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Pa'ina Hawaii LLC

Promoting Agriculture in Hawaii

PO Box 30542 Honolulu, HI 96820

August 1, 2012

G. Michael Vasquez, Chief
Nuclear Materials Safety Branch A
U.S. Nuclear Regulatory Commission
Region IV
1600 East Lamar Boulevard
Arlington, Texas 76011-4511

Dear Mr. Vasquez:

Thank you for your letter of June 25, 2012 regarding the findings of NRC inspection 030-36974/2012-001 conducted at CHL Systems in Pennsylvania and at Pa'ina Hawaii in Kunia (Hawaii).

The Conclusion of this report states:

"The initial construction activities associated with the installation of the GRAY*STAR Genesis II irradiator pool, were observed by the NRC and no violations were identified. Several potential deficiencies were identified during the inspection dealing with the irradiator pool liner and components. The licensee will evaluate the potential deficiencies and coordinate the results of the evaluation along with any remedial actions with the NRC before loading licensed material."

CHL System engineers were onsite at Pa'ina Hawaii in Kunia, Hawaii, over the past two weeks completing installation of the Pa'ina Hawaii Genesis II irradiator. The listed activities in the NRC Inspector's report were completed by CHL Systems (and Pa'ina Hawaii) and are summarized in the attached two reports. No voids were detected beneath the bottom plate of the pool. The pool was visually inspected for scratches. CHL Systems noted that the size and depth of scratches are not of concern for pool liner long term durability and were buffed smooth and removed. The tank was also visually inspected and checked for alignment of all four areas of guide attachment points by level and measurements and found to have not been bent or stressed as rigging points in the placement of the pool into the pool excavation.

The CHL Systems method for the detection of void space beneath the bottom plate of the pool was reviewed and approved by Pa'ina Hawaii (Irradiation Safety Committee) and shared and discussed with NRC in a conference call on July 12 , 2012. A plastic covered hammer was used in place of a chain in the sounding of the bottom plate: ASTM Designation: D4580-03 (Reapproved 2007), Standard Practice for Measuring Delamination in concrete Bridge Decks by Sounding is attached for reference; Procedure B. Chain Drag Procedure was used with a hammer substituted for chain as provided in the testing procedure.

The test consisted of:

Onsite Calibration:

- First tap on the ¼" pool liner wall 30" above building floor level and listen for sound. (Hollow sound – detect void behind liner)
- Second tap on the ¼" pool inner wall 30" below building floor level and listen for sound. (Solid sound – detect NO void behind liner)

Perform Test on pool floor:

- Strike floor in 6" grid pattern across complete pool floor area.

The strength of the ¼" stainless steel floor liner strength was raised in the conference call of July 12, 2012 with NRC. Kevin Landis of CHL Systems requested and received the attached analysis by CHL Chief Engineer, Mark D. Leer, P.E.

NRC Inspection Report 030-36974/2012-001 raised concern regarding the possibility of void space beneath the bottom plate of the Pa'ina Hawaii pool. The soundings conducted by CHL Systems indicate the area beneath the bottom plate is solid. CHL System inspection of the pool further confirmed the integrity of the pool. The CHL Systems reports and findings of the NRC Inspection support a conclusion that the Pa'ina Hawaii pool was installed in a manner consistent with installation guidelines and in a manner in compliance with NRC License No. 53-29296-01. Therein, no remedial measures are proposed nor required.

Sincerely,

Lyle Wong

Lyle Wong, Ph.D.
Radiation Safety Officer
Paina Hawaii

Attachments:

CHL Systems Inspection Report – 078934-15 Gray*Star Genesis II Irradiator Ingro9und Pool Weldment and Installation Inspection Criteria and Results ()Inspection of scratch and lifting damage
CHL Systems Inspection Report – 078934-15 Gray*Star Genesis II Irradiator Ingro9und Pool Weldment and Installation Inspection Criteria and Results (Inspection of annulus for voids below bottom plate)
ASTN Designation: D4580 – 03 (Reapproved 2007), Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding.
E-mail, Kevin Landis (CHL Systems) to Lyle Wong (Pa'ina Hawaii), July 26, 2012, Subject: FW:078934-15: Gray*Start Genesis II Irradiator.

Designation: D4580 – 03 (Reapproved 2007)

Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding[1]

This standard is issued under the fixed designation D4580; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers procedures for surveying concrete bridge decks by sounding to determine delaminations in the concrete. It is not intended that the procedures described herein are to be used on bridge decks that have been overlaid with bituminous mixtures. The procedures may be used on bridge decks that have been overlaid with portland cement concrete mixtures; however, areas indicated to be delaminated may have a lack of bond between the overlay and the underlying bridge deck (Note 1).

NOTE 1—The influence of variable field conditions such as traffic noise, vibration, moisture content of the concrete, and the like, are not completely known and additional investigation may be needed. It is generally agreed that the practice should not be used on frozen concrete.

1.2 The following three procedures are covered in this practice:

1.2.1 *Procedure A, Electro-Mechanical Sounding Device*—This procedure uses an electric powered tapping device, sonic receiver, and recorder mounted on a cart. The cart is pushed across the bridge deck and delaminations are recorded on the recorder.

1.2.2 *Procedure B, Chain Drag*—This procedure consists of dragging a chain over the bridge deck surface. The detection of delaminations is accomplished by the operator noting dull or hollow sounds. Tapping the bridge deck surface with a steel rod or hammer may be substituted for the chain drag.

1.2.3 *Procedure C, Rotary Percussion*[2]—This procedure consists of rolling a dual-wheel, multi-toothed apparatus attached to an extension pole over the bridge deck surface. The percussive force caused by the tapping wheels will create either a dull or hollow sound indicating any delamination.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Significance and Use

2.1 This practice may be used in conjunction with other methods in determining the general condition of concrete bridge decks.

2.2 This practice may be used in determining specific areas of delamination requiring repair.

PROCEDURE A—ELECTRO-MECHANICAL SOUNDING DEVICE

3. Summary of Procedure

3.1 Longitudinal lines at a predetermined spacing are established on the bridge deck.

3.2 After calibration, the sounding device is pushed along the established lines. Electrically powered tapping wheels emit vibrations into the deck that are sensed by sonic receivers. Areas of delamination are indicated by deflections on a strip chart recorder.

3.3 All portions on the strip chart indicating delaminations are plotted on a scaled map of the bridge deck. An outline is made showing the areas of delamination.

4. Apparatus

NOTE 2—The apparatus described here has been found suitable and is the most common type commercially available. Other apparatuses that do not exactly conform to these requirements such as sounding device, tapping rate, or sonic receivers may also be accepted.

4.1 *Electro-Mechanical Sounding Device*—A small, three-wheeled cart upon which is mounted a 12-V battery, two tapping wheels, two sonic receivers, a two-channel-strip recorder, and associated connectors and cables.

[1] This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.32 on Bridges and Structures.

Current edition approved Dec. 1, 2007. Published January 2008. Originally approved in 1986. Last previous edition approved in 2003 as D4580 – 03. DOI: 10.1520/D4580-03R07.

[2] The rotary sound detecting device for concrete and procedure are patent pending in the US Patent and Trademark Office by Philip K. Clark Company, Inc., 503 Central Drive, Suite 102, Virginia Beach, VA 23454. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patent pending item to ASTM International Headquarters, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. Your comments will receive careful consideration at a meeting of the responsible technical subcommittee,[1] which you may attend.

4.1.1 *Tapping Wheels*— Two rigid-steel-tapping wheels capable of tapping the bridge deck surface at the rate of 33 times/s. The tapping wheels shall be located approximately 6 in. (152 mm) apart.

4.1.2 *Sonic Receivers*— Two sonic receivers consisting of oil-filled soft tires, inside each of which a receiving transducer is mounted in nonrotating proximity to the concrete surface. The transducers shall be piezo-electric hydrophones that are coupled to the concrete surface through the soft tires and the oil within the wheels. Each receiving wheel shall be located approximately 3 in. (76 mm) outside of and parallel to its corresponding tapping wheel.

4.1.3 *Strip Chart Recorder*—A two-channel-strip chart recorder shall be capable of receiving the signals from the sonic receivers. The electronics unit shall accept only those portions of the signal that occur during the first 3 ms after the occurrence of a tap and further limit the recorder to respond only to those frequency components of the signal that lies in the range of 300 to 1200 Hz. The processed signals shall be rectified and integrated to produce a visual record on the respective channels of the record chart. The chart shall be driven in proportion to the distance traveled so that the length of the record represents a predetermined length of travel. The recording pen on one channel shall be capable of acting as an event marker.

4.1.4 *Cables and Connectors*—There shall be sufficient cables and connectors for connection of the left-tapping wheel sonic-receiver system to the left channel of the strip chart recorder and the right-tapping wheel sonic-receiver system to the right channel of the strip chart recorder.

4.2 *Measuring Tape, Markers, Stringline*—A measuring tape, markers, and stringline shall be provided for establishing lines on the bridge deck that will serve to keep the sounding device positioned properly while making the survey.

4.3 *Calibrator*—A solid aluminum bar capable of checking the operational system of the sounding device.

5. Calibration

5.1 Place the device on the calibrator bar in the on position with the chart drive operating. This will establish the electrical zero line.

5.2 With the calibration switch in the calibrate position, turn on the power, transmitter, and chart drive switches. Each of the recorder pens should trace a rather erratic line approximately half way between the maximum pen movement and the electrical zero line. This line may vary one or two major divisions due to normal variations in the response of the system to the aluminum bar. If the response line does not fall as described, then each channel shall be adjusted with the appropriate calibration adjustment control.

6. Bridge Deck Layout

6.1 Any accumulation of debris on the deck must be removed.

6.2 Beginning at a curb face, mark each end of the bridge at the interval chosen for making the survey.

NOTE 3—Various spacing intervals such as 15 in. (38.1 cm), 18 in. (45.7 cm), and 3 ft (91.4 cm) have been used. The closer spacings are recommended for an in-depth analysis of the bridge deck. The wider spacing intervals are suitable for general-condition surveys of bridge decks.

7. Test Procedure

7.1 Stretch the stringline between corresponding marks on each end of the bridge.

7.2 With the switch in the operate position and the power and transmitter switches on, push the sounding device at a normal walking speed over the bridge deck. The device must be centered over the stringline. Continue in this manner until the entire deck has been surveyed.

7.3 Mark the ends of the bridge, expansion devices, and so forth, by activating the event marker.

8. Data Interpretation and Plotting

8.1 Construct a scaled map of the deck surface.

8.2 Plot the limits of all portions of each trace indicating a delamination. A delamination is considered a trace deflection of four or more minor chart divisions above the normal background response.

8.3 Connect the limits of these plots and outline the individual delaminated areas.

8.4 Determine the total area contained in the individual delaminated areas.

8.5 Divide the total delaminated area by the total bridge deck area and multiply times 100 to yield the percent of deck area delaminated.

PROCEDURE B—CHAIN DRAG

9. Summary of Procedure

9.1 A grid system is laid out on the bridge deck.

9.2 Chains are dragged over the deck surface. Delaminated areas are those where a dull or hollow sound from the chain dragging operation is apparent.

9.3 Delaminated areas are outlined on the deck surface. A map is prepared indicating the location of delaminations with respect to the grid lines.

10. Apparatus

10.1 *Chains, Steel Rods, or Hammers*—Acceptable sizes and configurations of chains, steel rods, or hammers are those that produce a clear ringing sound when dragged or tapped over nondelaminated concrete and a dull or hollow sound over delaminated concrete. A common chain drag configuration consists of four or five segments of 1-in. (25-mm) link chain of ¼-in. (6-mm) diameter steel approximately 18 in. (45.7 cm) long, attached to a 2-ft (61-cm) piece of aluminum or copper tube to which a 2- to 3-ft (61- to 91.4-cm) piece of tubing, for the handle, is attached to the midpoint, forming a T. Steel rods ⅝ in. by 4 ft (16 mm by 121.9 cm), or larger, have been found to produce satisfactory results.

NOTE 4—Heavier chains have generally been shown to produce a more definitive sound under heavy traffic conditions.

10.2 *Measuring Tape, Markers, and Stringline*—A measuring tape, markers, and stringline shall be provided for establishing a grid system on the bridge deck. Markers such as spray

paint or lumber crayon shall be used to outline delaminated areas on the deck surface.

11. Bridge Deck Layout

11.1 Any accumulation of debris on the deck must be removed.

11.2 Construct a grid system on the deck surface with a lumber crayon so that delaminated areas marked on the deck can be plotted easily on a map by referencing the areas to the grid.

12. Test Procedure

12.1 Survey the entire bridge deck by dragging the chains or tapping with the steel rod or hammer over the entire surface. On nondelaminated concrete, a clear ringing sound will be heard. A dull or hollow sound is emitted when delaminated concrete is encountered.

12.2 Mark the areas of delamination on the deck surface with the spray paint or lumber crayon.

13. Plotting

13.1 Construct a scaled map of the deck surface.

13.2 By referencing to the established grid system on the deck, plot the areas of delamination on the map.

13.3 Determine the total area contained in the individual delaminated areas.

13.4 Divide the total delaminated area by the total bridge deck area and multiply by 100 to yield the percent of deck area delaminated.

PROCEDURE C—ROTARY PERCUSSION

14. Summary of Procedure

14.1 A grid system is laid out on the bridge deck, vertical structural support or the underside of the bridge structure.

14.2 A rotary percussive device is rolled over the bridge deck, vertical structural member or the underside of the bridge deck. Delaminated areas are those areas where a dull or hollow sound is created from the rotary percussion units striking the surface.

14.3 Delaminated areas are outlined on the bridge deck's surface, vertical structural surface or on the underside of the bridge deck surface. A map (or field schematic) is prepared indicating the locations of the delaminations with respect to the grid lines or with respect to their proximity to permanent structural elements.

15. Apparatus

15.1 *Rotary Percussion Sounding Device*—A "T" shaped device with two rotary percussion units, which spin when rolled over a concrete surface. The device is either hand-held or attached to an extension pole to reach the overhead surfaces of structural members or the underside of the bridge deck surface. As the rotary percussion sounding device is rolled over the surface, the two percussion units strike the surface with sufficient force to create either a clear ringing sound when passing over solid concrete or a dull or hollow sound when passing over delaminated concrete.

15.2 *Rotary Percussion Units*—Two hardedened steel, 15-point percussion units are fit onto an axle and are capable of being rolled over the surface to be tested to sufficiently strike the concrete surface to generate the hollow sound indicative of delaminated concrete.

15.3 *Extension Pole*—The rotary percussion device is attached to a telescoping extension pole to reach the surface to be tested, either the top slab deck or an overhead structural member.

15.4 *Measuring Wheel, Markers, and String Line*—A measuring wheel adapted to fit a telescoping extension pole. Lumber crayons, spray paint markers, and string line shall be used to establish a grid system so that the delaminated areas can be accurately recorded.

16. Bridge Deck Layout

16.1 Any accumulation of debris on the deck must be removed.

16.2 Construct a grid system on the deck surface, vertical structure member, or the underside of the bridge deck with chalk line, lumber crayon, or by the test area's proximity to fixed structural components. Plot the areas on the field sheet.

17. Test Procedure

17.1 Survey the entire deck surface or overhead structural member by rolling the rotary percussion device over the entire surface. On non-delaminated concrete, a clear ringing sound will be heard. A dull or hollow sound will indicate delaminated concrete.

17.2 Mark the areas of delamination on the deck surface with spray paint or lumber crayon. Mark the areas of delamination on the vertical structureal members or the underside of the deck structure with an up-spraying spray paint device or lumber crayon.

18. Plotting

18.1 Construct a scale map of the surface to be tested.

18.2 By referencing the established grid system on the deck or overhead surface, plot the areas of delamination on the map.

18.3 Determine the total delaminated area within the grid system.

18.4 Divide the total delaminated area by the total bridge deck area (or overhead structural element) and multiply by 100 to yield the percent of deck area or overhead structural element found to be delaminated.

19. Report

19.1 The report shall include the following information:

19.1.1 Bridge location and description,

19.1.2 Survey method used,

19.1.3 Date of test,

19.1.4 Spacing of interval if Procedure A is used,

19.1.5 Percent of deck delaminated, and

19.1.6 Remarks.

20. Precision and Bias

20.1 The nature of the methods do not allow for a round-robin testing program. Practices do not provide test results, therefore, no precision and bias statement has been made.

NOTE 5—Available data suggests that the chain drag procedure is more precise in locating delaminations than is the electromagnetic sounding device.

CHL SYSTEMS

078934-15 Gray*Star Genesis II Irradiator Inground Pool Weldment And Installation Inspection Criteria and Results

Purpose: The in ground irradiator pool weldment is installed as outlined on the installation drawing POOLA-104-001-REV0. And no areas were damaged in transportation or installation.

Procedure: Visually inspect pool for overall condition and alignment.

Results: Visually inspected pool starting at outside of pool at building floor level and surveyed all 4 walls both outside and inside and found no areas of concern.

Procedure: Visually inspect pool scratches as high-lighted on site.

Results: Visually inspected all scratches identified at pool delivery to site. Scratch size and depth are not of concern for pool liner long term durability. Buffed scratches to smooth and remove discoloration.

Procedure: Visually inspect pool corner guides for damage from lifting during installation, as high-lighted from site contact.

Results: Visually inspected and checked alignment of all 4 corner guides for any sign of bent or stressed guides and areas of guide attachment points. Found no visible signs of any bent or stressed areas.

Inspector - Jordan Nyce Date - 7/16/12

CHL SYSTEMS

078934-15 Gray*Star Genesis II Irradiator Inground Pool Weldment
Annulus Grout fill Test Procedure, Inspection Criteria and Results

Purpose: The inground irradiator pool weldment as outlined on the installation drawing POOLA-104-001-REV0 is to be filled with concrete grout as per note 6 on the referenced drawing including the bottom floor cavity area. To ensure the bottom floor cavity area is fully filled a "Thump test" will be performed.

Procedure: Using a dead blow mallet, strike the floor in a 6" interval pattern in both directions to feel for a solid floor surface.

Inspection Criteria: The complete pool floor should be solid.

Results:

Specifications of mallet used: Trusty Cook - Model S3. Made in Indianapolis USA. Red in color. Made of softer plastic material so to not mar the stainless steel liner. Handle length - 12". The mallet head - round - 1-7/8" diameter. Length of the head is 5.5". Mallet weight = 1.6 lbs

Onsite calibration:
- First tapped on the 1/4" pool liner wall 30" above building floor level and listened for sound. (Hollow sound - (ringing) - detect void behind liner)
- Second tapped on the 1/4" pool liner wall 30" below building floor level and listened for sound. (Solid sound - detect no void behind liner.)

OVER →

Inspector - Jordan Nyce Date - 7/16/12

Proceeded to perform test on pool floor liner:

- outlined 6" grid pattern on complete pool floor surface.
- struck floor in 6" grid pattern across complete pool floor area.

Report results

Results: complete floor area tested out with a clear <u>solid sound</u> - <u>no voids detected</u> under stainless steel liner.

lyle Wong

From: Kevin Landis [kevin.landis@chlsystems.com]
Sent: Thursday, July 26, 2012 5:17 AM
To: lyle@painahawaii.com
Cc: GrayStarGenesis@aol.com; Hawaiiexport@aol.com
Subject: FW: 078934-15: Gray*Star Genesis II Irradiator

Lyle,
Please see the information you requested, in regard to the pool liner strength.
Thanks
Kevin

From: Mark Leer
Sent: Thursday, July 26, 2012 11:02 AM
To: Kevin Landis
Subject: 078934-15: Gray*Star Genesis II Irradiator

Kevin,

The answer to your question is as follows:

There will be 7.8 psi uniform loading on the bottom of the plate due to pressure from the 18' of water during installation. This is 1,123 psf (pounds per square foot).

Since the plate has multiple supports the maximum moment is a little less than a standard simply supported plate. In this case it is 4,263 lb-inches. That will give you a stress on the ¼" stainless steel floor liner of approximately 34,105 psi. Stainless steel type 304 has a yield strength of 35 ksi and ultimate strength of 85 ksi. This is without the concrete annulus support backing. Once the annulus is filled with concrete the liner is fully supported so the stress is reduced to a purely compressive loading of a negligible amount.

I hope this answers your question.

Thanks,
Mark

CHL SYSTEMS

Mark D. Leer, P.E.
Chief Engineer

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mark.leer@chlsystems.com

Inspiring industry productivity by bringing better ideas to life!

From: Kevin Landis
Sent: Thursday, July 26, 2012 10:45 AM

To: Mark Leer
Subject: 078934-15: Gray*Star Genesis II Irradiator

Mark,
Can you give me the ¼" stainless steel floor liner strength specifications?
(Without the concrete annulus support backing)
Thanks
Kevin

Kevin C. Landis

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