Environment, Health & Safety
FACILITIES PLANNING & MANAGEMENT
UNIVERSITY OF WISCONSIN–MADISON

April 18, 2024

Incident Summary Report

Executive Summary

On the afternoon of Memorial Day, 2023, an estimated 80 people were on the UW-Madison Swimming Pier, some of whom were jumping and engaging in hazardous or disruptive behavior. Numerous warnings to halt this behavior were given by Union staff to these individuals. At 2:35pm, a pier support leg buckled, leading to a cascading failure of adjacent legs and sections of pier decking, causing numerous individuals to fall into the water. Lifeguards were not on duty at the time of the failure.

Approximately 20 people sustained injuries, mostly scrapes and minor lacerations. One individual was taken to a hospital out of concern that a previous injury had been exacerbated. A second individual sought urgent care for torn tendons related to having their foot trapped during the collapse. UWPD and Madison Fire Department responded rapidly with MFD providing the primary medical support.

The root cause of this incident is that the pier was subjected to strains more than what it was designed for. It was designed for supporting static, or longitudinal, loads, and the behavior of the occupants introduced significant latitudinal strain. The latitudinal strain caused a pier support leg to buckle, followed by catastrophic failure of numerous adjacent support legs and pier elements. Two additional contributing factors were an inability to halt hazardous or disruptive behaviors, and the weather being sunny and hot, with a large student population on campus prior to the start of semester classes.

EHS and Risk Management, in conjunction with input from Memorial Union, recommend installing a new swimming pier that is robust enough to accommodate static weights from high volume occupancy as well as latitudinal strain (horizontal sway). A substantial and lockable entrance gate should be installed at any future pier unless it is designed for excessively high occupant loads.

Units involved in staffing and managing aspects of the pier and swimming areas need to work together to address staffing, improved communications, and protocols for capacities and patrons engaging in activity that threatens the structural integrity of the pier.

Title: UW-Madison Swimming Pier Collapse

Date of Occurrence: Monday, September 4th, 2023

Location of Occurrence: 800 Langdon Street, at UW-Madison Swimming Pier along the Howard Temin Lakeshore Path

EH&S Incident Reviewers: Christopher Strang and Jesse Decker

Background: The UW-Madison Swimming Pier was purchased and installed by vendor, DL Anderson, in Spring 2013. Before the pier collapsed it was staffed by lifeguards at times pre-determined by Memorial Union with lifeguards assigned by Recreation Sports. Each year the pier was installed by the vendor following Memorial Day and removed by the vendor after Labor Day.

Incident Description: An estimated 80 people were on the pier, some of whom were jumping on the pier and otherwise engaging in hazardous or disruptive behavior, including, but not limited to individuals carrying each other, jumping on the pier, and combo jumping into the water. No lifeguards were on duty at the time of the incident due to confusion in communications earlier in the day.

Out of concern for other patrons, Union staff occasionally went onto the swim pier and asked people to halt this behavior following the departure of the lifeguards. A Union employee went onto pier and gave another verbal warning to halt these behaviors at approximately 2:25pm. These warnings were largely ignored by individuals on the pier.

At 2:35pm, an aluminum support piling buckled in one section of the pier, leading to a cascade of adjacent pilings and decking elements failing rapidly, causing numerous individuals to fall into the water. Most individuals swam or waded to shore while others held onto pier sections that had partially collapsed or to sections of the pier that remained fully standing. Others climbed into boats arriving on scene.

Impact of Incident: Numerous sections of the pier and its support structure were damaged. The pier cannot be re-used. Approx. 20 people sustained injuries, mostly scrapes and minor lacerations. One individual was taken to a hospital out of concern that a previous injury had been exacerbated. A second individual sought urgent care for torn tendons related to having their foot trapped during the collapse.

Post-Incident Response:

- Individuals left the water and reported to UWPD and MFD officials on scene to seek treatment for injuries and report lost items.
- Union staff closed the collapsed pier to further access using barricades.
- Union maintained possession of lost items for redistribution to owners following cataloging by UWPD**.**
- UWPD assisted with crowd control, general reporting and interviews with individuals involved. They provided some injury assistance, and itemization of lost property.
- MFD was the primary responder for the treatment of injuries.

- **Insurance information related to incident:**
    - State of Wisconsin Department of Administration Bureau of State Risk Management (BSRM) received subsequent liability claims from individuals claiming damage to their personal property and medical care-related expenses. These claims have been denied by BSRM under the State of WI Self-Funded Liability Program based on a finding by BRSM of no negligence on the part of UW-Madison officers, employees, or agents. UW Madison Union Management is reviewing these claims for direct good-will payments to the impacted individuals following UW System Administration Policy 610. Goodwill payments, if made, will be paid directly by the Union and not via the State of WI Self-Funded Liability Program.
    - UW-Madison submitted a property claim for the damaged pier, which BRSM denied. BRSM's asserted basis for denial was that piers are no longer covered under the State of WI Self-Funded Property Program.

Additional Concerns: What was observed that had the potential of exacerbating the incident?

- Lack of communication between lifeguards, Union staff, and RecWell lifeguard supervisors earlier in the day resulting in confusion as to whether lifeguards were supposed to be on duty at the time of the incident.
- Lifeguards were not on duty at the time of the collapse.
- Neither lifeguards nor Union staff were able to contact lifeguard supervisors.
- There is no barrier to restrict access or limit occupancy on the pier.
- There is no determined or posted maximum occupancy for the pier, nor are there procedures in place to monitor or enforce such limits.

Mitigating factors: What was observed that prevented the incident from potentially being worse?

- Rapid response by emergency services had medical assistance there within minutes of the collapse.
- The water was warm, reducing trauma for individuals falling into the water.
- No small children or individuals with infirmities were on the pier at the time of collapse.
- Some sections of the pier remained upright, allowing many individuals to hold onto, climb onto, and remain on, those sections.

Causes of Incident:

- Direct Cause:
    - Too many people on the pier engaging in activity that, in the aggregate, exerted lateral pressure on the pier more than its design capacity.
- Contributing Causes:
    - The pier was not designed for the activities being undertaken by occupants.
    - Failure of UW or contracted staff to halt individuals on the pier from engaging in such activity.
    - Confusion as to whether lifeguards were supposed to be on duty.
    - Holiday with warm sunny weather.

- Incident occurred on a weekend when many students had just returned to campus following summer break and had not yet commenced classes, which contributed to the large number of students at the Union generally.
- The structural condition of the pier was not known, as no inspection documentation was maintained.
- Per build specs from UW-Madison, "Legs need to taper out to make the pier more stable" This increases stability, but also increases latitudinal strain on pier leg supports compared with legs at a 90^{o} angle to the lakebed.
- Due to the number of people on numerous adjacent pier sections, the adjacent leg supports were likely already near maximum static load and experiencing latitudinal strain which they are not designed for. When one support leg buckled, others rapidly followed suit until weights on the pier stabilized from people falling into the water.
- Per Manufacturer Rep: The maximum load of 1,920 pounds is not to be exceeded on any one 6' x 8' section. "Each section can fit more than 10 people weighing 200 pounds making it possible to significantly exceed the 1,920-pound section load limit."
- Per Manufacturer: There is a dock leg rating of 1,200-lbs / leg which equates to 50 PSF for each 24 sq. ft. section. Each section can fit more than 10 people weighing 200 pounds making it possible to significantly exceed the 1,200-pound dock leg load limit.
- Vertical supports legs are braced with a diagonal brace (see pictures below). The longer the leg, the longer the unbraced length to the lakebed which impacts the ability of the leg to withstand latitudinal strain.

- Root Cause:
  - It was not anticipated in the design phase that the pier would need to be able to handle the loads created by high-capacity occupancy which included individuals engaging in hazardous or disruptive behavior.
  - The behavior of some individuals on the pier introduced significant latitudinal strain *(side-to-side/swaying/rotational movement)* on a structure designed for supporting static loads (longitudinal strain).

Corrective Actions:

- Any new swimming pier must be robust enough to accommodate static weights from high volume occupancy as well as latitudinal strain (horizontal sway).
  - It is not possible to control capacity or occupant actions on the pier without significant staffing, enforceable consequences for patrons engaging in hazardous or disruptive behavior, and physical barriers to access points.
  - A substantial and lockable entrance gate should be installed at any future pier unless designed for excessively high occupant loads.
- Develop a documented plan among affiliated parties, including lifeguards and their supervisors, Union building managers, Outdoor UW, Lake Rescue & Safety, contracted event security staff, and UWPD staff to address:
  - Consistent and appropriate staffing
  - Consistent communications
    - Standard Operating Procedures for daily use.
    - Response and responsibilities when incidents occur.

- Develop a plan to manage capacity and patrons engaging in activity prohibited by the swimming pier policies and rules.
    - Maximum capacity signage must be visible at entrance.
    - Train on this plan and ensure staffing is adequate to make the plan successful.
    - Review the swimming pier policies and rules to determine whether any changes are necessary to address activities that may impose excessive strains on the structural integrity of the pier.
        - Consider how to address activities that, when an individual or a small number of people engage in it, do not pose a risk to structural integrity, but when enough people engage in it at the same time may, in the aggregate, pose such a risk.
- Maintain an accurate log of pier condition reports which include condition before and after annual installation and removal.
    - The required weekly inspections are to be documented.
- Review the current weekly inspection protocols to determine whether they are adequate to identify potential structural problems with the pier.
- Signage needs to be secured to prevent patrons from altering "open/closed" status notifications.
    - Language on signage to be approved by Legal, Risk Mgmt., EHS Environmental Health
- Recommend that lifeguards staffed per Wisconsin State Statute ATCP 76.23
    - ATCP 76.23 does not apply regulatorily but provides guidance on staffing.

Addendum:

Videos

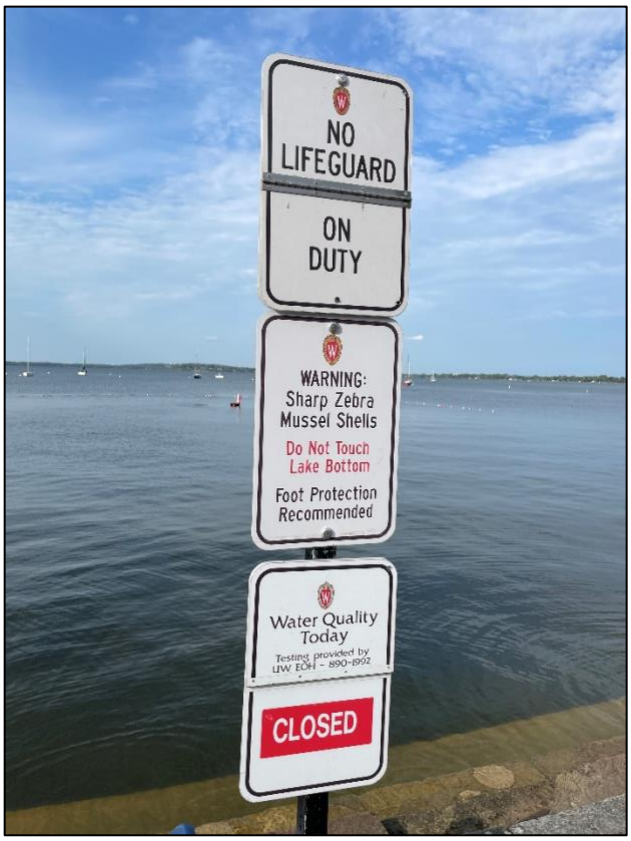
https://youtube.com/shorts/koiTL7BuIKc?si=oiEjx3iWFHjkFW1X

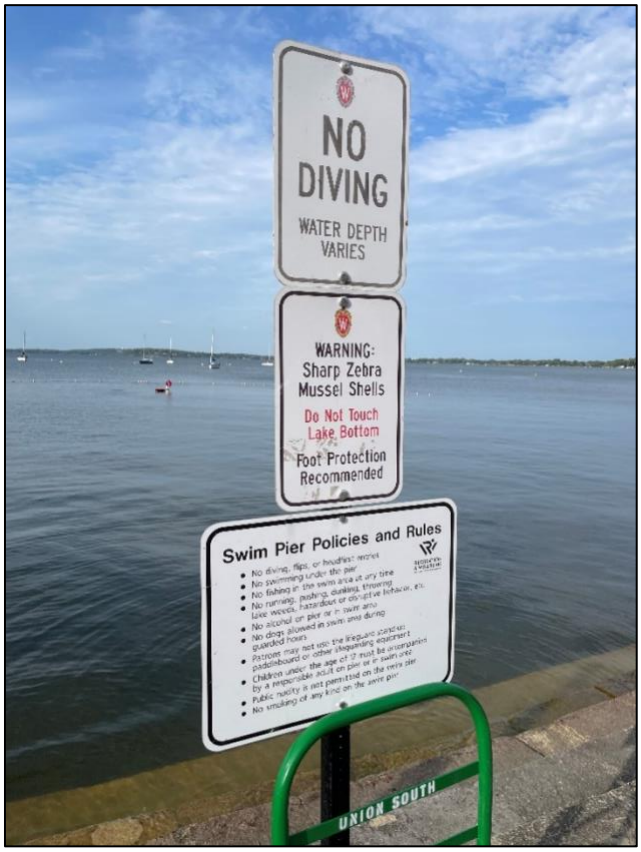
https://www.youtube.com/shorts/LM4Vwl0E5jU

https://www.youtube.com/shorts/o5ZBkMsEFfw

https://www.youtube.com/watch?v=4yl-aJ0mSiY

Signage at time of Incident (UWPD)

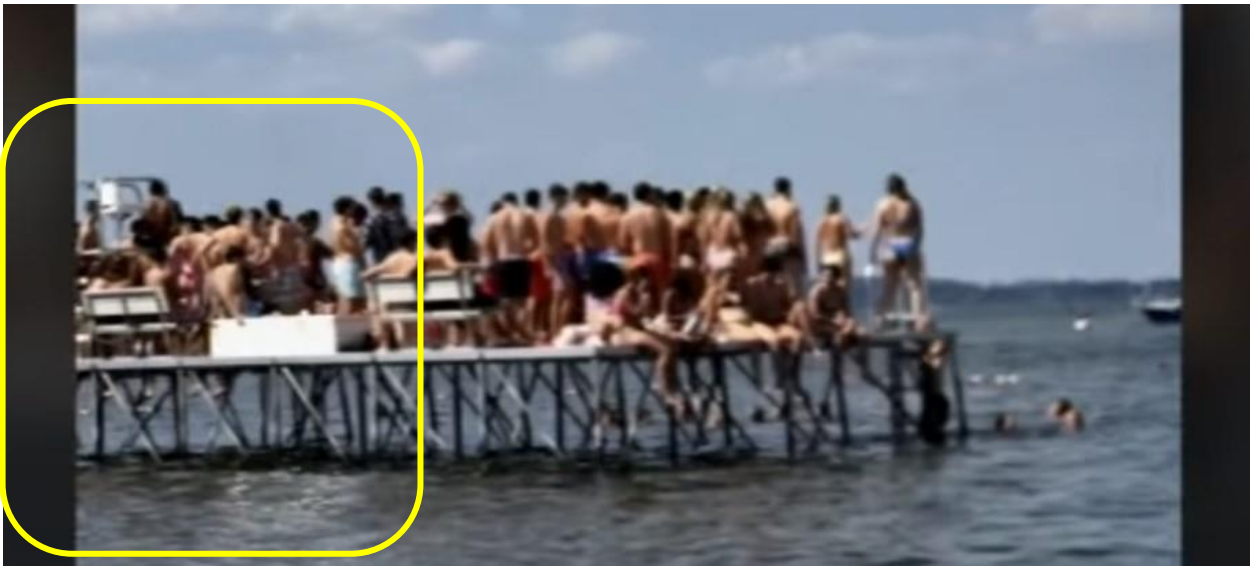




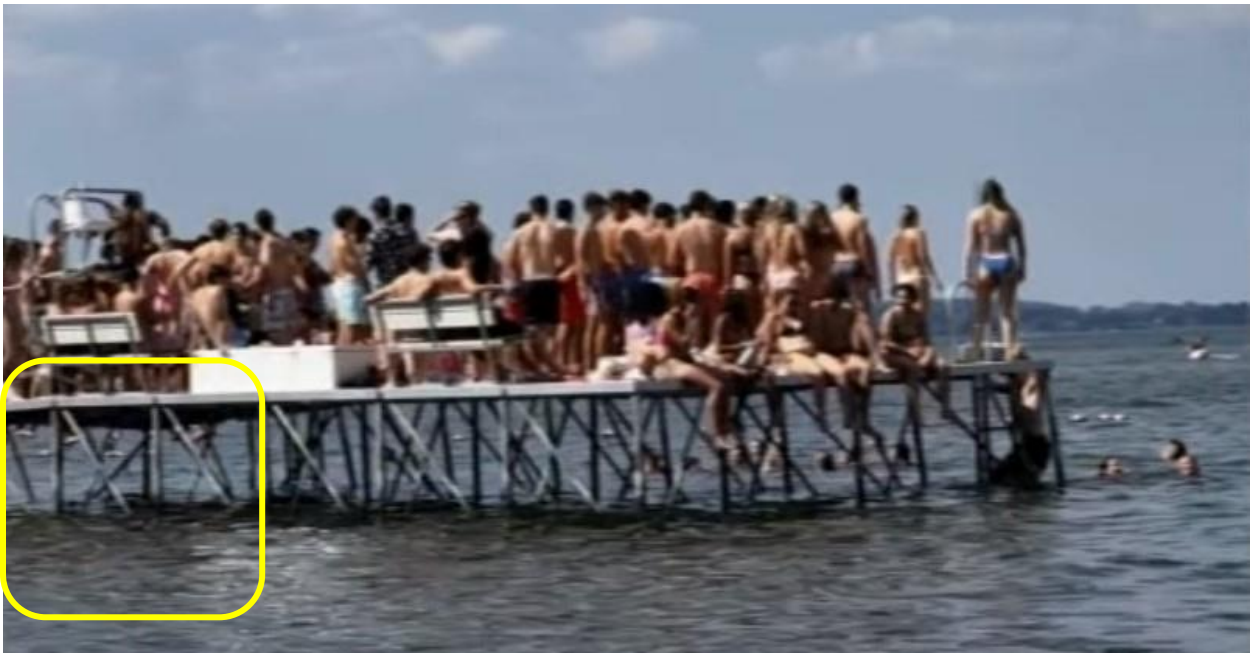
Flip signs denoting No Lifeguard on Duty and Water Quality

Swimming Pier Policies and Notice

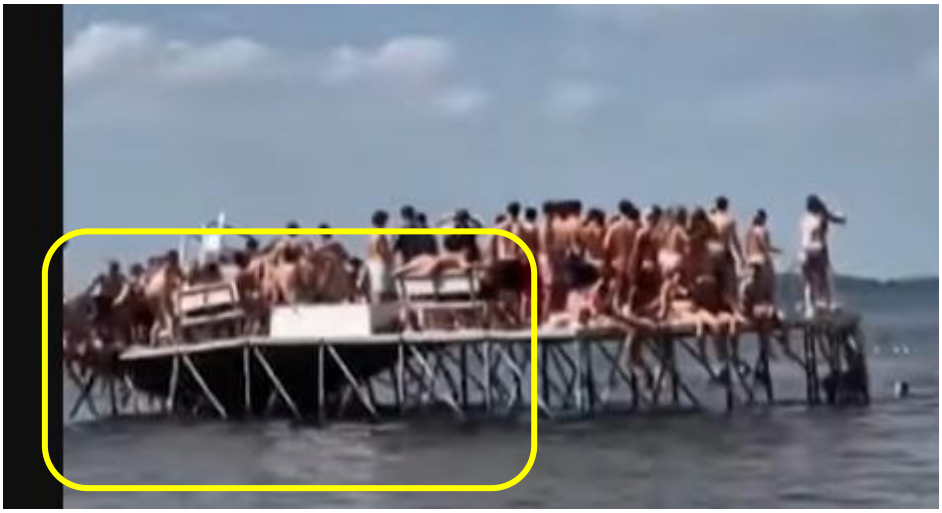
Still frames of collapse – < 2 seconds elapsed time (YouTube)



1) 1 Second before collapse all vertical support legs are currently vertical.

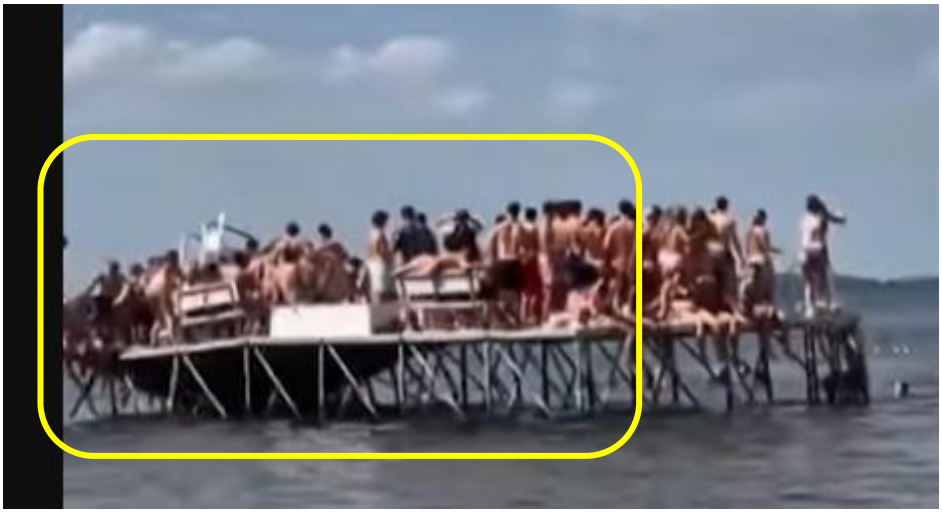


2) 0 Second. Failure begins. Notice bulge on the decking at the far left of this image, at the underside of the pier deck; the leg beneath that bulge appears to be buckling northward.

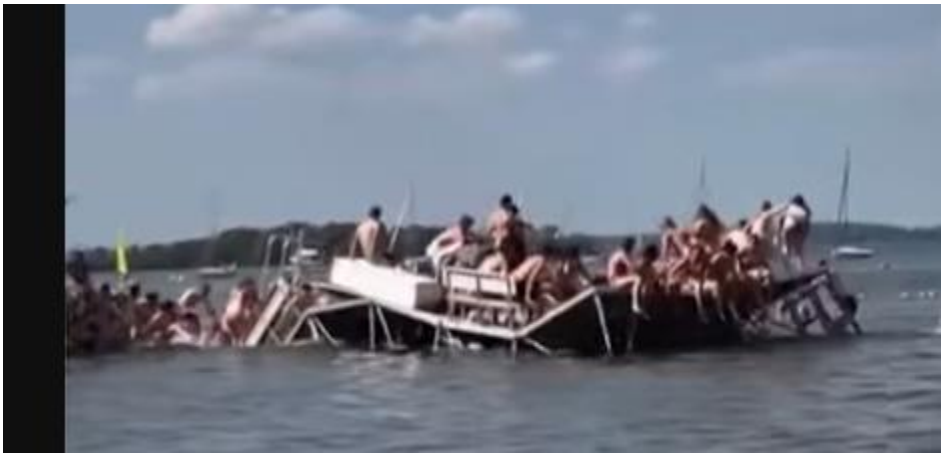


3) Less than .5 seconds later, multiple support legs have buckled in numerous directions and the horizontal edge of the pier decking is buckling across numerous sections. Occupants have begun falling into the water.

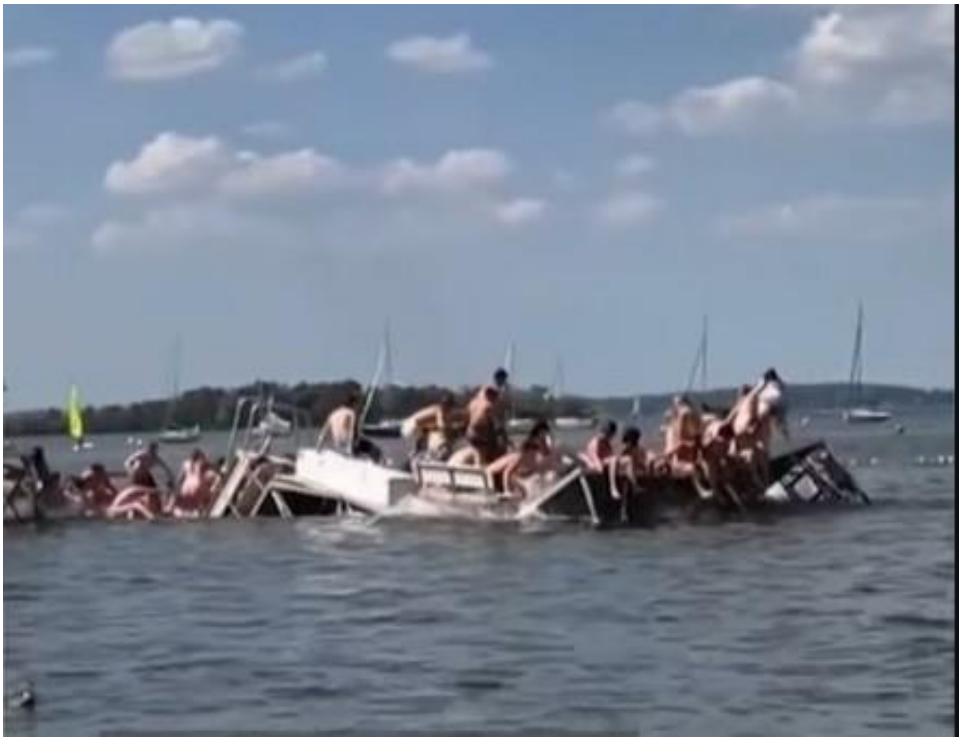
4) Continued cascade of support legs and deck edging failing northward.



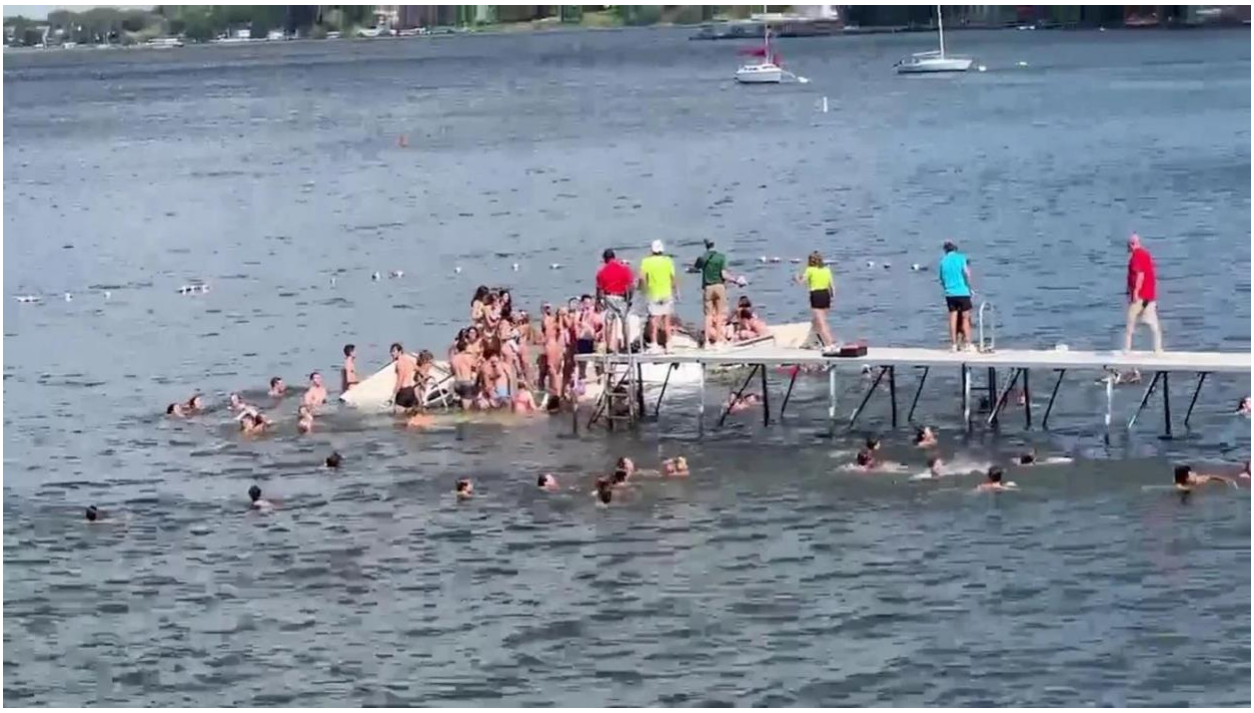
5) Support legs towards the south side are now failing. 1 second elapsed from initial buckling.



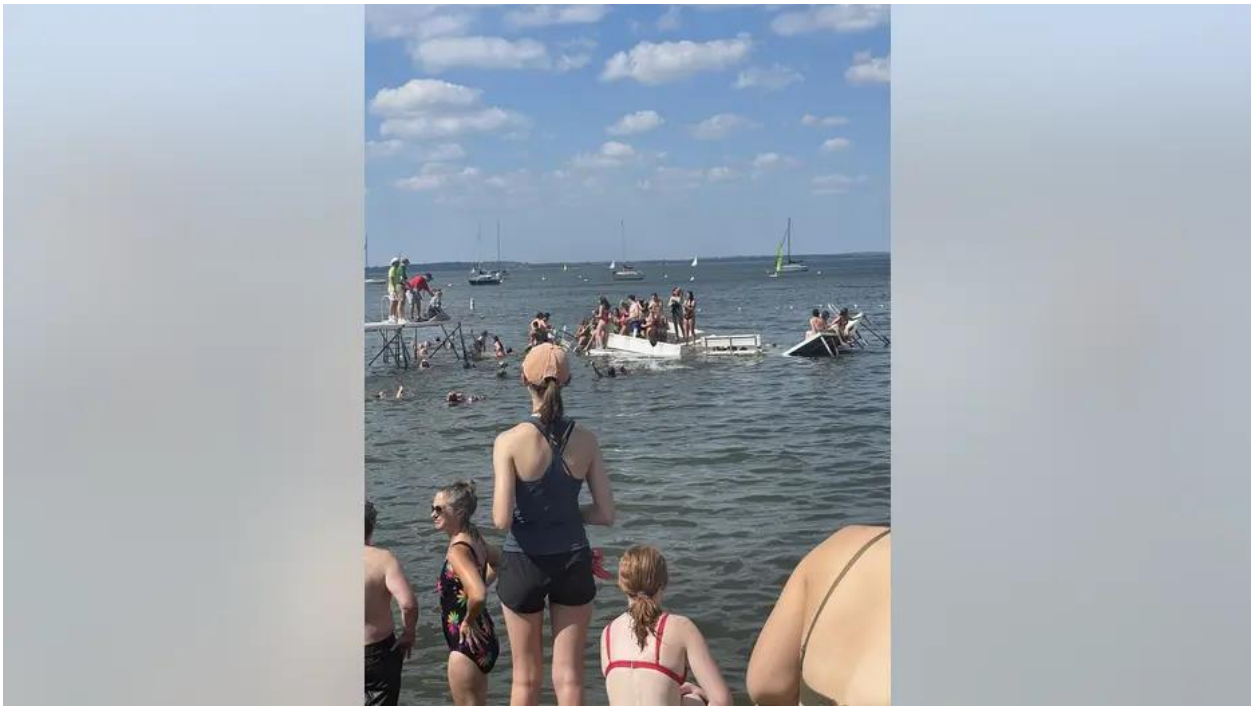
6) Extended failure continues across pier support legs and horizontal edging.



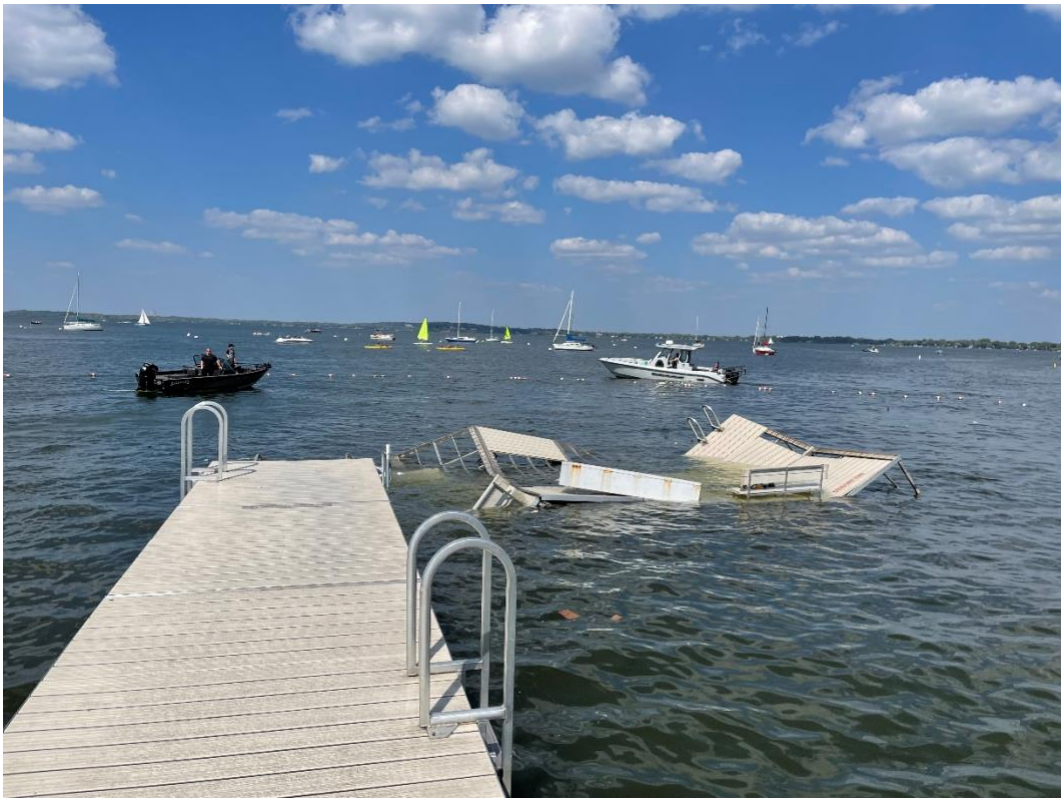
7) 2 Seconds in, pier support legs have finished failing in a cascade.



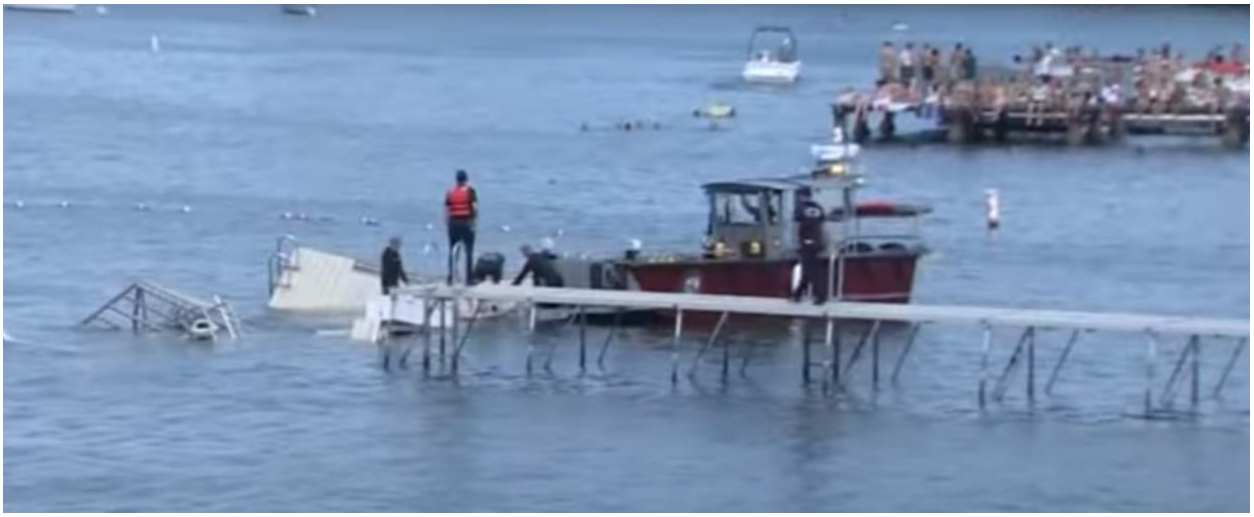
8) 5 Seconds in, people are swimming to shore or climbing onto remaining pier structures. Occupants climbing onto failed sections of the pier are causing those sections to sink deeper into the water. (Instagram)



9) Numerous pier sections have completely gone under water by 10 seconds from moment of initial failure.



10) Approximately 10 minutes after collapse. (UWPD)



11) Pier removal.

Wisconsin State Statute ATCP 76.23 Table A

Required Number of Lifeguards Based on Square Footage Actual Patron Load*

Actual Patron Load	Lifeguards for a Pool or *Water Attraction* with a Surface Area of 2,000 to 4,999 sq. ft	Lifeguards for a Pool or *Water Attraction* with a Surface Area of 5,000 to 9,999 sq. ft.	Lifeguards for a Pool or *Water Attraction* with a Surface Area of 10,000 or more sq. ft.
1 – 60	1	2	3
60-136	2	3	4
137-236	3	4	5
237-336	4	5	6

*When the patron load exceeds 336 patrons, one lifeguard shall be provided for each additional 100 patrons or fraction thereof.