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**American Concrete Institute  
Pittsburgh Area Chapter**

P.O. Box 86  
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February 2023

# Chapter News



## Concrete In the Steel City

# Chapter News

## Concrete Q&A

### Cold Weather Cylinder Protection

February 2016 Edition of Concrete International

**Q** We've been placing elevated decks and recently had a cold stretch on our project where ambient temperatures ranged from 5 to 20°F (–15 to –7°C) over several weeks. We followed a cold weather plan during this time that involved heating decks from below as well as applying blankets to the surface as soon as finishing was complete. To reduce finishing time, our supplier used hot water and increased the dosage of accelerator as the placement progressed. Field test reports show that the concrete was typically placed at 60 to 65°F (16 to 18°C).

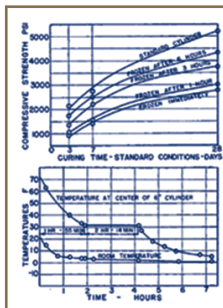


Fig. 1: Strength of concrete at different ages when molded at 72°F and allowed to set for the indicated times before being placed in a freezing unit at 5°F and the corresponding temperature curve of the concrete while freezing<sup>1</sup> (Note: 1 psi = 0.007 MPa; 1 in. = 25.4 mm; °C = (°F – 32) / 1.8)

Some initial strength tests from this period have come back significantly lower than expected. The testing lab had a heated cure box on ground level, but 6 x 12 in. (152 x 305 mm) cylinders were cast on the deck and not brought down to the cure box until the placement was completed—generally within 2 to 6 hours, depending on size.

I suspect that the low strengths are related to early cylinder protection. Could test cylinders freeze during that time frame? How much strength loss can be expected if they froze? Is there a way to confirm if cylinders froze or not?

**A** The best answer to your questions can be found in the results of a study by McNeese<sup>1</sup> conducted in 1952. The author was trying to determine the placement conditions under which freshly placed concrete would be damaged by freezing and how much is it damaged when frozen at various intervals and temperatures. He cast 6 x 12 in. (152 x 305 mm) cylinders at either

72 or 40°F (22 or 4°C), varied their exposure, and compared the strength loss of exposed cylinders to standard cured cylinders. Some cylinders were protected prior to exposure to freezing temperatures while others were exposed to freezing temperatures immediately upon casting.

McNeese's results for cylinders immediately exposed to freezing appear to be applicable to the conditions described for your project. The two bottom plots shown in Fig. 1 and 2 represent the temperature history of cylinders cast at 72°F (22°C) and immediately exposed to ambient conditions of 5 and 15°F (–15 and –9°C).

According to these plots, the temperature in your cylinders would likely have reached freezing after approximately 2 to 3 hours of cold weather exposure. McNeese found that cylinders can drop to about 32°F (0°C) within this period and suffer no long-term strength loss as long as the cylinders are protected prior to entering the freezing period. Once concrete freezes solid over the next 2 to 3.5 hours (flat-line portion of the bottom plots), permanent strength loss will occur due to the formation of ice crystals and disruption of the concrete paste. McNeese<sup>1</sup> and others<sup>2,3</sup> found that unprotected concrete loses approximately 30 to 50% of its strength potential when frozen early.

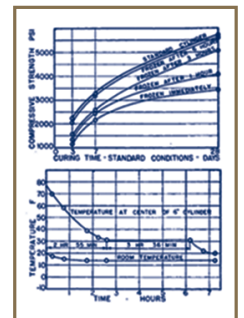


Fig. 2: Strength of concrete at different ages when molded at 72°F and allowed to set for the indicated times before being placed in a freezing unit at 15°F and the corresponding temperature curve of the concrete while freezing<sup>1</sup> (Note: 1 psi = 0.007 MPa; 1 in. = 25.4 mm; °C = (°F – 32) / 1.8)



## 2023 PITTSBURGH AREA CHAPTER UPCOMING MEETINGS & EVENTS

### MEMBER DINNER MEETING

**Wednesday - March 29, 2023**

Domenico's Restaurant

Piazza Plaza, 20550 Route 19, Cranberry Twp., PA 16066

### AWARDS BANQUET

**Friday - April 28, 2023**

Rivers Casino Pittsburgh

777 Casino Drive, Pittsburgh, PA 15212

### GOLF OUTING

**Monday - August 7, 2023**

Quicksilver Golf Club

## ~ MARCH DINNER MEETING ~

Abstract: Join us Wednesday, March 29th, 2023 for a project overview of the New River Chamber construction at Charleroi Lock. Kirk McWilliams and Brian Lucarelli will present a history of the construction of the New River Chamber and the challenges of constructing large infrastructure projects within the river.

Topic: In-the-Wet Concrete Construction at Charleroi Lock

Speakers: Kirk McWilliams, P.E., *Area Engineer for Navigation Mega Projects* & Brian Lucarelli, P.E., *Concrete Materials Engineer*

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Chapter News is published by the American Concrete Institute, Pittsburgh Area Chapter for the purpose of informing members and others about issues of concern to the concrete industry. If you have information to include in this publication or any comments, contact ACI Pittsburgh Chapter at 724-452-1468

*A Warm Welcome & Thank You  
to Our Newest Chapter Members!*

### INDIVIDUAL MEMBERSHIPS

**Garrett Zimmerman** ~ GCP Applied Technologies

**Kirk Kazienko** ~ GCP Applied Technologies

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**Zachary Casteel** ~ Beaver Excavating

**Michael Hopkins** ~ R-E-D Industrial Products

*The Pittsburgh Area Chapter continues to grow because of support  
from all of our members!*

## 8th Annual Excellence in Concrete Project Award

If you wish to submit an entry to  
be considered for this award,  
please visit our website  
[www.acipgh.org](http://www.acipgh.org) to download the  
application form.

### Reminder:

The deadline for project entries is  
February 28, 2023.



► Continued from page 1...

## Cold Weather Cylinder Protection

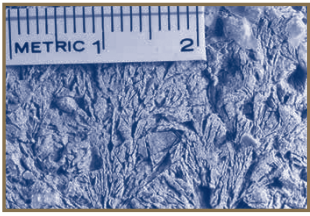


Fig. 3: "Crow's feet" visible in this micrograph show that ice crystals formed in the fresh concrete (photo courtesy of the Portland Cement Association)

If your placement times ranged from 2 to 6 hours, it is very likely that some of the test cylinders cast during longer placements froze before they were transferred to the curing box. To investigate if low strengths are due to freezing, you may be able to identify if the low-strength sets correlate with the first sets of cylinders cast for a particular placement. Those cylinders would have been exposed to low temperatures the longest. Also, if the lab retained the low-strength samples or if there are still cylinders left for testing, you can inspect broken sections for "crow's feet"—evidence that ice crystals formed in the fresh concrete (Fig. 3).

Regardless, your description indicates cylinders were not sampled in accordance with standard practices (ASTM C31/C31M<sup>4</sup>). To avoid similar issues on future projects, the construction team should discuss if a curing box can be located on the deck where the concrete is being placed or what arrangements need to be made to transport cylinders to ground level more quickly.

### References

1. McNeese, D.C., "Early Freezing of Non-Air-Entraining Concrete," *ACI Journal Proceedings*, V. 49, No. 12, Dec. 1952, pp. 293-300.
2. Bernhardt, C.J., "Damage Due to Freezing of Fresh Concrete," *ACI Journal Proceedings*, V. 49, No. 12, Jan. 1956, pp. 573-580.
3. Jonasson, J.-E., "Slipform Construction—Calculations for Assessing Protection Against Early Freezing," Swedish Cement and Concrete Research Institute, Stockholm, Sweden, 1985, 70 pp.
4. ASTM C31/C31M-15, "Standard Practice for Making and Curing Concrete Test Specimens in the Field," ASTM International, West Conshohocken, PA, 2015, 6 pp.

Thanks to Ron Kozikowski, North S.Tarr Concrete Consulting, Dover, NH, for providing the answer.

Questions in this column were asked by users of ACI documents and have been answered by ACI staff or by a member or members of ACI technical committees. The answers do not represent the official position of an ACI committee. Comments should be sent to [rex.donahey@concrete.org](mailto:rex.donahey@concrete.org).

## LIFETIME ACHIEVEMENT AWARD TRIBUTE TO: THOMAS "TINK" BRYAN

The Lifetime Achievement Award (formerly known as the Tink Bryan Award) was created in honor of an outstanding individual who had dedicated himself to his family, business, and the concrete industry. For several years now, the Chapter has honored various individuals with this award. The Pittsburgh Chapter Board of Directors is requesting nominations for this year's recipient. If a candidate is selected, they will be announced at the Awards Banquet in April. The candidate should demonstrate exceptional commitment and achievement of outstanding service to the concrete industry, and, throughout their professional career, has persistently made significant contributions in areas such as leadership, quality, or education in support of concrete promotion and industry advancement.

Please forward a letter with your candidate(s) name and reasons for nomination to:

ACI, Pittsburgh Area Chapter | PO Box 86, Zelienople, PA 16063 | or email to: [bethaci@zoominternet.net](mailto:bethaci@zoominternet.net)

*To be accepted for board review, nominations should be received by March 15th.*

### Past Award Recipients:

<b>2022</b> – David Thomas	<b>2008</b> – Russell Smith, Sr.	<b>2004</b> – Bernard Erlin	<b>2000</b> – George Wargo
<b>2016</b> – Chuck Niederriter	<b>2007</b> – John Thrower, Sr.	<b>2003</b> – Joe Homitsky, Sr.	<b>1999</b> – Wayne Miller
<b>2014</b> – Mark Patton	<b>2006</b> – Robert A. Prisby	<b>2002</b> – Paul Rader	
<b>2012</b> – Robert Lawrence	<b>2005</b> – David Chilcote, Sr.	<b>2001</b> – Andy Fertal	