads, Live Loads, and Major Equipment in Dynamic Model” in SRP Section 3.7.2, Revision 4. As stated therein, the mass of major equipment (e.g., polar crane) should be appropriately included in the dynamic model for SSI analysis.

Explicit approach for consideration of applicable crane lift loads for design should be determined based on the number and purpose of each of one or more structural models used by the applicant for design analysis, and applicable service conditions in which the crane heavy lifts are performed. In general, the polar crane can be considered unloaded (i.e., not performing a heavy lift) for the SSI analysis of the containment structure, considering that crane lifts are not expected to be performed during power operation. The in-structure response spectra (ISRS) derived from the containment structure SSI analysis at the elevation of the polar crane can be used as input for detailed design analysis of the polar crane and its supporting structure including seismic effects of lifted loads, as applicable, for the service conditions under which heavy lifts are performed.