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REPORT APPROVAL SHEET

SIMPSON GUMPERTZ & HEGER



Engineering of Structures
and Building Enclosures

Client: NextEra Energy-Seabrook **Project No.** 170444.02
Project: Support for Prompt Operability Determinations (PODs), NextEra Energy Seabrook Station, NH

Report No.: 170444-SVR-01-R0
Report Type: Site Visit Report
Title: September 2017, Threshold Inspections for the North Wall of the Containment Enclosure Ventilation Area (CEVA), NextEra Energy Seabrook Facility, Seabrook, NH


Number of pages including this page: 11
Are there unverified assumptions (Y/N): N
Is this report safety-related per contract (Y/N): Y

Objective:

To report September 2017 threshold measurement results of the lower portion of the North Wall of the Containment Enclosure Ventilation Area (CEVA) and to determine whether the threshold limits for the CEVA North Wall have been exceeded.

<u>Revision</u>	<u>Descriptions</u>
0	Initial Document

<u>Revision</u>	<u>Preparer / Date</u>	<u>Indep. Verifier / Date</u>	<u>Approver / Date</u>
0	 Liying Jiang 30 October 2017	 Michael Mudlock 30 October 2017	 Matthew R. Sherman 30 October 2017

SITE VISIT REPORT NO. 01		SIMPSON GUMPERTZ & HEGER  Engineering of Structures and Building Enclosures
Document ID No. 170444-SVR-01-R0		
Report By: Liying Jiang		
Date of Site Visit: 9 September 2017 Date Report Issued: 30 October 2017		
Project: 170444.02	Keyword: PODS	
Contract No. : 02365230 Release 0003	Executed: 29 March 2017	
Project Name/Subject: Support for Prompt Operability Determinations (PODs), NextEra Energy Seabrook Station, NH		Purpose: Perform threshold inspections for the north wall of CEVA as required per the structural evaluation of the CEVA structure.
Meeting/Work Location: Seabrook Station		Time – from: 7:30 a.m. to: 3:00 p.m.
Weather: Indoors		Ambient Temperature: 95°F
Reviewed By: Michael Mudlock		30 October 2017
Approved By: Matthew R. Sherman		30 October 2017

This Site Visit Report consists of the following:

Report Content

Content	Title	Page
Cover Sheet	Report Approval Sheet	1
Main Report	Site Visit Report No. 01, 170444-SVR-01-R0	2 – 6
Photographs	Photograph and Figure Pages	7 – 11

List of Tables

Content	Title	Page
Table 1	List of Equipment and Calibration Record	4

List of Figures

Content	Title	Page
Figure 1	Plumbness profile of North Wall of CEVA from EL +4 ft to EL +26 ft.	11

Abbreviations:

- NEE – NextEra Energy Seabrook, LLC
- NEE – Seabrook – NextEra Energy Seabrook Facility
- SGH – Simpson Gumpertz & Heger Inc.
- ASR – Alkali-Silica Reaction
- CEB – Containment Enclosure Building
- CB – Containment Building
- AZ – Azimuth
- CEVA – Containment Enclosure Ventilation Area
- Mech. Pen. – Mechanical Penetration

Field Inspectors:

- Liying Jiang – Primary Field Inspector, SGH
- Piyush Garg – Field Inspector, SGH

Persons Contacted:

- Jaclyn Hulbert – NENGII, License Renewal, NEE
- Dave Carlino III – Nuclear Construction Lead, NEE

1. REVISION HISTORY

Revision 0 – Initial Document.

2. INTRODUCTION

NextEra Energy Seabrook, LLC (NEE) contracted Simpson Gumpertz & Heger Inc. (SGH) to perform structural evaluation of selected structures at the NextEra Energy Seabrook Facility (NEE-Seabrook) in order to determine their susceptibility to concrete deformation caused by ASR, swelling, creep, and shrinkage. On 22 March 2017, SGH issued a structural evaluation of the CEVA structure considering stresses in the as-deformed condition in addition to each of the load combinations identified in the UFSAR for the CEVA structural evaluation. Detailed information is provided in SGH Document 160268-CA-05, Revision 0 [1], in which Section 8, “Threshold Monitoring Measurements and Limit,” recommends that, although the CEVA structure is evaluated as a Stage One structure, the threshold inspection of the lower portion of the north wall be conducted every six months, with the following scope of work and associated threshold limits:

- Measure the out-of-plumbness of the north wall for any increase in displacement. If the currently measured maximum bowing of 1.25 in. reaches 1.5 in. (corresponding to a 20% increase beyond the current maximum measured bowing), further evaluation of the wall stability or other appropriate action is required.
- Hammer-sound the north face (visible face) of the wall between EL +12 ft and EL +17 ft to check for any near-surface delamination¹. If any area with delaminated concrete is detected, consider removing and repairing or otherwise restraining the unsound concrete to prevent any concrete spalling off the wall onto the equipment and stairs below.

In September 2017, six months after SGH issued the structural analysis evaluation of the CEVA structure, NEE requested that SGH perform the threshold inspections of the CEVA north wall per the scope of work described above.

3. EQUIPMENT AND CALIBRATIONS

Table 1 provides a list of equipment, with associated calibration data, used for the threshold measurements during this task.

Table 1 – List of Equipment and Calibration Record

Equipment	Asset No./Model/ ID	Last Calibration Date	Calibration Due Date
12 ft Tape Measure ¹	Praz Precision/Crafted	–	–
30 ft Tape Measure ¹	Stanley PowerLock 33-430	–	–
Vaisala Digital Hygrometer ²	FLS8777	2 August 2017	2 February 2018

¹ Not Calibrated. Per NEE, calibration controls are not required for standard off-the-shelf measuring equipment (rulers, tape measures, levels, etc.) which is not likely to change or drift during use.

² NEE-Seabrook calibrated this equipment in accordance with their QA Topical Report.

4. SCOPE OF WORK

On 9 September 2017, SGH performed threshold inspections of the north wall of the CEVA structure under NEE-Seabrook Work Order 40552849-01 and PMID 83939, further described below.

- Measure the out-of-plumbness of the north wall for any increase in displacement.
- Visually survey and perform a delamination survey of the north face (visible face) of the north wall from EL +3 ft to EL +19 ft, where accessible, to check for any near-surface delamination.
- Document the visual observations, measurements, and findings in a site visit report (SVR) to NEE.

¹ A delamination is any planar separation in a material that is roughly parallel to the surface of the material that is essentially formed by a crack that is parallel to the surface of the wall [2].

5. ONSITE THRESHOLD INSPECTIONS AND RESULTS

5.1 Wall Plumbness Measurements

SGH measured the out-of-plumbness of the north face of the north wall from EL +4 ft to EL +26 ft using a plumb bob and a tape measure. SGH suspended the plumb bob from a string running along the wall surface from EL +27 ft to EL +3 ft (top of the Mech. Pen.) and measured the distance from the wall surface to the center of the string, starting at EL +4 ft (1 ft from the top of the Mech. Pen) and continuing to EL +26 ft (3.5 ft above the top of the base slab of the CEVA Building) (Photos 1 and 2). SGH performed the measurements from both sides of the stairs, which are located near the center of the wall.

The plumbness profile of the north face of the north wall, as illustrated in Figure 1, indicates outward bulging (relative to the face of the wall at EL +4 ft) with a zone of relatively uniform bulging present from EL +13 ft to EL +18 ft, with the maximum outward bulging of 1-7/16 in. occurring at EL +14 ft.

5.2 Visual and Delamination Survey

SGH visually observed the entire face of the north wall where accessible (Photo 3). SGH noted frequent prominent horizontal cracks from EL +11 ft to EL +19 ft across the entire north wall. The cracking condition is most obvious on the east side of the wall adjacent to the CEB, where it is above the equipment; this portion of the wall was inaccessible for close observation at the time of inspection. SGH did not note any apparent significant changes in the cracking condition as compared to SGH's prior survey in November 2016 [3].

SGH performed a delamination survey of the accessible north face of the north wall from the floor slab at EL +3 ft and from the stairs at the middle and top landings. SGH performed the delamination survey by sounding the wall with a mason's hammer and noted hollow-sounding areas at the following locations:

- Two localized areas at the bottom corners of the CEVA door, approximately 2 sq ft and 1 sq ft, respectively, next to the stair platform grating at EL +21 ft-6 in. (Photos 4 and 5).
- Multiple localized areas along cracks from EL +13 ft to +18 ft at the wall above the middle landing area of the stairs. The cracks at the hollow-sounding areas exhibit widths greater than 0.060 in. (Photos 6 through 8). The portions of the concrete wall above the equipment could not be sounded due to access restrictions. The cracks at the inaccessible locations (particularly on the east side adjacent to the CEB) appear to be wider than the cracks associated with the hollow-sounding areas at the stairs.

6. SUMMARY, DISCUSSIONS, AND RECOMMENDATIONS

SGH performed threshold inspections of the north wall of the CEVA structure in September 2017 and found the following:

- The concrete surface of the north wall between EL +3 ft and EL +18.5 ft exhibits extensive horizontal cracks. SGH noted no signs of significant changes in cracking condition as compared to the prior inspection in November 2016 [3].

- The results of wall plumbness measurements (between EL+4 ft to EL +26 ft) indicate an outward bulging of the wall with a maximum displacement of 1-7/16 in. at EL +14 ft, relative to the near-base of the north wall at EL +4 ft. The maximum outward bulging appears to have increased from the November 2016 inspections, when it was 1-1/4 in. occurring at EL +13 ft to +17 ft. The maximum bowing remains within the threshold limit (1.5 in.)
- Based on a delamination survey using conventional hammer sounding (which is limited in detection range to near-surface/shallow (typically 1 to 3 in. deep) delaminations [4]), SGH noted localized near-surface concrete delaminations at the accessible areas from the stairwell that are primarily associated with visible horizontal cracks. SGH could not perform a delamination survey above the equipment; however, based on the observed cracking condition, it is likely that additional near-surface delaminations are present at the prominent horizontal cracks above the equipment. The near-surface delaminations may further develop into concrete spalls that could break off from the wall and fall onto the stairs and equipment below.
- SGH recommends that concrete repairs of the north wall of CEVA be planned for the near future to address near-surface delaminations and potential future spalling. In the meantime, temporary protection or concrete restraints could be proactively and conservatively installed to prevent potential concrete spalls from contacting sensitive portions of the equipment and cabling.

7. REFERENCES

- [1] Simpson Gumpertz & Heger Inc., *Evaluation of Containment Enclosure Ventilation Area*, Calculation No. 160268-CA-05, Revision 0, 22 March 2017 (FP 101121).
- [2] American Concrete Institute, ACI 201.1R-08, *Guide for Conducting a Visual Inspection of Concrete In Service*, Farmington Hills, MI, 2008.
- [3] Simpson Gumpertz & Heger Inc., *ASR Inspections on Containment Enclosure Ventilation Area, NextEra Energy Seabrook Facility, Seabrook, NH*, SGH Site Visit Report No. 160268-SVR-05, Revision 0, 22 March 2017 (FP 101122).
- [4] Yehai, Abudayyeh, Abdel-Qader, and Zalt, "GPR, Chain Drag, and Ground Truth: Correlation of Bridge Deck Assessment Data," TRB 2008 Annual Meeting, Transportation Research Board, Washington DC.



Photo 1

SGH measuring the plumbness of the wall with a plumb bob attached to a string.



Photo 2

View down the plumb bob string (yellow arrow) extending from EL +27 ft to +3 ft.



Photo 3

Overall view of the north face of the north wall.



Photo 4

Concrete delamination at the stair platform (EL +21.5 ft) to the left of the door, as shown by the blue hatching.



Photo 5

Concrete delamination at the stair platform (EL +21.5 ft) to the right side of the door, as indicated by the yellow arrow.



Photo 6

SGH surveyed the portion of the wall between EL +13 ft and +18 ft from the middle stair landing.



Photo 7

Concrete delamination along cracks on the wall, shown in blue-hatched area.



Photo 8

Concrete delamination along cracks on the wall, shown in blue-hatched area.

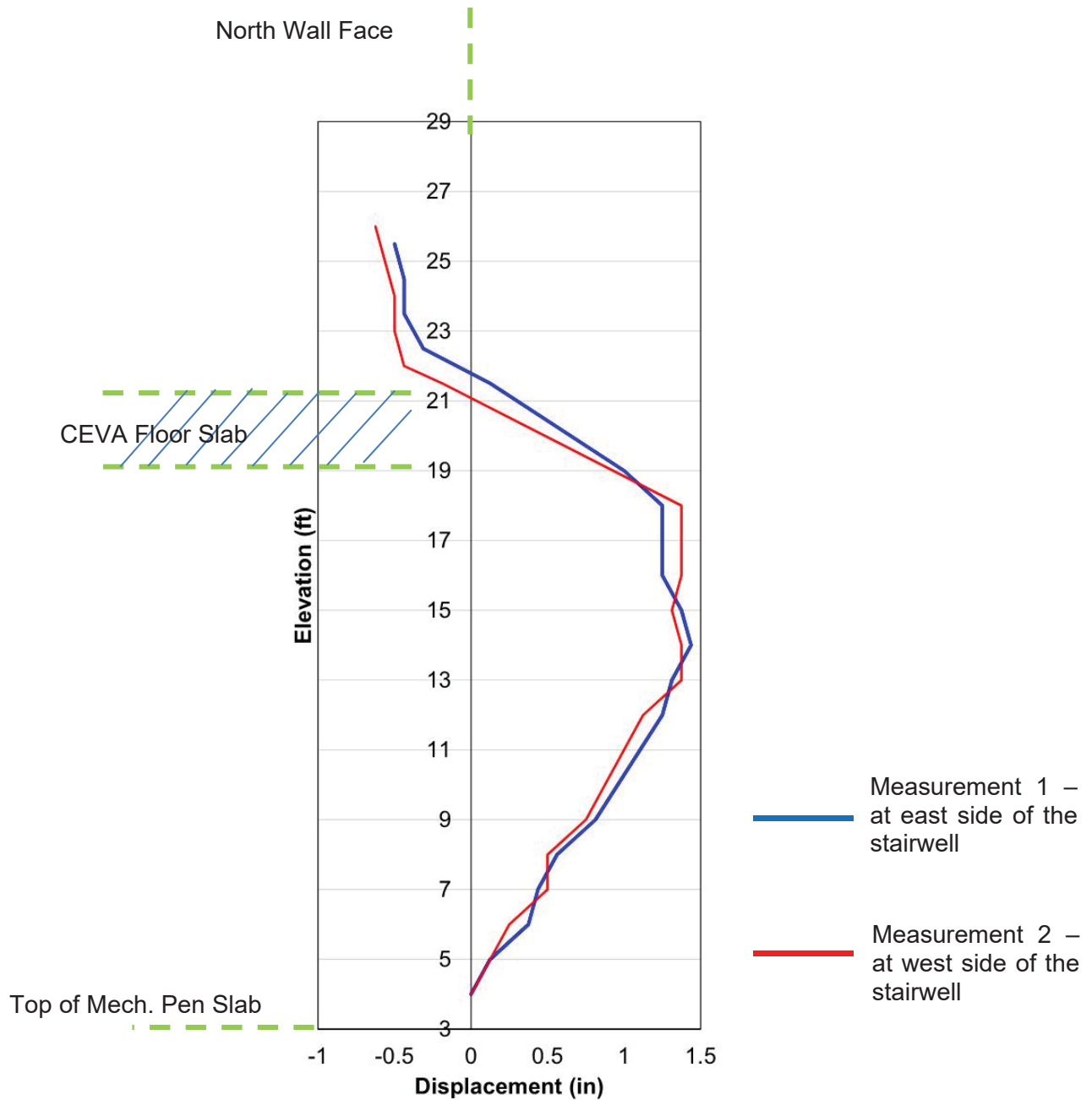


Figure 1 Plumbness profile of the north face of the North Wall of CEVA from EL +4 ft to EL +26 ft.