DIRECTORS’ MEETING  
MONDAY, JUNE 20, 2016  
555 S. 10TH STREET  
BILL LUXFORD STUDIO  
2:00 P.M.

I. MINUTES  

II. ADJUSTMENTS TO AGENDA

III. CITY CLERK

IV. MAYOR’ CORRESPONDENCE  
1. NEWS RELEASE. Health Department encourages immunizations.
2. NEWS RELEASE. “A Cast of Blues” opens Friday at Bennett Martin Public Library.
3. NEWS ADVISORY. Mayor Beutler will hold a news conference Thursday, June 16th, 10:00 a.m. at 555 S. 10th Street to discuss three topics: Taking Charge Survey, Uncle Sam Jam July 3rd, and plans for Streets Alive!
4. NEWS RELEASE. “Uncle Sam Jam 2016" features Soul Dawg, Kids’ games and Zambelli fireworks.

V. DIRECTORS CORRESPONDENCE

COMMISSION ON HUMAN RIGHTS  
1. 2015 Annual Report. Also on their website.

HEALTH DEPARTMENT  
1. Lincoln-Lancaster County Health Department, Board of Health meeting minutes of May 10, 2016.

WEED AUTHORITY  
1. Lancaster County Weed Control - City of Lincoln Weed Abatement newsletter for June, 2016.

WEST HAYMARKET JOINT PUBLIC AGENCY  
1. The West Haymarket Joint Public Agency Board meeting scheduled for Thursday, June 23rd has been canceled due to lack of agenda items.

VII. BOARDS/COMMITTEES/COMMISSION REPORTS  
1. District Energy Corporation (DEC) - Camp  
2. Public Building Commission (PBC) - Camp, Raybould  
3. Metropolitan Officials Committee (MPO) - Christensen, Gaylor Baird  
4. PBC Chair and Mayor - Raybould  
5. Board of Health - Raybould

VIII. MISCELLANEOUS  
1. Edward Byrne JAG Federal Grant - Chief Jeffery Bliemeister
IX. COUNCIL MEMBERS

JON CAMP
1. Donna Garden, Assistant Director Public Works & Utilities, replying on the concern of ammonia being introduced into Lincoln’s water system.
   a) Councilman Camp requesting Public Works & Utilities to look and reply to the concern of ammonia being introduced into Lincoln’s water – No. 6 on Agenda of 06.13.16.
2. Wall Street Journal article: “Pension Funds Pile on Risk Just to Get a Reasonable Return”

JANE RAYBOULD
1. Thomas Shafer, Design/Construction Section Manager, replying on Horst Hahn’s concerns of the intersection of Pace and Marilynn Avenue with the tree issue answered by Bob Weyhrich, City Forester.
   a) Councilwoman Raybould requesting answers on the street pavement condition at Marilynn Avenue and Pace Boulevard - No.’s 1 and 2 on Agenda of 06.13.16.

X. CORRESPONDENCE FROM CITIZENS
1. Gerald Hood writing with suggestions, comments, on the budget and the Take Charge Survey.

XI. MEETINGS/INVITATIONS
See invitation list.

XII. ADJOURNMENT
HEALTH DEPARTMENT ENCOURAGES IMMUNIZATIONS

The Lincoln-Lancaster County Health Department (LLCHD) is offering additional immunization clinics this summer to serve eligible children who may be excluded from school if they do not meet vaccination requirements. The clinics are by appointment only at the Health Department, 3140 “N” St., on following days:

- 8 a.m. to 6 p.m. Tuesdays and Thursdays in June, July and August.
- 10 a.m. to 1 p.m. Saturdays June 18 and July 16.

To speak to a nurse or make an appointment, call 402-441-8065.

Nebraska law requires private and public school students, kindergarten through grade 12, submit written verification of their immunization status by October 19, or 60 days after classes begin. Non-compliant students will be excluded from school.

To be eligible for the LLCHD vaccine, children must be under 19 years of age and uninsured, under-insured, covered by Nebraska Medicaid, or of American Indian or Alaskan Native origin. Children must be accompanied by a parent or legal guardian and have records of previous vaccines. Free or reduced cost services are available based on need.

More information is available at: health.lincoln.ne.gov. Select “Vaccine Clinic” under the heading “Community Health Services.”
FOR IMMEDIATE RELEASE: June 14, 2016
FOR MORE INFORMATION: Pat Leach, Lincoln City Libraries, 402-441-8510

“A CAST OF BLUES” OPENS FRIDAY AT BENNETT MARTIN PUBLIC LIBRARY

An exhibition celebrating Mississippi blues music begins Friday, June 17 with an opening reception from 6 to 8 p.m. at the Bennett Martin Public Library, 136 S. 14th St. “A Cast of Blues” features 15 resin-cast masks of blues legends created by artist Sharon McConnell-Dickerson, as well as 15 color photographs of performers and juke joints by photographer Ken Murphy. The reception will include a performance by local blues artist CA Waller.

The exhibition can be viewed during normal library hours through Wednesday, August 10. Three other special events are planned:

• Professor, composer and jazz musician Randall Snyder will present “They Call it Stormy Monday: Evolution of the Blues” at 3 p.m. Sunday, June 26.
• The Redwoods, a BluesEd Band sponsored by the Blues Society of Omaha, will present “Keep the Blues Alive” at 2 p.m. Wednesday, July 27.
• Emily Bass and the Near Miracles will perform at a First Friday closing reception from 6 to 7 p.m. Friday, August 5.

The exhibition includes educational materials, a music playlist and a closed-captioned film about the project. It is also accompanied by the 2008 documentary film “M for Mississippi: A Road Trip through the Birthplace of the Blues.” The exhibition was organized by ExhibitsUSA, a national partner of Mid-America Arts Alliance. It was curated by Chuck Haddix, music historian, author, radio personality and director of the Marr Sound Archives at the University of Missouri-Kansas City.

McConnell-Dickerson, who is visually impaired, said visitors are encouraged to touch the resin-cast masks. “A life cast is like a 3-D photograph to someone who is blind,” she said. “It captures the flesh, muscle, bone, hair and subtle expressions of emotion. I wanted to discover the faces behind the music I love, so I went to Mississippi to map out the visages of the real Delta blues men and women.” The exhibition includes braille labels.

-more-
Ken Murphy’s photographs are selected from the book “Mississippi: State of Blues” (published 2010 by Proteus/Ken Murphy Publishing). A longtime Mississippi resident, Murphy captures the essence of the blues through highly detailed, panoramic color photos.

Blues music was born in the Mississippi Delta in the 1920s and 1930s with artists like Charlie Patton, Son House and Robert Johnson. The next generation of Mississippi artists led by Willie Dixon, Muddy Waters and Howlin’ Wolf took the Delta blues north to Chicago. Their work has inspired generations of rock and roll musicians, including The Beatles, The Rolling Stones and the Black Keys. Since the 1990s, Delta blues has undergone a revival, with the rediscovery of overlooked artists and the rise of contemporary blues acts like the North Mississippi Allstars and the Homemade Jamz Blues Band.

ExhibitsUSA sends more than 25 exhibitions on tour to more than 100 communities every year. More information is available at eusa.org. The Mid-America Arts Alliance based in Kansas City, Missouri, is the oldest nonprofit regional arts organization in the U.S. More information is available at maaa.org.

More information on Lincoln City Libraries is available at lincolnlibraries.org.

-30-
DATE: June 15, 2016
FOR MORE INFORMATION: Diane Gonzolas, Citizen Information Center, 402-525-1520

Mayor Chris Beutler will have a news conference at 10 a.m. Thursday, June 16 in Room 303, third floor of the County-City Building, 555 S. 10th Street.

The news conference will have three topics:

- Update on the Taking Charge survey
- Plans for the Uncle Sam Jam July 3 at Oak Lake Park. One of the local acts performing for the celebration is Golden Studio. The Kurdish hip-hop duo will play a few songs before the news conference begins.
- Plans for Streets Alive! September 6. The featured speaker will be Jay Foreman, a former Husker and professional football player, who founded The Foreman Foundation, a nonprofit that helps those living with diabetes.

NOTE FOR TONIGHT: Media are invited to cover the Mayor’s Arts Awards this evening at the Lied Center (enter through Carson doors on west side). The reception starts at 5:30 p.m., with dinner at 6:15 p.m., and the awards presentation at 7:15 p.m.
FOR IMMEDIATE RELEASE: June 16, 2016
FOR MORE INFORMATION: Jon Taylor, Citizen Information Center, 402-441-7547

“UNCLE SAM JAM 2016” FEATURES
SOUL DAWG, KIDS’ GAMES AND ZAMBELLI FIREWORKS
Event is Sunday, July 3 at Oak Lake Park

Mayor Chris Beutler today invited area residents to the City’s annual Uncle Sam Jam Independence Day celebration at Oak Lake Park, Sunday, July 3. Activities will begin at 1 p.m., and the fireworks display will begin at 10 p.m.

Soul Dawg, a horn-driven, funk rock band will perform from 6:15 p.m. to 9:30 p.m. The group’s seven-piece lineup of area music veterans plays high-energy hits from bands such as Earth, Wind and Fire, Parliament, James Brown and Stevie Wonder. Visit Souldawg.com for more band information.

The fireworks are sponsored by Pepsi-Cola and presented by Zambelli Fireworks. The show will be set to music provided by NRG Media/Broadcast House and aired on its four radio stations – B107.3 FM, Froggy 98.1 FM, 105.3 Wow FM and KLIN 1400 AM. The Lincoln Journal Star also is a partner in the celebration.

The City Parks and Recreation Department will provide free family activities beginning at 1 p.m. with canoeing, disc golf, horseshoes and youth stage performances. More activities and kids’ games begin at 3 and 5 p.m. including, carnival games, bingo, box hockey, a gaga pit and the NEOS interactive playground game. The Kurdish hip-hop band Golden Studio will perform mid-afternoon. Food and concessions will be available beginning at 1 p.m. in the main parking lot. VFW Post 3606 will conduct the flag-lowering ceremony at 8:25 p.m.

In case of inclement weather, the musical performance, food vendors, fireworks display and radio broadcasts will be rescheduled to the same location and times on Monday, July 4. Many of the family activities and kids’ games also would be rescheduled.

Ample free parking is available at Oak Lake Park and the surrounding area. More parking can be found at the festival space north of Pinnacle Bank Arena. Only those with tickets to the baseball game may park in the Haymarket Park lots. The public is encouraged to arrive early to avoid traffic delays.

-more-
A $3 event parking fee will be offered beginning at 1 p.m. at Haymarket Garage, 9th and “Q” streets. StarTran will provide free public shuttle bus service from 5 p.m. to 11 p.m. between the main entrance at Oak Lake Park and these locations:

• Haymarket Parking Garage, 9th and “Q”
• Gold’s bus stop, 11th and “O”
• County-City building complex - northeast corner of 9th and “H” and southeast corner of 9th and “K”. Free parking is available in two lots – one bounded by 9th, 10th, “G” and “H” and one bounded by 9th, 10th, “K” and “L”.

Handi-Van service is available for those eligible, and reservations can be made by calling StarTran at 402-441-7109.

Fireworks other than those used in the Zambelli show are prohibited in the park during the celebration. Fireworks are prohibited in all City parks at all times. City ordinance allows the sale and use of permissible fireworks in the City only from 8 a.m. to 11 p.m. July 3 and from 8 a.m. to 11:59 p.m. July 4 of each year.

Attendees are reminded that Lincoln City parks are now tobacco-free. City policy prohibits use of any form of tobacco products, including cigarettes, cigars, pipes and chew or dip, in any park areas or facilities designated as tobacco-free.

The Red Cross will have first aid available. Alcohol and personal water craft are prohibited in the park. All pets are required to wear a leash in the park, and residents are discouraged from bringing pets to the park during the fireworks display.

Please visit lincoln.ne.gov (keyword: uncle sam jam) for more information.
COMMISSION ON HUMAN RIGHTS

Let’s pull together before we’re torn apart.

2015

ANNUAL REPORT

555 S. 10th Street, Ste. 304
Lincoln, NE 68508
402-441-7624
402-441-6937- Fax
Lincoln.ne.gov
TABLE OF CONTENTS

Contents

Mayor ________________________________ 1
Executive Director ________________________ 2
Commission Chair ________________________ 3
Commissioners __________________________ 4
Mission Statement _________________________ 6
LCHR Staff ______________________________ 7
Complaint Process* _______________________ 8
Case Statistics _____________________________ 9
Settlement Summaries ______________________ 15
Service Satisfaction Survey ________________ 16
Budget Fiscal Year 2014-2015 ________________ 19
Education and Outreach _____________________ 20
Award Winners ______________________________ 21
Contact Information _________________________ 23
February 2016

Dear Lincoln Residents,

In 1966, Title 11 on equal opportunity in employment and housing was added to the Lincoln Municipal Code. Since then, the Lincoln Commission on Human Rights (LCHR) has worked to fulfill its mission of promoting equal opportunity and combating discrimination. This Annual Report highlights the work of LCHR in 2015.

This past year, LCHR has been very busy enforcing the protections afforded by local, state and federal law. I appreciate the willingness of the Commissioners to volunteer their valuable time and talents as well as their strong commitment to equality and fairness in employment, housing and public accommodation.

In 2015, Commissioners and our two LCHR investigators closed 28 housing cases, 33 employment cases and five public accommodation cases. LCHR also reached more than 6,000 residents with 108 educational sessions covering civil rights and responsibilities.

The annual Civil Rights Conference in April 2015 focused on both employment and housing. Presenters included local, regional and national experts in their fields. We appreciate our Conference sponsors for their continued support. They include the Nebraska Department of Economic Development, the Omaha Human Rights and Relations Department, the U.S. Equal Employment Opportunity Commission, the U.S. Department of Housing and Urban Development and the Nebraska Housing Developers Association. The success of our conference depends on their support.

The LCHR and its dedicated staff do important work every day on behalf of our community. I am proud to be the Mayor of a City that is committed to diversity and to ensuring that everyone is welcome in our Capital City.

Sincerely,

Chris Beutler
Mayor, City of Lincoln
Dear Friends of the Commission:

What a difference a year makes! In 2015, we bid farewell to Mary Reese and Takako Olson after each had served two full terms on the Commission. We could not begin the task of enforcing discrimination laws without the spirit of commitment and dedication demonstrated by all of our Commissioners. We are now awaiting the appointment of two new Commissioners to step up and provide this invaluable service to the community.

For the first quarter of the year, Margie Nichols carried the entire load of investigating cases for The Lincoln Commission on Human Rights (LCHR). In March of 2015, we welcomed Abigail Littrell as a Sr. Civil Rights Investigator. Both Abby and Margie have worked diligently investigating housing, public accommodation, and employment discrimination cases. We are glad to have Abby join our ranks!

Loren Mestre-Roberts continued community outreach efforts through her association with the Lincoln Housing Authority, RentWise, Center Pointe and Community Action Partnership. Loren also maintained our tradition of advising Lincoln Public High School students about their rights related to housing and employment as they prepare to move into the workforce and out of the parental home. Additionally, Loren strengthened her outreach efforts involving distribution of Commission pamphlets at various locations, such as the Lincoln/Lancaster County Health Clinics, the Center for People in Need, the Asian Center and the Malone Center to spread the word about the existence of the Commission and its role in the community. Loren resigned her position with LCHR in October to take another position with the City, as a Housing Rehabilitation Specialist in the Urban Development Department. We hated to see Loren go, but wish her all the best in her new position.

Our annual Civil Rights Conference was a great success! We had 200 professionals present and our speakers came to us from the U. S. Housing and Urban Development Office in Kansas City, MO and the Omaha Field Office as well, the District Office of the Equal Employment Opportunity Commission in St. Louis, MO, and the Great Plains Americans with Disabilities Action Center. In addition to the legal updates that are provided every year, sessions were conducted on the Intersection of Diversity and Poverty, Contemporary Disability Discrimination Cases and Housing Best Practices. All were well received.

The LCHR continues its commitment to law enforcement and education while fostering a welcoming environment of inclusion in the City of Lincoln.

Best Regards,

Kimberley Taylor-Riley
Executive Director
Dear Citizens and Friends of the Commission,

I would like to take this opportunity to provide an update on the Commission’s work throughout 2015. The Executive Director and staff of the LCHR continue to work in a professional manner to investigate complaints, discuss the cases brought before the Commission, and issue findings in a timely and just manner. We hope to educate the employers, employees, landlords, and tenants about acceptable practices and discriminatory ones that arise in the daily lives of our residents.

I am proud to serve with Amanda Baron, Elizabeth Kennedy-King, Susan Oldfield, Takako Olson, Mary Reece, Jon Rehm, Micheal Q. Thompson and Melanie Ways on the Commission. This diverse complement of individuals allowed the Commission to operate as an experienced set of fact finders, thoughtful problem solvers, and committed dispute resolution specialists. Their civic service on the Commission shows that Lincoln is a place where people count.

The terms of Commissioners Mary Reece and Takako Olson ended in December 2015. Additionally, we said goodbye to our Community Outreach Coordinator, Ms. Loren Roberts. She left the commission during 2015 to pursue other career interests. The LCHR will miss the experienced and judicious counsel of these women. We thank them for their service to the City of Lincoln and wish them well in their future endeavors.

The annual Civil Rights Conference was hosted by the LCHR staff in April 2015 and was again a resounding success. The Annual Conference is an educational and instructive how-to seminar focusing on compliance with housing and employment requirements that affect all of us.

It goes without saying, but I acknowledge the support, attention to detail, work ethic, and pure joy the Commissioners and I receive from working with Peg Dillon, Margie Nichols, and Kimberley Taylor-Riley—the dedicated staff of the Lincoln Human Rights Commission. During 2015, we welcomed one addition to the LCHR Staff. Abigail Littrell joined as a Senior Civil Rights Investigator in early 2015. I enjoy working with all of you. I appreciate your guidance, temperament, and skills. We continue to rely upon these attributes as the Commission goes forward with our designated tasks. Thank you.

Our work continues as we strive for fairness and equality in a city that supports a local Civil Rights Agency to specifically address housing and employment discrimination. How fortunate we are to live in Lincoln, Nebraska, a city committed to equity and fairness for all its residents.

Sincerely,

Bennie Shobe
Chair, 2015
2015 Lincoln Commission on Human Rights Commissioners: Front row, left to right: Amanda Baron, Chair-Bennie Shobe, Jr., Vice Chair-Mary Reece and Jonathan Rehm. Back row, left to right: Susan Oldfield, Melanie Ways, Elizabeth Kennedy-King and Micheal Q. Thompson. Not pictured Takako Olson.

The LCHR Commission is a nine member board of diverse people who hear and decide the cases presented to them. They are volunteers who are appointed by the Mayor and approved by the City Council. An additional goal of the Commission is to continue educating the public on discrimination laws in the hope of preventing and eventually eliminating unlawful discrimination. They meet on the last Thursday of each month at 4 p.m. in the City Council Chambers of the County/City Building. The public is welcome to attend.
In 2015, two of our long time Commissioners completed their tenure with the Lincoln Commission on Human Rights. Takako and Mary both began serving on the Commission in March, 2010, and continued their service until December, 2015. Their commitment to the Commission and the work we do will be greatly missed.

Thank You!

Thank You!
Mission

The administration of the Human Rights Division supports the enforcement of all provisions of Title 11 of the Lincoln Municipal Code. To receive, settle, conciliate, investigate, issue findings, and hold public hearings on complaints alleging discrimination based on race, color, religion, sex, disability, national origin, familial status, age, ancestry, marital status, and retaliation.

To perform functions and activities with community groups, businesses, schools, and governmental entities for the purpose of promoting understanding between races, cultures, and sexes, and to work to eliminate inequalities and sources of inter-racial friction.

Review all City of Lincoln procurement bids and awards in excess of $10,000.00.

Review DBE (Disadvantaged Business Enterprises) program of minority and women-owned businesses and maintain directory.

Goals
To eliminate and prevent all forms of illegal discrimination, to assure and foster equal opportunity for all citizens of the City, and to act in all matters within its jurisdiction.

The Commission’s Role

The Commission is a NEUTRAL agency. We do not serve as either side's lawyer, advocate, or advisor. We are not prosecutors. We do not take the side of either the complainant (the person who filed the complaint) or the respondent (the alleged discriminator).

The job of the Commission is:

- to investigate complaints of discrimination;
- to settle complaints, if possible;
- to determine, after investigation, whether there was discrimination in violation of the City of Lincoln Equal Opportunity Ordinance; and
- to order remedies if the complainant proves at a hearing that discrimination has occurred.
Lincoln Commission on Human Rights (LCHR) is the primary City Agency that has the responsibility for the remedy of discrimination complaints brought by individuals. Any remedy pursued by the LCHR will be based on the enforcement authority of the Equal Opportunities Ordinance which provides a fair and impartial process for resolving charges of discrimination. The LCHR also provides community education and technical assistance in order for people to know and understand their rights and responsibilities under the law.
Complainant always has the option throughout the process of pursuing his or her case privately in court.
LCHR ANNUAL REPORT 2015

Case Statistics

Cases Filed 2005-2015

Cases Filed by Type 2005-2015

- Public Accommodation
- Housing
- Employment
Cases Filed by Type, Total 84

- Employment: 47
- Housing: 33
- Public Accommodation: 4

Cases Closed* by Type, Total 66

- Employment: 33
- Housing: 28
- Public Accommodation: 5

*Cases closed include cases filed from 2014-2015 but closed in calendar year 2015.
**Breakdown of Cases Filed by Basis***

<table>
<thead>
<tr>
<th>Basis</th>
<th>Cases Filed</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Origin</td>
<td>34</td>
</tr>
<tr>
<td>Disability</td>
<td>23</td>
</tr>
<tr>
<td>Race</td>
<td>17</td>
</tr>
<tr>
<td>Sex</td>
<td>9</td>
</tr>
<tr>
<td>Retaliation</td>
<td>9</td>
</tr>
<tr>
<td>Age</td>
<td>9</td>
</tr>
<tr>
<td>Familial Status</td>
<td>6</td>
</tr>
<tr>
<td>Marital Status</td>
<td>1</td>
</tr>
<tr>
<td>Color</td>
<td>1</td>
</tr>
<tr>
<td>Ancestry</td>
<td>1</td>
</tr>
</tbody>
</table>

*Cases are often filed under more than one basis, which could include a case filed, for example, on the basis of both sex and disability, or race and retaliation.

**Breakdown of Cases Filed by Basis and Type***

<table>
<thead>
<tr>
<th>Basis</th>
<th>Employment</th>
<th>Housing</th>
<th>Public Accommodation</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Origin</td>
<td>15</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Disability</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Race</td>
<td>7</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Sex</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Retaliation</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Familial Status</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ancestry</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The basis of age is only covered in employment, while familial status is only covered in housing.
Case Statistics Continued

Breakdown of Cases Filed by Gender

Breakdown of Cases Filed by Race / National Origin / Ethnicity** of Complainant

- Croatian: 1
- Ecuadorian: 1
- Peruvian: 1
- Argentinian: 1
- Guatemalan: 1
- Salvadoran: 1
- Native-American: 2
- Iraqi: 7
- Mexican: 13
- Black: 16
- Hispanic: 24
- White: 31

*N A / filed with the City of Lincoln as the Complainant.
**This provides an approximate demographic report based on the racial, national origin, or ethnic designation provided by the Complainant.
There are various reasons why inquiries do not result in the filing of a complaint. They include, but are not limited to, the Commission not having subject matter jurisdiction, the individual not wanting to file a complaint or the individual failing to follow-through with the filing of a complaint.
Breakdown of Commission Decisions

What do the numbers mean? No Reasonable Cause cases are when the Commissioners determine there is insufficient evidence to believe discrimination occurred. In Reasonable Cause determinations, Commissioners believe there is evidence of discrimination. Administrative Closures are cases closed for a variety of reasons (see chart below). Pre-Determination Settlements are cases closed due to a settlement agreement prior to a Commission decision. Successful conciliation occurs when the parties reach an agreement after the commission makes a reasonable cause finding.

Sometimes the Commissioners make more than one decision in a single case. Commissioners may determine that Reasonable Cause exists and those cases may later be closed in the same year by the Commission due to successful conciliation, public hearing determination, or issuance of a notice of right to sue. Because of this, the total number of Commission decisions may be greater than the number of cases closed.

Administrative Closures
Pre-Determination*, Conciliation Settlements and Withdrawals with Settlements

**Employment**
Respondent pays Complainant $825.  
Respondent pays Complainant $1,540; neutral reference; attend EOE training.  
A Private Settlement agreement.  
Pay Complainant $306.  
Neutral Employment Reference; designate end of relationship as 'separation'; disclose dates of employment.

**Housing**
Provide neutral reference; Forgive balance & damage fees; Respondent to attend LCHR Civil Rights Conference.  
Complainant was allowed to move to a new rental with A/C, to transfer deposit, and was released from their lease. Attend Fair Housing Training and attend LCHR Civil Rights Conference.  
Paid $331.88; Attend Fair Housing Training.  
Respondent rescinds money demands; Returns security deposit less water bill- $565; post Fair Housing posters and property managers attend Fair Housing Training.  
Rescind notice of termination of lease; begin 6 month lease; Respondent pays the Complainant $600; Attend Fair Housing Training.  
Rescind notice of termination of tenancy; post Fair Housing posters; conduct communication in a civil manner.  
Provide denied lease applications & new lease agreements with # of bedrooms and # of tenants to LCHR; and attend Fair Housing Training.  
Wave $1,215 owed by Complainant, Fair Housing language added to new rental applications, Post Fair Housing posters.  
Reduce amount owed to $3,400 from $8,317.  
Move to new apartment, Refund pet deposits, Flyers Posted.  
Forgive Complainant $2,848 and pay $525; letter of Reference; Fair Housing Training.  
Respondent assist with alternative housing for tenant; Post Fair Housing Posters and Brochures will be given to new tenants.  
A Reasonable Cause finding 10/29/2015. Conciliation 12/10/2015 - $2,000; attend Fair Housing Training; Amend Criminal History/Conviction policy for applicants.  
Release & forgive $1,786.43 of the $2,286.43 owed by Complainant; Complainant agrees to pay $500; Attend Fair Housing Training.

*A Pre-Determination Settlement (PDS) is a no-fault settlement agreement voluntarily entered into by both parties prior to the Commission making a determination in the case. Conciliation is a settlement agreement after a reasonable cause finding.
The Commission strives to achieve high satisfaction rates among Complainants and Respondents involved in investigations. In an effort to gauge how the staff and overall process is perceived, Complainants and Respondents are asked to participate in a survey following case closure. Survey takers are asked to provide feedback on their comprehension of the process, overall satisfaction, and suggestions on how we could provide better service.

Complainants and Respondents were asked to rank our office on a 1 to 5 scale with 1 being “Disagree Strongly” and 5 being “Agree strongly”.

- **All department staff presented themselves in a courteous and professional manner at all times.**

- **The intake investigator explained the laws and the LCHR investigative procedures to your satisfaction.**
The investigator kept you adequately informed about the progress of the investigation.

Regardless of the case outcome, you felt the overall process was fair.
Would you refer someone experiencing discrimination to the LCHR?

Opportunities to present your position were given to you during the investigation.
The Lincoln Commission on Human Rights’ budget is comprised of funding from the City of Lincoln General Fund as well as two Federal funding sources—the U.S. Department of Housing and Urban Development and the Equal Employment Opportunity Commission. For FY 2014-2015, the budget expenditures were supported by $196,480 from the General Fund and $120,675 from federal funding sources for a total expenditure of $316,963.

**Where Did the Money Go?**

Of the total, $316,963, the largest percentage went to personnel for salaries and benefits, for a total of $253,439 or 80%. Services* which expenditures cover insurance, travel, mileage, interpretation/translation costs, office rental, copying, printing and utilities totaling $55,443 or 17% of the budget. Office supplies account for $4,860 or 2% of the budget, and capital outlay for computer equipment was $3,221 or 1% of the total budget.

---

*Services Summary*
The Lincoln Commission on Human Rights (LCHR) provides services to the community to ensure that individuals are aware of their rights and responsibilities under the Equal Opportunity and Fair Housing Laws. The LCHR works to reach as many agencies, groups, community-based organizations, employers, property owners, civic groups and individuals as possible. These efforts include training programs which can be customized to meet the needs of the target audience. Topics include: racial and sexual harassment; fair employment practices; fair housing laws; public accommodation laws; the Americans with Disabilities Act; and diversity training.

In 2015, the staff conducted training at a number of organizations for a total of 108 sessions reaching over 6,000 people. These organizations include LPS Career Education Classes; the Lincoln Housing Authority; Rentwise; and various fairs and festivals, such as: Juneteenth; Streets Alive; Project Homeless Connect; and Community Cultural Conversations. There were also training sessions held with several Respondents. The Civil Rights Conference was attended by over 200 individuals and continues to provide the attendees with information on a wide range of civil rights topics.
Gerald Henderson Human Rights Award
Recipient Wendy Francis

The Gerald Henderson Human Rights Award recognizes outstanding achievements in furthering human relations in Lincoln, including a demonstrated commitment to improving cooperation and understanding among people of different racial, ethnic, religious and diverse backgrounds.

Wendy Francis served as a Commissioner with the Lincoln Commission on Human Rights for 6 years. As a Commissioner, she volunteered her time to eliminate discrimination and ensure that all residents are treated fairly in her city.

While serving in this capacity, she worked tirelessly as a realtor connecting families with financial need programs when warranted and striving to secure affordable housing for her clients. Through her work with the Realtors Association of Lincoln Board of Directors, Public Policy Committee, Affordable Housing Committee, and Equal Opportunity Committee as well as her work with the Nebraska Realtors Association Equal Opportunity Cultural Diversity Committee and Diversity Advisory Council, Wendy has demonstrated an unyielding commitment to equity, diversity and fair housing.

The Lincoln Commission on Human Rights is proud to award the Gerald Henderson Human Rights Award to her in recognition of all that she has done to promote fair housing in Lincoln.
Service Recognition Award Recipient Angela Lemke

Chair person, Bennie Shobe presents a Service Recognition Award to Angela Lemke at the 2015 Annual Civil Rights Conference.

Ms. Angela Lemke retired from her position with the City of Lincoln Commission on Human Rights in 2014. When she retired, she was a Senior Civil Rights Investigator and held that position for 6 years. She was a Civil Rights Investigator for 7 years prior to being promoted and began her long career with the Commission as an Office Assistant in 1997.

Ms. Lemke graduated from Lincoln School of Commerce in 1997 with an Associate Degree in Paralegal studies, and has continued her education in the Civil Rights field by attending various conferences and workshops involving equal opportunity.

Ms. Lemke was employed with LCHR for 17 years fulfilling her primary responsibilities of investigating and conciliating complaints of discrimination in the areas of housing, employment and public accommodation. Ms. Lemke was a great source of historical information about the Commission as well as a referral resource for many of the residents that presented at the Lincoln Commission on Human Rights office and were in need of other services not available through LCHR.

Ms. Lemke also provided training and outreach to the public on various civil rights and equal opportunity laws. Ms. Lemke demonstrated a strong commitment to equity and fair treatment for everyone. While her presence in this field will be sorely missed, certainly her dedication to this cause bears recognition.
In 2015 LCHR updated our website with a new look and more information about our organization. Included on our website is a fill-in form to file a discrimination complaint with the Commission, Commission Meeting minutes, the Civil Rights Conference registration form, local resources and general information.

City of Lincoln
Lincoln Commission on Human Rights
lchr@lincoln.ne.gov
555 S 10th Street, Suite 304
Lincoln, NE, 68508
Work Tel 402-441-7624
Fax 402-441-6937
Lincoln-Lancaster County Health Department

Board of Health
May 10, 2016

I. Roll Call

The meeting of the Board of Health was called to order at 5:02 PM by Craig Strong at the Lincoln-Lancaster County Health Department. Members Present: Bill Avery, Alan Doster, Jacquelyn Miller, Michelle Petersen, Tom Randa, Jane Raybould, Dave Derbin (ex-officio) and Craig Strong. Tim Sieh (ex-officio) arrived at 5:05 PM. James Michael Bowers arrived at 5:10 PM.

Members Absent: Heidi Stark and Molly Burton (ex-officio).

Staff Present: Judy Halstead, Scott Holmes, Steve Frederick, Steve Beal, Gwendy Meginnis, Andrea Haberman, Christina Hitz, John Chess, Brian Baker, Justin Daniel, Nancy Clark and Elaine Walsh.

Others Present: Donna Garden, Gene Hanlon, Linda Hubka, and Gus Hitz.

Introductions

Donna Garden, Assistant Director, Public Works and Utilities, Gene Hanlon, City Recycling Coordinator, Linda Hubka, Food Advisory Committee Chair, and Gus Hitz, husband of Christina Hitz.

II. Approval of Agenda

Col. Strong asked if there were any additions or corrections to the Agenda.

Motion: Moved by Ms. Raybould that the Agenda be approved as printed. Second by Dr. Petersen. Motion carried by a 7-0 roll call vote.

APPROVAL OF MINUTES

Col. Strong asked if there were any additions or corrections to the Minutes.

Motion: Moved by Mr. Avery that the April 12, 2016 Minutes be approved as printed. Second by Ms. Raybould. Motion carried by a 7-0 roll call vote.

III. Public Session

Department Reports

A. Health Director Update

Ms. Halstead thanked everyone for attending the Board of Health Annual Luncheon and Awards Ceremony. Dr. Ali Khan, Dean of the College of Public Health at the University of Nebraska Medical Center, was not able to attend. She will arrange for
Dr. Khan to visit the Health Department this summer. She stated the Luncheon and Awards Ceremony were filmed and will be available on the City’s Channel 5 in the near future.

Ms. Halstead stated Dr. Petersen and Mr. Randa’s reappointments to the Board of Health were approved by the Lincoln City Council and Lancaster County Board of Commissioners. The Lincoln District Dental Association’s nomination of Katie Garcia, DDS was also submitted to the Lincoln City Council and Lancaster County Board of Commissioners for approval. Dr. Garcia would replace Dr. Stark as the Dental representative to the Board of Health.

Ms. Halstead stated she and Ms. Cook met with the Mayor’s Office regarding the 2016-2017 and 2017-2018 budget request. She expects the Mayor will present his proposed budget to the Lincoln City Council around the first week in July. The Mayor’s Office will also release the Taking Charge Survey in the coming week. The public is urged to complete the customer satisfaction survey. Survey results are used to help prioritize City services.

Ms. Halstead asked Board members about their availability for the July 12, 2016 Board of Health meeting. In the past, the Board has not always met in July due to vacations, etc. Dr. Petersen, Col. Strong and Mr. Randa indicated they would not be available for the meeting. This item will be discussed again at the June 14th Board of Health meeting.

IV. CURRENT BUSINESS (Action items)

A. Proposed Policy 223.24 – Property Transfer Review

Mr. Chess stated properties serviced by onsite water or wastewater treatment systems are inspected and letters of determination are issued by the Health Department prior to the sale of the property. This program began in 2006. The proposed policy would ensure letters of determination are issued within five business days after receipt of the inspection reports. The policy would also provide guidance on factors that affect the approval or denial of a property transfer. He reviewed the process and the reports. He stated local Title Companies are very positive about the program.

Motion: Moved by Dr. Miller that the Board of Health approve Policy 223.24 – Property Transfer Review. Second by Ms. Raybould. Motion carried by an 8-0 roll call vote.

V. CURRENT BUSINESS (Information Items)

A. Recycle Lincoln! Proposed Ordinance to Ban Cardboard From The Landfill

Ms. Garden, Public Works & Utilities Assistant Director, provided a presentation on the proposed City ordinance to be included in LMC 8.32 to ban cardboard from the landfill. She stated recycling efforts help grow the local economy and reduce the expensive need to expand the landfill. She noted 42% of the waste that goes to
the Bluff Road Landfill is readily recyclable. She reviewed the Solid Waste Management Plan 2040 including the 20 member Citizen Advisory Committee, 10 Member Workgroup and overall goals. The Workgroup met and prepared a 3 Phase Plan which included: 1) all haulers offer recycling to residential and commercial customers; 2) disposal ban of corrugated cardboard from residential and commercial waste generators, and 3) consideration of future material disposal bans. The plans would include educational/behavior change programs. The Workgroup met with Stakeholders which included waste and recycling collection companies, processors, property managers, retailers, human resource groups, neighborhood associations, etc. to present their proposals and gather their input and suggestions. From the input, a draft ordinance was prepared. She reviewed the proposed ordinance and proposed dates of implementation of the landfill ban dates. Board members asked about plastic recycling, enforcement, educating the public, how the proposed ordinance will affect low income individuals, who is defined as a recycling collector and the licensing requirements. Ms. Raybould noted the education process would be extremely important. Ms. Halstead asked Board members to send any additional comments and suggestions to her and she would forward them to Ms. Garden.

B. Smoke Free Multi-Unit Housing Update

Ms. Hitz provided an update on the Department’s Tobacco Program Smoke Free Housing Initiative. She reviewed the smoke-free policies for multi-unit housing and why it is important noting cigarettes are now the second leading cause of fires in Lincoln. A Smoke-Free Housing Summit was held on in November, 2015 and was well attended. Participants learned about making rental property smoke-free and improving compliance with existing smoke-free housing policies. She stated the Department, Safe Kids Lincoln Lancaster County, Farm Bureau Financial Services and Paul Davis Restoration will provide three “Fire Safe Landlord Training” sessions in 2016.

C. Food Advisory Committee Update

Mr. Daniel and Ms. Hubka, Chair of the Food Advisory Committee, provided an update on the Committee. Mr. Daniel stated the Committee recently worked on the “No Bare Hand Contact” policy for food handlers. The policy was approved by the Board of Health and the Lincoln City Council. He reviewed the Committee’s objectives and upcoming policy updates. Ms. Hubka reviewed the membership of the Committee and policy updates. The Food Advisory Committee and staff will be reviewing and updating the FDA Standards in the coming months.

VII. FUTURE BUSINESS

VIII. ANNOUNCEMENTS

Next Meeting – June 14, 2016– 5:00 PM

IX. ADJOURNMENT
The meeting was adjourned at 6:38 PM.

Elaine Walsh
Recording Secretary

Jacquelyn Miller
Vice-President
DEPARTMENT REPORT
MAY, 2016

DIRECTOR’S OFFICE

The Lincoln District Dental Association nominated Katie Garcia, DDS, for appointment to the Board of Health. The appointment was approved by the Lincoln City Council and Lancaster County Board of Commissioners.

The Health Department hosted the Friends of Public Health Annual Retreat on May 17, 2016.

The Health Director attended the Community Health Endowment Board of Trustees Meeting, Tabitha Foundation Board of Directors Meeting and Lancaster County Management Team Meeting.

The Health Director continues to serve on the UNMC College of Public Health Community Based Health Transformation Workgroup and the College of Public Health Panel of Advisors.

The Health Director attended the Lincoln Community Foundation’s Collective Impact/Community Funding Meeting.

Mayor Beutler honored the City Service Year Employees at a breakfast on May 27, 2016. Service Year Employees. Health Department employees receiving recognition for their years of service were:

40 Years – Brenda Monroe & Doug Smith

35 Years – Steve Beal, Joyce Endres & Randy Sipp

30 Years – Harry LeDuc & Barbara Martinez

25 Years – Marjorie Determan & Marcia Huenink

20 Years – James Bare & Phillip Rooney

15 Years – Jane Bitney, Lucy Blood, Janette Johnson, Mark Kenne, Beth Mann & Betsy Resch

10 Years – Bobbi Beat, Shelli Buhr, Megan Davison, Gina Egenberger, Lesley Hammerschmidt, Kathy King, Maritza Leon & James Newman

Employee of the Month – Jennifer Lantz – Community Health Services Division
## ANIMAL CONTROL

**Animal Control Stats**

<table>
<thead>
<tr>
<th></th>
<th>Sep 13-Apr 14</th>
<th>Sep 14-Apr 15</th>
<th>Sep 15-Apr 16</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pet Licenses Sold</strong></td>
<td>42085</td>
<td>42743</td>
<td>44176</td>
</tr>
<tr>
<td><strong>Cases Dispatched</strong></td>
<td>14482</td>
<td>15373</td>
<td>15615</td>
</tr>
<tr>
<td><strong>Investigation</strong></td>
<td>15683</td>
<td>16852</td>
<td>17332</td>
</tr>
<tr>
<td><strong>Animals Impounded</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dogs</td>
<td>951</td>
<td>1044</td>
<td>804</td>
</tr>
<tr>
<td>Cats</td>
<td>781</td>
<td>811</td>
<td>841</td>
</tr>
<tr>
<td><strong>Court Citations Issued</strong></td>
<td>264</td>
<td>223</td>
<td>275</td>
</tr>
<tr>
<td><strong>Warnings/Defects Issued</strong></td>
<td>10119</td>
<td>11067</td>
<td>11349</td>
</tr>
<tr>
<td><strong>Bite Cases Reported</strong></td>
<td>275</td>
<td>306</td>
<td>328</td>
</tr>
<tr>
<td><strong>Attack Cases Reported</strong></td>
<td>31</td>
<td>34</td>
<td>27</td>
</tr>
<tr>
<td><strong>Dogs Declared Pot. Dangerous</strong></td>
<td>45</td>
<td>43</td>
<td>52</td>
</tr>
<tr>
<td><strong>Dangerous Dogs</strong></td>
<td>8</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td><strong>Animal Neglect Investigations</strong></td>
<td>394</td>
<td>350</td>
<td>362</td>
</tr>
<tr>
<td><strong>Injured Animal Rescue</strong></td>
<td>394</td>
<td>475</td>
<td>483</td>
</tr>
<tr>
<td><strong>Wildlife Removal</strong></td>
<td>227</td>
<td>271</td>
<td>314</td>
</tr>
<tr>
<td><strong>Dead Animal Pickup</strong></td>
<td>1035</td>
<td>1204</td>
<td>1280</td>
</tr>
<tr>
<td><strong>Lost and Found Reports</strong></td>
<td>1365</td>
<td>1434</td>
<td>1447</td>
</tr>
<tr>
<td><strong>Phone Calls</strong></td>
<td>28918</td>
<td>28758</td>
<td>33138</td>
</tr>
<tr>
<td><strong>Average Response Time (in mins)</strong></td>
<td>21</td>
<td>22</td>
<td>19</td>
</tr>
</tbody>
</table>

Officers took 44 cats, 1 rabbit, 13 spiders, 3 finches and 2 fish out of the home of Autumn Rupert on May 16, 2016. Officers had to wear protective clothing and respirators to operate in the home. The owner was cited for Animal Neglect, License Required-Cat, Rabies Vaccination Required-Cat, Sanitation Regulations-Cat, and Failure To Remove Dead Animals.

On May 21, 2016 Animal Control Officers removed three adult cats and five kittens and one dog from a home at 830 B Street after the home was destroyed by a natural gas explosion.

Pet license sales remain strong and currently we anticipate a continued increase in license sales from last fiscal year and the prior year.

Public calls regarding animal related questions, comments and reports have increased for the first 8 months of the current fiscal year. Animal has received 33,138 calls from the public.
Animal Control continues to promote spay neuter assistance to low income pet owners. The amount of reimbursement was recently increased. The program is promoted with all the local veterinarians in Lincoln. We hope to increase our outreach of this program to more pet owners.

COMMUNITY HEALTH SERVICES

Homeless Vaccine Outreach

This chart highlights the work of nurses and support staff in our efforts to protect poor & uninsured adults who are served by local homeless agencies from vaccine-preventable disease. Data is from September 1 through March 31 of a given year, over the last 5 years. This time period was chosen for our outreach efforts as we typically see more interest in vaccination due to seasonal flu vaccine availability. We do, however, offer a broader array of vaccines including;
Hepatitis B, Hepatitis A, Influenza (Seasonal Flu Virus), Pneumococcal, Tdap (Tetanus, Diphtheria, & Acellular Pertussis/Whooping Cough), and Zoster (Herpes Zoster causing Shingles). The average age of patients served by these efforts has increased over the 5 years, represented in the chart, from 43 to 48 years of age. All vaccines are obtained free of charge to LLCHD through the Adult Immunization Program of the federal Vaccine for Children Program. Eligible patients are not charged for this service and, due to living conditions, are some of the most vulnerable patients we serve in the community. Thank you to Ruth Shubert, Marj Determan, Kim Rettig, Jane Bitney, Bernice Afuh, Brenda Monroe and Jeff Krotz for your efforts!

**HPV Vaccination Survey of Local Health Care Providers**

In March 2016, a survey was mailed to each licensed clinician living in Lancaster County to ask about their practices regarding the vaccine to prevent human papillomavirus (HPV). HPV is a very common virus that infects epithelial tissue. Approximately 40 types of the virus infect mucosal epithelial cells on the genitals, and in the mouth and throat. Although most HPV infections are asymptomatic and resolve spontaneously or become undetectable, some HPV infections can persist and lead to cancer. Persistent infections with high-risk HPV types can cause cancers of the anus, cervix, penis, vulva, vagina, and the oropharynx (back of the throat including the tongue and tonsils). According to the CDC, HPV is so common that almost everyone who is sexually active in America will be infected with it at some point in their lives. The CDC estimates that 79 million Americans are infected with HPV, most new infections occurring in teens and young adults.

HPV vaccine is a cancer prevention tool that is most likely to be utilized when clinicians effectively communicate its benefit to parents/guardians. Since the vaccine was introduced in 2006 in the United States, vaccine-type HPV prevalence decreased by 56% among adolescent females (The Journal of Infectious Diseases, 2013; 208:385-93). The CDC recommends that clinicians offer HPV vaccination for girls and boys at ages 11 or 12, by offering it in the same way and the same day as they routinely recommend other vaccines for adolescents. The best time to vaccinate is before exposure is likely to occur.

Four hundred sixty nine (469) surveys were mailed. Seventy four (74) surveys were returned. Most clinicians completing the survey identified themselves as physicians, followed by advanced practice registered nurses, and physician assistants. The most common practice area for respondents was family practice, followed by pediatrics, women’s health, and urgent care respectively. Survey questions were asked and answered in the following way:

1) Do you utilize our state’s vaccine registry, the Nebraska State Immunization Information System? No – 50%, Yes, for look up & to enter patient data – 29%, Yes, for look up only – 21%.
2) Do you participate in the Vaccine for Children program? No – 49%, Yes, children only – 47%, Yes, Children & Adults – 4%.
3) Do you provide HPV vaccine to adolescents? Yes – 79%, No – 21%.
4) Do you emphasize giving HPV vaccine at particular ages? Yes – 80%, No – 20%.
5) Do you encounter parental reluctance in giving the HPV vaccine? Yes – 83%, No – 17%.
6) If yes, please circle the top 3 concerns parents/guardians share with you:
   #1: My child is too young for the vaccine.
   #2: Uninformed, disbelief, or no concern about HPV causing cancer and genital warts.
   #3: Concern about side effects, and/or future fertility.
   #4: Giving the vaccine encourages sexual activity.
   #4: The vaccine is not safe.
   #5: Boys don’t need it.
   #6: Other: “Insurance coverage, My child will not get exposed, My child not high risk, Not wanting to think about sexual activity in 11-12 years even in the vague distant future, None of the above-overall poor societal education & anger at the assumption that all are at risk.”
   #7: The vaccine is ineffective.

7) Do you feel confident in your skills to respond accurately to parental concerns that may lead to refusal of the HPV vaccine?  Yes, very confident - 74%, Yes, somewhat confident – 23%, No, not confident - 3%.

8) From the statements below, please circle the answer(s) that best describes your approach to HPV vaccination:
   #1: I recommend the vaccine for adolescent males and females.  66%
   #2: When parents/guardians are reluctant, I encourage vaccination of the child at an older age (i.e. older than the recommended 11 -12 years of age).  13%
   #3: I share that children in my own family were vaccinated.  11%
   #4: I recommend the vaccine for adolescent females only.  4%
   #5: I do not specifically recommend the vaccine, but I offer it as an option.  3%
   #6: I recommend the vaccine, but I have some reservations about it.  2%

According to CDC studies, the most effective way for clinicians to recommend the vaccine is to share that children in his/her own family have been vaccinated. Again, the message that the HPV vaccine is a cancer prevention tool, is a very effective method to encourage protection. A special thank you to Jeff Krotz and Ann King for organizing this large mailing and to Jeff again, for organizing the data as surveys were returned to LLCHD!

**DENTAL HEALTH & NUTRITION**

**WIC**

**Caseload (Participation)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3834</td>
</tr>
<tr>
<td>Main</td>
<td>2918</td>
</tr>
<tr>
<td>Cornhusker Clinic</td>
<td>916</td>
</tr>
<tr>
<td>%Enrolled with Benefits</td>
<td>85.71%</td>
</tr>
<tr>
<td></td>
<td>LLCHD</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Total Women</strong></td>
<td>933 (24.3%)</td>
</tr>
<tr>
<td><strong>Total Children</strong></td>
<td>2027 (52.8%)</td>
</tr>
<tr>
<td><strong>Total Infants</strong></td>
<td>874 (22.7%)</td>
</tr>
<tr>
<td><strong>Infants Receiving Breastmilk</strong></td>
<td>287 (32.8%)</td>
</tr>
<tr>
<td><strong>Infants Exclusive Breastmilk</strong></td>
<td>110 (12.5%)</td>
</tr>
</tbody>
</table>

**Mentoring:**

(Number and school)

<table>
<thead>
<tr>
<th>Students</th>
<th>Doane Undergraduate-1</th>
<th>UNL-Graduate Student-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volunteers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMEP Residents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Our April caseload was 3834 participants. This was our highest number of participants seen in April since 2010. Our current fiscal year average is 3784 participants per month. We have seen a 7.25% increase in participation in the last seven months, at our newly renovated clinic space at 27th and Cornhusker.

**Dental Health**

**Dental Clinical Services:**

- Total number of clients served (unduplicated count): 525
- Total number of patient encounters (duplicated client count): 736
- Total number of patient visits (duplicated provider appointments/visits): 1020
- Total number of Racial/Ethnic and White Non-English speaking patients: 438 (83%)
- Total number of children served: 345 (66%)
- Total number of clients enrolled in Medicaid: 379 (72%)
- Number of clients served during Thursday evening hours (unduplicated count): 57
- Number of patient encounters during Thursday evening hours (duplicated client count): 59
- Number of patient visits during Thursday evening hours (duplicated provider appointments/visits): 69

**ENVIRONMENTAL PUBLIC HEALTH**

**Food Safety Goals:**

Protect human health by reducing the risk of foodborne illness.

Methods/Strategies (What we do):

- conduct uniform inspections of food establishments
- conduct new and remodeled facility plan review
- issue permits, collect fees
- provide compliance and foodborne illness prevention assistance
- investigate complaints and foodborne illness outbreaks
- take enforcement actions (NOVs, FENs, Court cases)
- provide food handler training in safe food preparation, hygiene, and sanitization

**Indicators:**
Maintain number of food safety complaints at less than 325 per year and food-borne illness reports at less than 50 per year. *(Note: staff have recommended that the foodborne illness indicator be changed to 75 per year.)*
Inspect 95% of food establishments within established risk based intervals.
Decrease the average number of critical item violations by 5%.
Decrease the average number of regular violations by 5%.
Obtain compliance with all nine FDA Retail Food Regulatory Program Standards.

**Funding/Source:**
In FY15, the direct costs of the Food Safety Program, including program supervision, was 85.4% fee and grant funded.

**Comparison and Status on Indicators:**

**Complaints:**
See Mayor’s Indicator chart below on complaints. In FY15, 357 complaints on food establishments were received, including 70 potential foodborne illness complaints. (2)
The numbers of complaints received on food establishments had been trending down the previous three years, but increased in FY15. The number of foodborne complaints has fluctuated more, but is within a normal range. The number of complaints, especially on foodborne illness, is driven not only by local issues, such as Norovirus outbreaks, but by highly publicized national foodborne outbreaks of Listeria, E. coli, Salmonella and Cyclospora.

Percent of Inspections Completed Within Risk Based Intervals:

Staff completed 83% of food inspections within risk-based intervals. While we did not meet our “stretch” goal of 95% within risk based intervals, this is the highest percent completion rate we have had for many years. And, it is important to note that 98% of food inspections were completed before or within 30 days of their risk based interval. In FY14, 80% of inspections were completed within the risk based interval. In FY13, 59% of inspections were completed within the risk based intervals. In FY13, the Food Safety Program was short one staff person for several months, greatly impacting our ability to keep up with inspections. Once hired, the new person had to be trained per FDA Standards. It takes considerable time before a newly hired person can conduct independent inspections. (3)

Violations Found During Inspections:

The average number of critical item violations in food establishments (restaurants) has remained stable, averaging around 2.25 per regular inspection. The average number of non-critical item violations has decreased from 7.75 to 6.35 per regular inspection over the last five years. (4)

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Item Violation</td>
<td>2.28</td>
<td>2.20</td>
<td>2.29</td>
<td>2.24</td>
<td>2.15</td>
<td>2.36</td>
</tr>
<tr>
<td>Non-Critical Item Violation</td>
<td>7.75</td>
<td>6.83</td>
<td>6.57</td>
<td>6.21</td>
<td>5.38</td>
<td>6.35</td>
</tr>
</tbody>
</table>

FDA Program Standards:

LLCHD continues to implement FDA’s Voluntary National Retail Food Regulatory Program Standards and meets seven of nine standards. This quality assurance program ensures overall program excellence in
inspections, foodborne illness response, training, and community interactions. A separate report is typically presented annually to the Board of Health on the FDA Standards.

**Description:**

The LLCHD Food Safety Program was recognized as the winner of the 2015 Samuel J. Crumbine Consumer Protection Award. The award was presented to LLCHD by the National Environmental Health Association’s, the National Association of County and City Health Officials, and the U.S. Conference for Food Protection.

The Samuel J. Crumbine Consumer Protection Award is a prestigious award given annually by the Conference for Food Protection to a local health department that demonstrates unsurpassed achievement in providing outstanding food protection services to their community. The purpose of the award is to encourage innovative programs and methods that reduce or eliminate the occurrence of foodborne illnesses, recognize the importance of food protection at the local level and stimulate public interest in foodservice sanitation. As a Crumbine Award winner, LLCHD joins an elite group of local public health agencies that have demonstrated excellence in food protection through innovative, effective strategies and approaches to protecting communities from foodborne illness.

To meet the goal of protecting human health by reducing the risk of foodborne illness, the Food Safety Program issues permits, conducts inspections, educates food handlers works with the Food Advisory Committee, and takes enforcement actions when necessary. In FY15, the Food Safety Program permitted 1,276 food establishments in Lancaster County, including restaurants, grocery stores, temporary booths, events and farmers’ markets and as of October 30, 2015 there were 1,384 food establishments in “active” status. In April, 1,114 annual permit renewals were sent out, 49 more (about 5% more) than the previous year.

Inspection intervals are risk based and range from one to three times per year. Staff performed 2,899 inspections. About 14% of inspections (410) resulted in Notices of Violation being issued, with the majority for lack of compliance with Food Handler Permits. Stronger enforcement action, the Food Enforcement Notice (FEN) is taken when violations pose an imminent risk to the public’s health. About 3% of inspections (105) resulted in a FEN, which were issued for serious or repeat higher risk food code violations. This is about average for any given year. Each food establishment that receives and FEN is required to complete a plan of action on how to prevent such violations in the future. In addition, more frequent inspections are conducted at these facilities to ensure safe food preparation. Administrative meetings are also held in situations where repeat enforcement actions have not resulted in improved sanitation and food safety. In these cases, consultative assistance is offered or required to address the highest risk violations. Two food establishment permits were suspended based on significant risk to public health.
The inspection findings for all food establishments are available to the public on the Internet. The easiest way to find the website is to search “Lincoln food inspections” with your favorite browser. http://lincoln.ne.gov/city/health/environ/food-inspections/

LLCHD’s unique Inspection Rating dial quickly shows how a food establishment compares to similar facilities in Lincoln.

**Food Handler and Food Manager Permits**

All food establishment employees must have food handler permits and each establishment must have a Food Manager in charge of the operation. Training food managers and food handlers in safe food handling practices, hygiene, and sanitization is critical to preventing foodborne illnesses in our community. 14,010 Food Handler and Food Manager Permits were issued. (9)

Food Managers received continuing education through our Food Manager classes taught by LLCHD staff. Food handler training and permits are available both on-line through an interactive training program developed with UNL and via in-person classes. The vast majority of the food handler permits were obtained on-line. Food Handler classes are offered at least once per week and Spanish classes are offered at least once per month.

**FDA Grants – INFUSE - Food Safety Consultation**

Funded by FDA grants, LLCHD provides food safety consultation to poorer performing food establishments to help them adopt active managerial controls to address the highest risk food code violations.

Intervention involved:

- 140 technical assistance and consultation visits.
- 14 food establishments went through the Active Managerial Control based intervention and implemented 30 AMC tools in their regular establishment policy and practice.
- Contact was initiated with an additional 16 establishments (10)
The Food Safety Consultant worked with the Food Managers for Excellence Taskforce to identify one of the “5 Key Food Safety Risk Factors” they believed most needed to change in order to improve food safety in Lincoln. They selected improving hand washing in food establishments to reduce risk factor violations for poor personal hygiene. The “TAKE 20! WASH YOUR HANDS” pilot project, a community behavior change effort, will be launched in several restaurants in 2016.

The Food Safety Program also received three separate smaller grants from the Association of Food and Drug Officials/FDA specifically to: update our InspecTab software for conducting electronic food inspections, staff training, and completing a self-assessment of FDA Retail Program Standard #6 Compliance and Enforcement. InspecTab was updated and staff have been using the new program for several months. In addition to many upgrades, LLCHD adopted FDA’s updated terminology for violations: Priority, Priority Foundation, and Core replacing the historic Critical and Non-Critical. While we are still warming up to naming scheme, we strongly supported the need for more than two categories of violations. Staff attended FDA training on risk based inspections. We completed the self-assessment for Standard #6 and determined that we did not meet this standard at this time. Specific changes in monitoring enforcement actions have been made and we are now in substantial compliance with Standard #6.

FY15 was a stellar year for the LLCHD Food Safety Program!

HEALTH DATA & EVALUATION

This has been a very active time for exercises. Randy Fischer, Public Health Emergency Response Coordinator, facilitated three Ebola tabletop exercises with the other local health departments in Southeast Nebraska as part of a grant requirement. The feedback from all of the exercises has been positive and although the scenario was Ebola, the exercises helped prepare the hospitals, EMS staff, and other participants for other infectious diseases they might encounter. In addition to Randy, Tim Timmons served as a subject matter expert at the exercise in Plymouth, NE (Public Health Solutions district) and the Nebraska Public Health Laboratory also provided one of their staff members as a subject matter expert for the exercises.

Randy Fischer is also working with members of the Lancaster County Healthcare Coalition to conduct a full-scale Ebola exercise on July 12th. More information about the exercise will be provided next month.

Randy and Gina Egenberger, Childcare Health Consultant (EPH), have been following up with the needs of childcare centers to be prepared for emergency events they might have to address. Much of the consultation is a follow-up to issues raised at the active shooter exercise that was conducted in April.
The after-action reports (AAR) for all exercises with improvement plans are available.

Staff in the HDE Division are busy assembling the information needed for documentation related to the PHAB accreditation standards and measures. The process has been helpful in pointing out areas where we need to improve processes and take the time to write down protocols and processes that we have been following for years.

We are through monitoring flu cases in Lincoln and Lancaster County for this year and will pick it up in the late summer with the start of school. As summer has arrived the types of cases we see changes to food- and water-borne diseases (e.g., campylobacter, cryptosporidiosis, and salmonellosis) due to people being more active, grilling and picnicking. Of course, there’s the ever present norovirus cases also. This is also the time when we see more bat exposures and tick- and mosquito-borne cases. In order to reduce the chances of a summer illness, we stress prevention (i.e., proper food prep and handling, hand hygiene, insect repellents, dumping standing water, checking for ticks, etc.) Let’s hope we all make it through the summer without becoming sick. Zika cases contracted elsewhere will likely be an additional issue this summer, but the mosquitoes in Nebraska will not transmit the virus here.

**HEALTH PROMOTION & OUTREACH**

**Chronic Disease Reduction**

The 2016 Summer Food Service Program (SFSP) began on May 23rd, and staff are currently delivering meals to 30 sites, with an anticipated 8 additional sites to be added during June. Meal counts are approximately 2,000 per day with an average of 45% of the meals being breakfast and 55% lunch. Site supervisors and staff from all sites have been trained on the required procedures of the SFSP. LLCHD staff visit each site before beginning operation and during the first and fourth weeks of operation to ensure that procedures are accurately followed. The 2016 SFSP will operate for 12 weeks, from May 23rd through August 12th. The SFSP is an extension of the USDA’s school food program and is administered through the Nebraska Department of Education. Information on sites, dates, and times of service of the SFSP can be found at the website, [Lincoln.ne.gov](http://Lincoln.ne.gov) keyword “summer food”.

Approximately 250 students and family members of Kloefkorn Elementary School received pedestrian and bicycle safety information at the school’s annual fitness event on May 7. Of the more than 125 bikes used in the bike skills station, over 60 were found to have ineffective brakes. The youth were directed to take their bikes to a tent staffed by a mechanic from Bike Rack who corrected the problems. Mechanics from Bike Rack and Cycle Works have donated their time to assist with biking events at multiple elementary schools including Prescott, Sheridan, Pyrtle, and Kloefkorn.

Staff was featured in the May edition of the “Shape of the City” program of Channel 10 Health and provided information on The National Bike Challenge, Bike to Work Week, Bike to School
Day and other bicycling events. Staff also talked about the National Bike Challenge and Bike to Work Week on a noon-time forum on KLKN Channel 8.

**Injury Prevention**

Staff coordinated car seat check events at Honda of Lincoln and at Community Action of Lancaster and Saunders Counties. Twenty-five certified child passenger safety technicians checked 40 car seats between both events (each check requires 45 minutes of tech time and is reviewed by a ‘senior checker’ to ensure accuracy of installation). Thirteen seats were provided to families in need. These events were sponsored by SKLLC, the Nebraska office of Highway Safety, and Honda of Lincoln.

Staff conducted two Child Care Transportation trainings in May for 55 childcare workers who provide transportation to children attending the childcare centers.

**Tobacco Prevention**

Staff coordinated a tobacco retailer compliance check with the Lincoln Police Department and youth volunteers. There were two sales out of 48 attempts to purchase for a 96% compliance rate. Year-to-date, there have been 13 sales out of 131 attempts to purchase for a 90% compliance rate.

Powell Management has implemented a smoke free policy for the 24 living units of Branched Oak Apartments in Malcolm.

**Additions to the Smoke Free Housing Registry:**

- 144 units at Holmes Lake Apartments
- 147 units at Ashbrook by Broadmoor
- 120 units at HiPark Apartments

Total - 5,341 units are now listed on the registry
Lancaster County Weed Control –
City of Lincoln Weed Abatement

INSIDE THIS REPORT:
Nebraska Academy of Sciences Grant 1
Weed Free Forage Program 1
Stop the Spread of Invasives 2

NAS $3,000 Grant
Lancaster County Weed Authority is approved to receive a $3,000 Public Information and Education (PIE) grant from the Nebraska Academy of Sciences (NAS), funded through the Nebraska Environmental Trust (NET). The Nebraska Academy of Sciences grant’s focus is to provide education and outreach in any Nebraska Environmental Trust grant category. The focus of our grant is to provide information to the public using the national outreach campaign Play Clean Go. This campaign encourages outdoor enthusiasts to enjoy the outdoors and reminds them to clean their gear before entering or leaving the recreation site. The $3,000 grant will be matched with $3,000 from the Nebraska Weed Control Association and $650 from Lancaster County Weed Control. The funds will be used to create ATV/UTV, Boat & RV dealer packets. They will also be used for printing brochures and creating a video showing recreationists what they can do to prevent the spread of invasive plants in their favorite recreation spot. This will help protect the places we enjoy by removing seeds, plants and mud from boots, gear, pets and vehicles. The Environmental impacts of not controlling invasive plants can be costly to all Nebraskan’s. Flooding and reduced water conveyance due to overgrown vegetation along the waterways, less water for drinking, lost wildlife habitat and risk of fire, are all impacts created by invasive plants.

Weed Free Forage Program
When forages are transported, be it across the road or across the United States, the potential for the spread of weeds is present. A North America weed free forage program was formulated and implemented to prevent the spread of weeds from one location to another. There is a growing demand in all of North America for the use of certified weed free forage and mulch as a preventative measure to limit the spread of noxious weeds. The Lancaster County Weed Control Authority will upon request inspect any forage prior to harvest as to the presence or absence of the designated noxious weeds of the participating states and provinces. The forage is required to be inspected in the field of origin prior to cutting or harvesting. Forage containing any noxious weeds or other listed weeds may be certified if prescribed treatments are followed. An inspection certificate will document that the requirements were met. Interstate shipments of forages must be accompanied by a transit certificate and/or certification marking issued by the Weed Control Authority in the state of origin. If you are interested in having your forage certified, please contact the Weed Authority office in your county.

“The forage is required to be inspected in the field of origin prior to cutting or harvesting”
**Campgrounds at Risk from Invasive Species**

INVASIVE SPECIES are taking over our campgrounds and natural areas making it difficult to simply enjoy nature, as well as damaging valuable wildlife habitat.

Campers can play a critical role in slowing the spread of invasive species.

**WHAT CAMPERS NEED TO KNOW ABOUT INVASIVES**
- Invasive species are nonnative plants, animals, and diseases that can cause harm to the economy, environment, and human health.
- Invasive plants tend to reproduce and grow quickly making trails impassable.
- They harm wildlife and replace wildflowers.
- Invasive insects and diseases can kill trees.

**WHAT DOES THIS HAVE TO DO WITH CAMPERS?**
- Invasive plant seeds, insects, and diseases can be moved on equipment, such as mud on tires or seeds with burs on clothes and shoes.
- Concerns about spreading invasive species may endanger access to lands and campgrounds in the future.

**HOW YOU CAN HELP**
- Learn to recognize invasive species.
- Wear clothing and footwear that do not attract seeds.
- Clean yourself and your equipment before and after use.
- Clean your animals and their equipment before and after use.
- Properly dispose of soil, seeds, or plant parts from cleaning.
- Minimize soil disturbance: stay on designated trails.
- Avoid areas that are infected with invasive species; “When in doubt, stay out!”
- Do not transport firewood that originates more than 25 miles away from the campground or from outside of Wisconsin.
- Follow guidelines for bringing domestic animals into forested recreation areas.
- Educate others: how to limit the spread of invasive species.
- Volunteer to help control invasive species.

For more information on this and other recreational user groups (Anglers, Animal-Based, Bicyclists, Hikers, Hunters), visit the Recreation Best Management Practices at: [http://council.wisconsinforestry.org/invasives/](http://council.wisconsinforestry.org/invasives/)
Please be advised that the West Haymarket JPA Board meeting scheduled for Thursday, June 23, 2016, has been cancelled due to a lack of agenda items. Attached for your records is a revised Board Meeting Schedule for 2016 reflecting the cancellation of the June meeting.

*Kasey Simonson*
City Law Department
555 South 10th St., Suite 300
Lincoln, NE 68508
402-441-8801
ksimonson@lincoln.ne.gov
Subject: Lincoln Water System--ammonia in water

Councilman Camp,

In order to provide adequate disinfection, LWS chemically reacts chlorine with ammonia producing chloramine that provides a disinfection product that is much more stable than chlorine alone. This is needed in the LWS in order to provide quality drinking water that is free from pathogens throughout the transmission from Ashland and throughout the City. This process has been used successfully in Lincoln’s water since the 1930’s. It is also commonly used throughout the country in many other water systems, particularly where source water is far away from the community it serves.

We do not know of any issues with this type of treatment here in Lincoln and have a long history with this type of disinfection.

We are discussing your constituents’ concern with other members of the plumbing community and we’ll be providing you with additional information by the end of the week. If you’d like, we’d be happy to discuss it with the plumbers that have reached out to you – just let us know.

Donna K. Garden  
Assistant Director  
Department of Public Works and Utilities; 402.441.8605

On Jun 8, 2016, at 3:42 PM

Miki

Would you, or the appropriate individual, confirm that ammonia is now being introduced into Lincoln’s water system?

I have been contacted by plumbers who have noted that they thought this was the case and that the ammonia is damaging various plumbing components including rubber fittings, rubber and galvanized pipes, to name a few items.

I look forward to understanding what is occurring as if this is accurate, then a substantial amount of cost will be incurred by residents and businesses in Lincoln due to premature aging/damage to plumbing components.

Jon

JON A. CAMP  
Lincoln City Council  
200 Haymarket Square  
808 P Street  
P.O. Box 82307  
Lincoln, NE  68501-2307

Office: 402.474.1838/402.474.1812  
Fax: 402.474.1838; Cell: 402.560.1001; Email: joncamp@lincolnhaymarket.com
Pension Funds Pile on Risk Just to Get a Reasonable Return

An investor used to get a 7.5% return by holding safe bonds. To earn that now, research finds, takes a more volatile mix.

By TIMOTHY W. MARTIN
May 31, 2016 12:43 p.m. ET

What it means to be a successful investor in 2016 can be summed up in four words: bigger gambles, lower returns.

Thanks to rock-bottom interest rates in the U.S., negative rates in other parts of the world, and lackluster growth, investors are becoming increasingly creative—and embracing increasing risk—to bolster their performances.

To even come close these days to what is considered a reasonably strong return of 7.5%, pension funds and other large endowments are reaching ever further into riskier investments: adding big dollops of global stocks, real estate and private-equity investments to the once-standard investment of high-grade bonds. Two decades ago, it was possible to make that kind of return just by buying and holding investment-grade bonds, according to new research.
In 1995, a portfolio made up wholly of bonds would return 7.5% a year with a likelihood that returns could vary by about 6%, according to research by Callan Associates Inc., which advises large investors. To make a 7.5% return in 2015, Callan found, investors needed to spread money across risky assets, shrinking bonds to just 12% of the portfolio. Private equity and stocks needed to take up some three-quarters of the entire investment pool. But with the added risk, returns could vary by more than 17%.

Nominal returns were used for the projections, but substituting in assumptions about real returns, adjusted for inflation, would have produced similar findings, said Jay Kloepfer, Callan’s head of capital markets research.

The amplified bets carry potential pitfalls and heftier management fees. Global stocks and private equity represent among the riskiest bets investors can make today, Mr. Kloepfer said.

“Stocks are just ownership, and they can go to zero. Private equity can also go to zero,” said Mr. Kloepfer, noting bonds will almost always pay back what was borrowed, plus a coupon. “The perverse result is you need more of that to get the extra oomph.”

Bonds historically produced a source of safe, good-enough streams of profit that allowed long-term, risk-averse investors to hit annual targets. The era of low rates has all but erased that buffer. The absence of a few extra percentage points of yield means investors must now compensate by embracing unsafe bets that could strike big—or flop. The Callan report highlights how risky an endeavor that is.

“Not nearly enough attention has been paid to the toll these low rates—and now negative rates—are taking on the ability of investors to save and plan for the future,” BlackRock Inc. Chief Executive Officer Laurence Fink said in a recent letter to shareholders.

Some investors such as David Villa of the $100 billion State of Wisconsin Investment Board argue that at near zero, rates are artificially suppressed, and it’s creating bubbles in asset prices.

“We know the Federal Reserve is trying to trick us—we’re dealing with distortions,” said Mr. Villa, referring to how low rates have historically encouraged investors to take on more risk. “They want us to invest in building new things, but what [investors are] doing is trading existing assets at higher and higher prices.”
Many large investors aren’t gambling that big—and their returns are lagging well behind internal targets. The nation’s largest public pension fund, the California Public Employees’ Retirement System, has one-fifth of its assets in bonds and is down 1.3% since July 1, according to public documents. The system, known by its abbreviation Calpers, also has 53.1% of its assets in stocks, 9% in real estate and 9.4% in private equity. In 2015, Calpers posted a return of 2.4%, below its target rate of 7.5%.

The risk dilemma for investors has real-life consequences. Retirement plans, including Calpers and the New York State Common Retirement Fund, are lowering what they predict they can earn on their investments, a move that means workers and cities likely face higher contributions and taxes. For insurers, lower bond returns mean life-insurance policyholders pay more for coverage.

It wasn’t always this complex. Two decades ago big investors had their money sitting primarily in U.S. stocks and bonds. Inflation was 4% and yields on investment-grade bonds soared upward at double that rate.

After the 2008 financial crisis, central bankers pushed down rates to stimulate growth, dropping real returns close to zero for higher-quality debt. Government bonds in Japan and Europe now have nominal yields below zero.

Cheaper borrowing costs generally spur new investments from companies or consumers. But instead, global production is flat or declining, and consumers face stagnant wages that crimp their ability to spend.

That has pushed down the “neutral rate,” or the real rate of interest that neither accelerates nor decelerates the economy. It is now basically flat, compared with
4% or 5% in prior decades, said Roberto Perli, a partner at Cornerstone Macro, a macroeconomic research firm.

While some investors are loading up on traditionally risky assets as a way of hitting ambitious targets, others—concerned about a slowing global economy—are wrestling with how to reduce risk without piling into bonds.

—I can’t just reach out and grab a high-quality bond that’s yielding 6% or 7%. They don’t exist.’

—Tom Girard, New York Life Insurance Co.

The nation’s second-largest public pension plan, the California State Teachers’ Retirement System, has shifted a significant amount of money away from some stocks and bonds to protect against a downturn. It moved assets into U.S. Treasurys and so-called liquid-alternative funds, which mimic hedge-fund strategies. Calstrs, as the pension is called, reported gains of 1.5% during a choppy 2015, with returns on its fixed-income investments up just 0.6%.

“We used to say bonds would be that risk protection,” said Christopher Ailman, chief investment officer at Calstrs. “Now we can’t.”

For instance, in 2002, safer corporate bonds returned about 11%, while U.S. stocks fell roughly 22%, according to a Segal Rogerscasey analysis of the Russell 3000 stock index, plus historical bond returns tracked by Barclays and Citigroup. But during the 2008 crisis, stocks fell more than 37% and higher-quality bonds declined 3.3%, according to the Segal Rogerscasey analysis. More recently, those types of bonds fell during stock-market tumbles in August and December, Segal Rogerscasey said.

Others are willing to accept lower returns for now and wait for better days ahead. The Wisconsin pension sold off trophy real-estate and private-equity holdings when it believed prices were high over the past two years and switched into publicly traded stocks and bonds that can be sold quickly, Mr. Villa said.

Not all investors have the luxury of avoiding bonds. New York Life Insurance Co., which has about 89% of its $220 billion in assets in bonds and other fixed-income securities, once could find what it needed among well-known, plain-vanilla securities. Insurers typically have large holdings of high-quality government and corporate bonds, because of state-regulatory guidelines encouraging safe investments.
But now the insurer has to scour the globe for suitable bets in assets in which it had never before dabbled—such as complex bond deals involving railcar leases, shipping containers and legal-settlement payouts.

The insurer has “looked under rocks, far and wide” to find suitable fixed-income investments, said Tom Girard, who leads New York Life’s fixed-income team.

“I can’t just reach out and grab a high-quality bond that’s yielding 6% or 7%,” he added. “They don’t exist.”

Write to Timothy W. Martin at timothy.martin@wsj.com
From: Thomas S. Shafer  
Sent: Monday, June 13, 2016 2:21 PM  
Subject: RE: Street pavement condition at Marilynn Ave.

Councilperson Raybould,

On the tree issue, I contacted Bob Weyhrich, City Forester who provided the following information:

_The street light at the intersection of Pace and Marilyn stands alone from any tree foliage obstruction. This is a street tree canopy issue rather than an individual tree or limb obstruction. I have put out a work order to raise the locust tree at 3905 pace. This tree stands approximately 70 ft from the street light and Forestry will remove some low limbs to allow more light penetration up the street._

On the street issue –

Mr. Hahn is correct that we did the worst piece of roadway the last time, but due to the increasing numbers of poor roads, had to make a judgement call on whether to spend funds doing the remainder at that time or work on other worst stretches. I believe if the asphalt is patched it will improve the drainage of the area, until a rehab project for the remainder of the road can be programmed, hopefully in the next 4 to 5 years. The asphalt work has been referred to Street maintenance for evaluation in light of their entire street network repair workload and at this time I am unable to give a tentative date repair may start.

Thomas Shafer  
Design/Construction Section Manager  
402-525-5644

From: Thomas S. Shafer  
Sent: Monday, June 06, 2016 1:17 PM  
Subject: RE: Street pavement condition at Marilynn Ave.

I will visit with Pavement Management and we will work with Watershed Mgmt on the street/drainage issue raised, I will forward the tree growth to Parks & Rec (City Forester) for their response.

Thomas Shafer  
Design/Construction Section Manager  
402-525-5644

From: Jane Raybould  
Sent: Monday, June 06, 2016 1:13 PM  
To: Thomas S. Shafer <tshafer@lincoln.ne.gov>; Miki Esposito  
Subject: FW: Street pavement condition at Marilynn Ave.

Thomas and Miki,
I am forwarding on these photos from Horst Hahn. He lives on Marilynn Avenue. I had brought this to your attention in May of 2015 even before I was sworn in! Mr. Hahn is concerned that his street to the west never got paved even though the rest of the street to the east of Pace did. He is pointing out again that the intersection is in horrible shape primarily because the drainage is so bad that the water just ponds and destroys the concrete work that was done some time ago to repair it. He has two questions that I had asked last year. One, when will the drainage work get done and the road paved and two, he mentioned the lack of street lights. I actually drove his neighborhood and saw that the street light at the bottom of his street had pretty dense tree growth that effectively blocked the illumination from the street lamp. Can you help with these two issues. He said that tree still hasn't been trimmed.

Thank you!

Jane

-----Original Message-----
From: Horst Hahn [mailto:hogahahn@windstream.net]
Sent: Monday, June 06, 2016 12:26 PM
To: jane@brstores.com
Subject: Street pavement condition at Marilynn Ave.

Dear Ms. Rayboult,
here are the photos of the intersection Marilynn Ave./Pace Blvd.
Begin forwarded message:

From: Skip Hood <skiphood@gmail.com>
Date: June 10, 2016 at 6:08:06 PM CDT
Subject: Goofy survey

Yes, it's budget time so his honor rolls out that goofy survey that never does give anyone any options other than shutting down city programs/services that are sure to get people, especially his honor's Left wing "letter to the editor" writers all fired up!
Let's get a move ahead of The administration by offering a citizen/city council list of money saving ideas that will save "big" money, will NOT shut down any programs/services, leave the snow depth at 4 in. on Residential streets, keep Swimming pools open etc.
Ok, we're not gonna shut down a branch library one day a week-(really dumb)-
Idea, let's be smart and do this instead: Reduce operating hours of all city libraries by one hour per day...either open One hour later, or close one hour earlier per day, or open 1/2hr. Later,and close 1/2hr. Earlier per day--eliminate 1hour per day, and based on 7 day Operation: you save 7hrs.Per week--28hrs.per mo., 336hrs. Per BRANCH, per Year!
---how many library Branches in Lincoln, and how much do they cost to run per hour? Let the mayor figure that out!
Now, on to the nature center, just shut it down One day a week...using daily attendance records, Pick a slow day or two and Shut it down either a half a day for two days, or shut It down one complete day per week... The public will adjust to new hours!
The 24 hour "ask a nurse" Program for seniors is Very expensive, but by using past call records to Identify slow times, it shud be possible to adjust Hours of operation enough to save some real Money over a 12 month Period!
And that is how u save a Substantial amount of money without beating the citizens over the head With threatened program and service elimination by the city...NOT with really "Goofy" surveys !!!!
Thanks,
Up To My Ears in Property Taxes here in NE Lincoln!

Gerald Hood
skiphood@gmail.com

Sent from my iPhone
I. CITY CLERK

II. MAYOR CORRESPONDENCE
1. NEWS RELEASE. Officials urge caution during heat advisory.
2. NEWS ADVISORY. Mayor Beutler’s public schedule for the week of June 18th through June 24, 2016.

III. DIRECTORS

HEALTH DEPARTMENT
1. NEWS RELEASE. Household hazardous waste collection scheduled for Friday, June 24th.

PLANNING DEPARTMENT

PUBLIC WORKS & UTILITIES/ENGINEERING
1. ADVISORY. South 56th Street, Shadow Pines Drive - Old Cheney Road. State Project No. LCLC-5241(5), Control No. 13141. City Project No. 701923.

IV. MISCELLANEOUS

IV. COUNCIL MEMBERS

JANE RAYBOULD
1. Michael Davis, Transit Manager, responding to concerns from Derek and Judy Andersen, including a map of proposed StarTran schedule changes to Route 50.
   a) Routes 40 and 56 near 33rd Street map.

V. CORRESPONDENCE FROM CITIZENS
1. Norville Rogers comments regarding using brine on the streets is harmful, causing damage.
   a) Types and causes of concrete deterioration.
   b) Effects of deicers on concrete deterioration.
   c) The deleterious chemical effects of concentrated deicing solutions on Portland cement concrete.
   d) Councilwoman Cyndi Lamm responding to Norville Rogers on his interest, comments, articles, and reports.

VI. ADJOURNMENT
OFFICIALS URGE CAUTION DURING HEAT ADVISORY

The National Weather Service has issued a heat advisory for Lincoln until 7 p.m. tonight. A heat advisory means that a period of hot conditions (heat index from 100 to 104 degrees) is expected. The hot environment will create a situation in which heat illnesses are possible. The heat index is a more accurate measure of how hot it really feels when the humidity is added to the actual air temperature. Information is available on local weather, the heat index and safety precautions at the NWS Web site at weather.gov.

Those without air conditioning can cool off during regular hours at recreation centers, libraries, and senior centers as well as other public locations such as theaters and shopping malls. Parks and Recreation also offers family swim nights at neighborhood pools from 6 to 8 p.m. on Monday, Tuesday, Wednesday and Friday with a fee of just $8 for the whole family. Information on regular and extended hours at City facilities is available at lincoln.ne.gov.

Health officials say children are more at risk from high temperatures because they adjust more slowly to the heat, have thinner skin, produce more heat with activity, sweat less and are less likely to rest or get a drink when they are active. Others at risk include the elderly, those with chronic diseases, those who are overweight and those using certain medications or alcohol.

Both air temperature and humidity affect the body’s ability to cool itself during hot weather. Heat stress occurs when sweating isn’t enough to cool the body, causing a person’s body temperature to rise rapidly. Heat stress symptoms include clammy, sweaty skin; light-headedness; weakness; and nausea. Heat-related illnesses include sunburn, heat exhaustion and heat stroke, and the most severe form requires immediate medical attention. More health information can be found at the Web site of the Centers for Disease Control and Prevention at cdc.gov.

Hot weather precautions include the following:

• Drink plenty of non-alcoholic, non-caffeinated fluids, especially during physical activity.
• Avoid heavy meals and hot foods, which add heat to your body.
• Monitor infants for fluid intake, and dress them in cool, loose-fitting clothing.
• Check on relatives, neighbors and friends who may be at risk.
• Never leave children or pets in parked cars. Even with the windows open, temperatures can reach 130 degrees in only a few minutes. Place your cell phone, purse or left shoe in the backseat as a reminder that you have a child in the car.
• Make sure pets and livestock that live outdoors have plenty of fresh, cool water and shade. Pets should be brought indoors if possible.

Those who do need to be outside are advised to wear loose-fitting, light-colored clothing, sunglasses, sunscreen (SPF of 30 or more) and a hat. Plan activities to avoid being outside between 10 a.m. and 4 p.m. Rest frequently in shaded areas, and stay hydrated. Stop activity and get into a cool area if you become lightheaded, confused, weak or faint. Extreme heat can be a concern to healthy people as well, including children participating in outdoor activities such as summer camps and athletic events and practices.

More information on protecting pets including the video “Too Hot for Spot” is available by visiting lincoln.ne.gov (keyword: Animal Control). Animal Control can be reached at 402-441-7900.
Mayor Beutler’s Public Schedule
Week of June 18 through 24, 2016
(Schedule subject to change)

Saturday, June 18
• Taking Charge Community Conversation on the City budget – 8:30 a.m. to 1:30 p.m., first floor, County-City Building, 555 South 10th St.

Monday, June 20
• Kick Off to Summer Cook Out, remarks – 6:30 p.m., Lincoln Olive Oil Shop, 201 N. 7th St.

Tuesday, June 21
• KLIN – 8:10 a.m., 4343 “O” St.
• Volunteer Recognition and Celebration for the Foster Grandparent Program – 11:30 a.m., Valentino’s, 2701 S. 70th St.

Friday, June 24
• Network Globally, Act Locally event, remarks – 9 a.m., McDonald Theatre, 51st and Huntington Ave., Nebraska Wesleyan University.
FOR IMMEDIATE RELEASE: June 17, 2016
FOR MORE INFORMATION: Dan N. King, Environmental Health Specialist, 402-441-8084

HOUSINGHOLD HAZARDOUS WASTE COLLECTION SCHEDULED FOR FRIDAY JUNE 24

Lincoln and Lancaster County residents are encouraged to clean out unwanted chemicals by bringing their household hazardous waste to a collection event from 9 a.m. to 1 p.m. Friday, June 24th at Union College, South 52nd & Cooper Ave. This event is sponsored by the Lincoln-Lancaster County Health Department.

Accepted items include pesticides, lawn and garden chemicals, household cleaning products, paint thinners, stains, polishes and waxes, turpentine, oil-based paint, pool cleaning chemicals, flea and tick powders, rodent poison, charcoal starter fluids, mixed or old gasoline, brake or power steering fluids, and items containing mercury such as CFLs and thermometers. A complete list of accepted items is available at lincoln.ne.gov (keyword: household).

Items NOT accepted include latex paint, motor oil, fertilizers, gas grill cylinders, medicines and pharmaceutical waste, electronics and batteries. For information on recycling these and other materials, check the “Waste Reduction and Recycling Guide” at lincoln.ne.gov (keyword: recycle guide). No business waste will be accepted.

The event is free of charge to Lincoln and Lancaster County residents. Donations are accepted at the collection.

The household hazardous waste program is partially funded by the Nebraska Department of Environmental Quality.
NEBRASKA CAPITOL ENVIRONS COMMISSION

The Nebraska Capitol Environ Commission will hold a public meeting on Thursday, June 23, 2016. The meeting will convene at 8:00 a.m. in Room 214, second floor, County/City Building, 555 S. 10th Street, Lincoln, Nebraska, to consider the following agenda.

For more information, please contact the Lincoln/Lancaster County Planning Department at 402-441-7491.

AGENDA
June 23, 2016

1. Approval of meeting record of regular meeting of March 24, 2016.

Hearing and Action

2. A Certificate of Appropriateness for ground (monument) signs at the Nebraska State Office Building, 301 Centennial Mall South, in the Capitol Environ District.

Discussion

3. Update on Centennial Mall.
4. Staff report and misc.

Accommodation Notice

The City of Lincoln complies with Title VI of the Civil Rights Act of 1964 and Section 504 of the Rehabilitation Act of 1973 guidelines. Ensuring the public’s access to and participating in public meetings is a priority for the City of Lincoln. In the event you are in need of a reasonable accommodation in order to attend or participate in a public meeting conducted by the City of Lincoln, please contact the Director of Equity and Diversity, Lincoln Commission on Human Rights, at 402 441-7624 as soon as possible before the scheduled meeting date in order to make your request.
June 17, 2016

South 56th Street
Shadow Pines Drive – Old Cheney Road
State Project No. LCLC-5241(5) Control No. 13141
City Project No. 701923

The City of Lincoln and their Contractor, Constructors, Inc. are nearing completion for the roadway widening project on South 56th Street from Shadow Pines Drive to Old Cheney Road. The Contractor will soon begin working to complete the noise wall at the northeast corner of 56th Street and Shadow Pines Drive. In order to safely and efficiently complete this wall they will be utilizing both northbound lanes of 56th Street as a work zone. In order to make room for this work zone the northbound traffic on 56th Street will be shifted to the west from Shadow Pines Drive to approximately 500 feet north of the intersection.

During this temporary traffic control shift the northbound traffic on 56th Street will be slowed to 35 miles per hour. No left turns will be allowed for any traffic in the Shadow Pines Drive intersection during this work. The restriction on left turns at Shadow Pines Drive will begin once the construction of the noise wall commences. Motorists trying to turn from 56th Street left on to Shadow Pines Drive will have to drive through the intersection to the next available street and make a U-turn before traveling back to Shadow Pines Drive. Motorists trying to turn from Shadow Pines Drive left on to 56th Street will have to first turn right on 56th Street and drive to the next street before making a U-turn, where they can then continue traveling on 56th Street in their intended direction. The work to construct the noise wall is expected to take approximately four weeks to complete, and is expected to begin during the next couple of weeks.

The entire project team appreciates the support and understanding of the public as we work to complete this final piece of the 56th Street Widening Project. The result of this infrastructure will be an improvement to everyone’s lives and livelihoods, and will help in getting you and your family where you need to go safely and conveniently in southeast Lincoln.

Information on the South 56th Street Roadway Widening Project is available on the City’s website at www.lincoln.ne.gov (keyword: 56th). If you have questions or comments, please contact one of the following people:

Zach Becker, Project Engineer
City of Lincoln - Engineering Services
(402) 613-3763
zbecker@lincoln.ne.gov

Gaylon Masek, Project Manager
City of Lincoln - Engineering Services
(402) 416-7486
gmasek@lincoln.ne.gov
Thank you for the clarifications. A map of the proposed locations for bus stops near your home are attached. We will provide more information to you as it becomes available including the public schedule. We are planning to do several open houses in September as well.

Thanks,
Mike

Mike Davis, AICP
Transit Manager
402-441-7185

-----Original Message-----
From: Derek Anderson [mailto:andersen@inebraska.com]
Sent: Wednesday, June 08, 2016 9:32 AM
To: Jane Raybould <JRaybould@lincoln.ne.gov>; Michael J. Davis <MJDavis@lincoln.ne.gov>
Subject: Re: FW: Proposed StarTran route and schedule changes to Route 50

Jane and Mike,

Thank you for the information. 33rd and South Streets is seven blocks from our house. We are at 34th & Smith. Lake St. is two blocks north, Sewell St. is four blocks north and South Street is two blocks north of Sewell. For some reason, two blocks separate Smith, Lake, Sewell and South in our neighborhood. While three streets separate Smith and South, it is six blocks between the two. We've lived at 34th and Smith for 29 years. The current route 50 has worked for more than 25 years and the route is filled with riders every morning, so why change (why would you change and inbound route that is full five days a week in a.m. drive between 6:30 and 7:00 a.m.)? A teacher that carries bags of school supplies is burdened by walking 1/2 mile to a bus stop. Judy and countless others have walked and stood in downpour rain, blizzards, searing heat and freezing cold to ride the bus. The current 50 route has been convenient for her and other riders. Changing the route where she walks twice as far to board a bus makes a big difference for her and others on the route.

Please provide us the final route so we can make decisions about our transportation options.

Sincerely,
Derek and Judy Andersen
I am writing you because I want you to know how some Lincoln's citizens feel about the proposed expansion of the Public Works' brine program.

First off, the material itself is not effective. We have seen this numerous times in the last 3 years since its inception. Even the county engineer dismisses the effectiveness of the brine solution. I see it like this - If you use a water based solution to melt ice and snow, it melts the snow, adding more water and diluting the solution. You have now effectively added more water to an icy street, creating a cycle that is hard to break. A prime example is the first storm the brine was used on, with more than 80 reported accidents. It created an ice rink.

Secondly, its fairly obvious, despite what a lawyer (Miki Esposito) and her faithfull assistant (Ty Barger) say, the calcium chloride component of the brine mixture is causing major issues with our streets. Can you remember any time the streets were as bad as they have been in the last 3 or so years? If you ask the big wigs in Public Works, they will tell you its a coincidence that the streets are falling apart at this time. Despite what you may have been lead to believe, the key component to the deicing brine solution - calcium chloride - is extremely corrosive to both concrete and to metal. Porous concrete absorbs the calcium chloride, degrades the concrete from the inside out and causes concrete scaling, which leads to pot holes. Calcium chloride also agressively attacks the steel rebar substructure of concrete. As the metal rusts, it expands, breaking and popping the concrete, again causing pot holes. The city knew this 25 years ago, and stopped using it then.

Knowing what it does to the streets and infrastructure, i can only imagine what it does to my car. Public works dumps upwards of 40,000 gallons of this mixture on our streets, EACH SNOW EVENT! Throw in all of the "oops. we made too much" or "oops its too cold for what we made" and 30,000+ extra gallons are spread on our roads as waste. This happened numerous times this past winter. Ask a few of the guys that are working on the streets for their thoughts. The guys doing concrete and asphalt repairs are the real experts, not lawyers and office workers. Maybe they will tell you about the concrete base that turns into the consistancy of a Wendy's Frosty after the spraying operation, or the cracks in the road, crusted with white residue. The guys that do the spraying and road repairs were purposely kept away from the council members during your tour of the MSC brine facility. Something to think about.

I do not have a laboratory science background. I freely admit that. Perhaps my simple memories of biology and chemistry are a little off, but how seriously can you take an "experiment" like the one being conducted by Ty Barger, being performed in break room refrigerators and storage closets? Throw in the fact that they are being carried out by a guy that is far from unbiased, looking only to prove himself right and the results become questionable at best.

The notion of selling brine to other entities is rediculous. Please dont let the taxpayers of Lincoln get hosed twice, when the city streets and state highways both start falling apart due to the brine!

I am attaching a few studies conducted by real scientists and experts in this field. Although the reading is rather dull and technical in nature, it clearly shows that calcium chloride is bad for our streets, bridges, infrastructure and cars.

Thaks for your time and attention
Types and Causes of Concrete Deterioration

The exceptional durability of portland cement concrete is a major reason why it is the world's most widely used construction material. But material limitations, design and construction practices, and severe exposure conditions can cause concrete to deteriorate, which may result in aesthetic, functional, or structural problems.

Concrete can deteriorate for a variety of reasons, and concrete damage is often the result of a combination of factors. The following summary discusses potential causes of concrete deterioration and the factors that influence them.

**CORROSION OF EMBEDDED METALS**

Corrosion of reinforcing steel and other embedded metals is the leading cause of deterioration in concrete. When steel corrodes, the resulting rust occupies a greater volume than the steel. This expansion creates tensile stresses in the concrete, which can eventually cause cracking, delamination, and spalling (Figs. 1 and 2).

Steel corrodes because it is not a naturally occurring material. Rather, iron ore is smelted and refined to produce steel. The production steps that transform iron ore into steel add energy to the metal.

Steel, like most metals except gold and platinum, is thermodynamically unstable under normal atmospheric conditions and will release energy and revert back to its natural state—iron oxide, or rust. This process is called corrosion.

For corrosion to occur, four elements must be present: There must be at least two metals (or two locations on a single metal) at different energy levels, an electrolyte, and a metallic connection. In reinforced concrete, the rebar may have many separate areas at different energy levels. Concrete acts as the electrolyte, and the metallic connection is provided by wire ties, chair supports, or the rebar itself.

Corrosion is an electrochemical process involving the flow of charges (electrons and ions). Fig. 3 shows a corroding steel bar embedded in concrete. At active sites on the bar, called anodes, iron atoms lose electrons and move into the surrounding concrete as ferrous ions. This process is called a reinforced concrete, the rebar may have many separate areas at different energy levels. Concrete acts as the electrolyte, and the metallic connection is provided by wire ties, chair supports, or the rebar itself.

![Fig. 1. Corrosion of reinforcing steel is the most common cause of concrete deterioration. (46080)](image1)

![Fig. 2. The expansion of corroding steel creates tensile stresses in the concrete, which can cause cracking, delamination, and spalling.](image2)

![Fig. 3. When reinforcing steel corrodes, electrons flow through the bar and ions flow through the concrete.](image3)
half-cell oxidation reaction, or the anodic reaction, and is represented as:

$$2Fe \rightarrow 2Fe^{2+} + 4e^-$$

The electrons remain in the bar and flow to sites called cathodes, where they combine with water and oxygen in the concrete. The reaction at the cathode is called a reduction reaction. A common reduction reaction is:

$$2H_2O + O_2 + 4e^- \rightarrow 4OH^-$$

To maintain electrical neutrality, the ferrous ions migrate through the concrete pore water to these cathodic sites where they combine to form iron hydroxides, or rust:

$$2Fe^{2+} + 4OH^- \rightarrow 2Fe(OH)_2$$

This initial precipitated hydroxide tends to react further with oxygen to form higher oxides. The increases in volume as the reaction products react further with dissolved oxygen leads to internal stress within the concrete that may be sufficient to cause cracking and spalling of the concrete cover.

Corrosion of embedded metals in concrete can be greatly reduced by placing crack-free concrete with low permeability and sufficient concrete cover. Table 1 shows the concrete cover requirements for different exposure conditions as set by ACI 318, *Building Code Requirements for Structural Concrete*.

Table 1. Minimum Concrete Cover Requirements (ACI 318)

<table>
<thead>
<tr>
<th>Cast-In-Place Concrete</th>
<th>Min. cover, mm (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete cast against and permanently exposed to earth</td>
<td>75 (3)</td>
</tr>
<tr>
<td>Concrete exposed to earth or weather:</td>
<td></td>
</tr>
<tr>
<td>No. 19 (No. 6) through No. 57 (No. 18) bars</td>
<td>50 (2)</td>
</tr>
<tr>
<td>No. 16 (No. 5) bar, MW200 (W31) or MD200 (D31) wire, and smaller</td>
<td>40 (1½)</td>
</tr>
<tr>
<td>Concrete not exposed to weather or in contact with ground:</td>
<td></td>
</tr>
<tr>
<td>Slabs, Walls, Joists:</td>
<td></td>
</tr>
<tr>
<td>No. 43 (No. 14) and No. 57 (No. 18) bars</td>
<td>40 (1½)</td>
</tr>
<tr>
<td>No. 36 (No. 11) bar and smaller</td>
<td>20 (%)</td>
</tr>
<tr>
<td>Beams, columns:</td>
<td></td>
</tr>
<tr>
<td>Primary reinforcement, ties, stirrups, spirals</td>
<td>40 (1½)</td>
</tr>
<tr>
<td>Shells, folded plate members:</td>
<td></td>
</tr>
<tr>
<td>No. 19 (No. 6) bar and larger</td>
<td>20 (%)</td>
</tr>
<tr>
<td>No. 16 (No. 5) bar, MW200 (W31) or MD200 (D31) wire, and smaller</td>
<td>15 (%)</td>
</tr>
</tbody>
</table>

Precast Concrete

| Concrete exposed to earth or weather: | |
| Wall panels: | |
| No. 43 (No. 14) and No. 57 (No. 18) bars | 40 (1½) |
| No. 36 (No. 11) bar and smaller | 20 (%) |
| Other members: | |
| No. 43 (No. 14) and No. 57 (No. 18) bars | 50 (2) |
| No. 19 (No. 6) through No. 36 (No. 11) bars | 40 (1½) |
| No. 16 (No. 5), MW200 (W31) or MD200 (D31) wire, and smaller | 30 (1½) |
| Concrete not exposed to weather or in contact with ground: | |
| Slabs, walls, joists: | |
| No. 43 (No. 14) and No. 57 (No. 18) bars | 30 (1½) |
| No. 36 (No. 11) bar and smaller | 15 (%) |
| Beams, columns: | |
| Primary reinforcement | 10 (%) |
| Ties, stirrups, spirals | |
| Shells, folded plate members: | |
| No. 19 (No. 6) bar and larger | 15 (%) |
| No. 16 (No. 5) bar, MW200 (W31) or MD200 (D31) wire, and smaller | 10 (%) |

Prestressed Concrete

| Concrete cast against and permanently exposed to earth | 75 (3) |
| Concrete exposed to earth or weather: | |
| Wall panels, slabs, joists | 25 (1) |
| Other members | 40 (1½) |
| Concrete not exposed to weather or in contact with ground: | |
| Slabs, walls, joists | 20 (%) |
| Beams, columns: | |
| Primary reinforcement | 40 (1½) |
| Ties, stirrups, spirals | 25 (1) |
| Shells, folded plate members: | |
| No. 16 (No. 5) bar, MW200 (W31) or MD200 (D31) wire, and smaller | 10 (%) |
| Other reinforcement | $d_b$ but not less than 20 (%) |

$1$ Manufactured under plant controlled conditions. $2$ Modification to the cover requirements are possible depending on the manufacturing method and tensile stress in the member. See ACI 318.

$d_b =$ diameter of reinforcing bar
Concrete and the Passivating Layer

Although steel’s natural tendency is to undergo corrosion reactions, the alkaline environment of concrete (pH of 12 to 13) provides steel with corrosion protection. At the high pH, a thin oxide layer forms on the steel and prevents metal atoms from dissolving. This passive film does not actually stop corrosion; it reduces the corrosion rate to an insignificant level. For steel in concrete, the passive corrosion rate is typically 0.1 µm per year. Without the passive film, the steel would corrode at rates at least 1,000 times higher (ACI 222 2001).

Because of concrete’s inherent protection, reinforcing steel does not corrode in the majority of concrete elements and structures. However, corrosion can occur when the passivating layer is destroyed. The destruction of the passivating layer occurs when the alkalinity of the concrete is reduced or when the chloride concentration in concrete is increased to a certain level.

The Role of Chloride Ions

Exposure of reinforced concrete to chloride ions is the primary cause of premature corrosion of steel reinforcement. The intrusion of chloride ions, present in deicing salts and seawater, into reinforced concrete can cause steel corrosion if oxygen and moisture are also available to sustain the reaction (Fig. 4). Chlorides dissolved in water can permeate through sound concrete or reach the steel through cracks. Chloride-containing admixtures can also cause corrosion.

No other contaminant is documented as extensively in the literature as a cause of corrosion of metals in concrete than chloride ions. The mechanism by which chlorides promote corrosion is not entirely understood, but the most popular theory is that chloride ions penetrate the protective oxide film easier than do other ions, leaving the steel vulnerable to corrosion.

The risk of corrosion increases as the chloride content of concrete increases. When the chloride content at the surface of the steel exceeds a certain limit, called the threshold value, corrosion will occur if water and oxygen are also available. Federal Highway Administration (FHWA) studies found that a threshold limit of 0.20% total (acid-soluble) chloride by weight of cement could induce corrosion of reinforcing steel in bridge decks (Clear 1976). However, only water-soluble chlorides promote corrosion; some acid-soluble chlorides may be bound within aggregates and, therefore, unavailable to promote corrosion. Work at the FHWA (Clear 1973) found that the conversion factor from acid-soluble to water-soluble chlorides could range from 0.35 to 0.90, depending on the constituents and history of the concrete. Arbitrarily, 0.75 was chosen, resulting in a water-soluble chloride limit of 0.15 % by weight of cement. Table 2 shows the maximum permissible water-soluble chloride-ion content for reinforced concrete in various exposure conditions (ACI 318 2002).

Although chlorides are directly responsible for the initiation of corrosion, they appear to play only an indirect role in the rate of corrosion after initiation. The primary rate-controlling factors are the availability of oxygen, the electrical resistivity and relative humidity of the concrete, and the pH and temperature.

<table>
<thead>
<tr>
<th>Maximum Chloride Ion Content of Concrete (ACI 318)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Member</strong></td>
</tr>
<tr>
<td>Prestressed concrete</td>
</tr>
<tr>
<td>Reinforced concrete exposed to chloride in service</td>
</tr>
<tr>
<td>Reinforced concrete that will be dry or protected from moisture in service</td>
</tr>
<tr>
<td>Other reinforced concrete construction</td>
</tr>
</tbody>
</table>

*Water-soluble chloride, percent by weight of cement.

Carbonation

Carbonation occurs when carbon dioxide from the air penetrates the concrete and reacts with hydroxides, such as calcium hydroxide, to form carbonates. In the reaction with calcium hydroxide, calcium carbonate is formed:

\[ \text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O} \]

This reaction reduces the pH of the pore solution to as low as 8.5, at which level the passive film on the steel is not stable.

Carbonation is generally a slow process. In high-quality concrete, it has been estimated that carbonation will proceed at a rate up to 1.0 mm (0.04 in.) per year. The amount of carbonation is significantly increased in concrete with a high water-to-cement ratio, low cement content, short curing period, low strength, and highly permeable or porous paste.

Carbonation is highly dependent on the relative humidity of the concrete. The highest rates of carbonation occur when the relative humidity is maintained between 50% and 75%. Below 25% relative humidity, the degree of carbonation that takes place is considered insignificant. Above 75% relative humidity, moisture in the pores restricts CO₂ penetration (ACI 201 1992). Carbonation-induced corrosion often occurs on areas of building facades that are exposed to rainfall, shaded from sunlight, and have low concrete cover over the reinforcing steel (Fig. 5).

![Fig. 4. Deicing salts are a major cause of corrosion of reinforcing steel in concrete. (55807)](image)

![Fig. 5. Carbonation-induced corrosion often occurs on building facades with shallow concrete cover. (70157)](image)
Carbonation of concrete also lowers the amount of chloride ions needed to promote corrosion. In new concrete with a pH of 12 to 13, about 7,000 to 8,000 ppm of chlorides are required to start corrosion of embedded steel. If, however, the pH is lowered to a range of 10 to 11, the chloride threshold for corrosion is significantly lower—at or below 100 ppm (Montani 1995). Like chloride ions, however, carbonation destroys the passive film of the reinforcement, but does not influence the rate of corrosion.

**Dissimilar Metal Corrosion**

When two different metals, such as aluminum and steel, are in contact within concrete, corrosion can occur because each metal has a unique electrochemical potential. A familiar type of dissimilar metal corrosion occurs in an ordinary flashlight battery. The zinc case and carbon rod are the two metals, and the moist paste acts as the electrolyte. When the carbon and zinc are connected by a wire, current flows. In reinforced concrete, dissimilar metal corrosion can occur in balconies where embedded aluminum railings are in contact with the reinforcing steel.

Below is a list of metals in order of electrochemical activity:

1. Zinc
2. Aluminum
3. Steel
4. Iron
5. Nickel
6. Tin
7. Lead
8. Brass
9. Copper
10. Bronze
11. Stainless Steel
12. Gold

When the metals are in contact in an active electrolyte, the less active metal (lower number) in the series corrodes.

**FREEZE-THAW DETERIORATION**

When water freezes, it expands about 9%. As the water in moist concrete freezes, it produces pressure in the capillaries and pores of the concrete. If the pressure exceeds the tensile strength of the concrete, the cavity will dilate and rupture. The accumulative effect of successive freeze-thaw cycles and disruption of paste and aggregate can eventually cause significant expansion and cracking, scaling, and crumbling of the concrete (Fig. 6). Fig. 7 shows the severity of freeze-thaw exposure typically encountered in different areas of the United States. Local weather records can also be referenced to more precisely determine the severity of exposure.

The resistance of concrete to freezing and thawing in a moist condition is significantly improved by the use of intentionally entrained air. Entrained air voids act as empty chambers in the paste for the freezing and migrating water to enter, thus relieving the pressure in the capillaries and pores and preventing damage to the concrete. Concrete air content requirements for various exposure conditions are shown in Table 3.

Concrete with low permeability is also better able resist the penetration of water and, as a result, performs better when exposed to freeze-thaw cycles. The permeability of concrete is directly related to its water-to-cement ratio—the lower the water-to-cement ratio, the lower the permeability of the concrete. Table 4 shows the maximum water-to-cementitious materials ratio and minimum compressive strength required for different exposure conditions.

### Table 3. Target Air Contents for Frost-Resistant Concrete (ACI 318)

<table>
<thead>
<tr>
<th>Nominal Maximum Aggregate Size, mm (in.)</th>
<th>Air Content, %&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Exposure</td>
<td>Moderate Exposure</td>
</tr>
<tr>
<td>9 (%)</td>
<td>7.5</td>
</tr>
<tr>
<td>13 (%)</td>
<td>7</td>
</tr>
<tr>
<td>19 (%)</td>
<td>6</td>
</tr>
<tr>
<td>25 (1)</td>
<td>6</td>
</tr>
<tr>
<td>37.5 (1 1/2)</td>
<td>5.5</td>
</tr>
<tr>
<td>50&lt;sup&gt;1&lt;/sup&gt; (2)</td>
<td>5</td>
</tr>
<tr>
<td>75&lt;sup&gt;2&lt;/sup&gt; (3)</td>
<td>4.5</td>
</tr>
</tbody>
</table>

<sup>1</sup> See ASTM C 33 for tolerance on oversize for various nominal maximum size designations.

<sup>2</sup> Concrete should have an air content within –1 to +2 percent of the target value.

<sup>3</sup> These air contents apply to total mix, as for the preceding aggregate sizes. When testing these concretes, however, aggregate larger than 37.5 mm (1 1/2 in.) is removed by hand-picking or sieving, and air content is determined on the minus 37.5 mm (1 1/2 in.) fraction of mix (tolerance on air content as delivered applies to this value). Air content of total mix is computed from value determined on the minus 37.5 mm (1 1/2 in.) fraction.

*Fig. 6. Freeze-thaw cycles can cause scaling of concrete surfaces. (A5273)*

*Fig. 7. The frequency of freeze-thaw exposure typically encountered in different areas of the United States.*
### Table 4. Requirements for Special Exposure Conditions (ACI 318)

<table>
<thead>
<tr>
<th>Exposure Condition</th>
<th>Minimum $w/cm^1$</th>
<th>Maximum Compressive Strength$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete intended to have low permeability when exposed to water</td>
<td>0.50</td>
<td>4000</td>
</tr>
<tr>
<td>Concrete exposed to freezing and thawing in a moist condition or to deicing chemicals</td>
<td>0.45</td>
<td>4500</td>
</tr>
<tr>
<td>For corrosion protection of reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources</td>
<td>0.40</td>
<td>5000</td>
</tr>
</tbody>
</table>

1 Water-to-cementitious materials ratio, by weight, normal weight aggregate concrete.  
2 Normal-weight and lightweight aggregate concrete.

### Deicer Scaling

Deicing chemicals used for snow and ice removal, such as sodium chloride, can aggravate freeze-thaw deterioration. The additional problem caused by deicers is believed to be a buildup of osmotic and hydraulic pressures in excess of the normal hydraulic pressures produced when water in concrete freezes. In addition, because salt absorbs moisture, it keeps the concrete more saturated, increasing the potential for freeze-thaw deterioration. However, properly designed and placed air-entrained concrete can withstand deicers for many years.

In the absence of freezing, sodium chloride has little to no chemical effect on concrete. Weak solutions of calcium chloride generally have little chemical effect on concrete, but studies have shown that concentrated calcium chloride solutions can chemically attack concrete. Magnesium chloride deicers have come under recent criticism for aggravating scaling. One study found that magnesium chloride, magnesium acetate, magnesium nitrate, and calcium chloride are more damaging to concrete than sodium chloride (Cody, Cody, Spry, and Gan 1996). Deicers containing ammonium nitrate and ammonium sulfate should be prohibited because they rapidly attack and disintegrate concrete (See section on “Chemical Attack,” page 7).

### Aggregate Expansion

Some aggregates may absorb so much water (to critical saturation) that they cannot accommodate the expansion and hydraulic pressure that occurs during the freezing of water. The result is expansion of the aggregate and possible disintegration of the concrete if enough of the offending particles are present. If a problem particle is near the surface of the concrete, it can cause a popout (Fig. 8).

**D-cracking** is a form of freeze-thaw deterioration that has been observed in some pavements after three or more years of service. Due to the natural accumulation of water in the base and sub-

### Freezing of Fresh Concrete

Concrete gains very little early strength at low temperatures. Freshly mixed concrete must be protected against freezing until the degree of saturation of the concrete has been sufficiently reduced by cement hydration (Fig. 9). The time at which this reduction is accomplished corresponds roughly to the time required for the concrete to attain a compressive strength of 3.5 MPa (500 psi). At normal temperatures and water-to-cement ratios less than 0.60, this typically occurs within the first 24 hours after placement. Significant ultimate strength reductions, up to about 50%, can occur if concrete is frozen within the first few hours after placement or before it attains a compressive strength of 3.5 MPa (500 psi). Concrete to be exposed to deicers should attain a strength of 28 MPa (4000 psi) prior to exposure to cycles of freezing and thawing.

Concrete that has been frozen just once at an early age can often be restored to nearly normal strength by providing favorable subsequent curing conditions. Such concrete, however, will not be as resistant to weathering or as watertight as concrete that had not been frozen. The critical period after which concrete is not seriously damaged by one or two freezing cycles depends on the concrete ingredients and conditions of mixing, placing, curing, and subsequent drying. For example, air-entrained concrete is less susceptible to damage by early freezing than non-air-entrained concrete.

**Fig. 8. Some aggregates absorb water and, upon freezing, expand to produce a popout. (0113)**

**Fig. 9. Ice crystals often form in concrete that is frozen before it hardens. The disruption of the paste matrix by freezing can cause reduced strength gain and increased porosity. (44047)**
Fig. 11. Bacteria in sewage systems can produce sulfuric acid, which aggressively attacks concrete. (70149)

In addition to individual organic and mineral acids which may attack concrete, acid-containing or acid-producing substances, such as acidic industrial wastes, silage, fruit juices, and sour milk, will also cause damage.

Animal wastes contain substances which may oxidize in air to form acids which attack concrete. The saponification reaction between animal fats and the hydration products of portland cement consumes these hydration products, producing salts and alcohols, in a reaction analogous to that of acids.

Acid rain, which often has a pH of 4 to 4.5, can slightly etch concrete, usually without affecting the performance of the exposed surface.

Any water that contains bicarbonate ion also contains free carbon dioxide, a part of which can dissolve calcium carbonate unless saturation already exists. This part is called the “aggressive carbon dioxide.” Water with aggressive carbon dioxide acts by acid reaction and can attack concrete and other portland cement products whether or not they are carbonated.

Calcium-absorptive acidic soil can attack concrete, especially porous concrete. Even slightly acidic solutions that are lime-deficient can attack concrete by dissolving calcium from the paste, leaving behind a deteriorated paste consisting primarily of silica gel.

To prevent deterioration from acid attack, portland cement concrete generally must be protected from acidic environments with surface protective treatments. Unlike limestone and dolomitic aggregates, siliceous aggregates are acid-resistant and are sometimes specified to improve the chemical resistance of concrete, especially with the use of chemical-resistant cement. Properly cured concrete with reduced permeability experience a slightly lower rate of attack from acids.

Salts and Alkalis

The chlorides and nitrates of ammonium, magnesium, aluminum, and iron all cause concrete deterioration, with those of ammonium producing the most damage. Most ammonium salts are destructive because, in the alkaline environment of concrete, they release ammonia gas and hydrogen ions. These are replaced by dissolving calcium hydroxide from the concrete. The result is
a leaching action, much like acid attack. Strong alkalies (over 20 percent) can also cause concrete disintegration (ACI 515 1979).

Environmental conditions have a great influence on sulfate attack. The attack is greater in concrete exposed to wet/dry cycling (Fig. 12). When water evaporates, sulfates can accumulate at the concrete surface, increasing in concentration and their potential for causing deterioration.

Porous concrete is susceptible to weathering caused by salt crystallization. Examples of salts known to cause weathering of field concrete include sodium carbonate and sodium sulfate (laboratory studies have also related saturated solutions of calcium chloride and other salts to concrete deterioration). Under drying conditions, salt solutions can rise to the surface by capillary action and, as a result of surface evaporation, the solution phase becomes supersaturated and salt crystallization occurs, sometimes generating pressures large enough to cause cracking and scaling (Mehta 2000).

Thaumasite may form during sulfate attack in moist conditions at temperatures usually between 0°C and 10°C (32°F to 50°F) and it occurs as a result of a reaction between calcium silicate hydrate, sulfate, calcium carbonate, and water. In concrete undergoing excessive thaumasite formation, cracks can be filled with thaumasite and haloes of white thaumasite surround aggregates. At the concrete/soil interface, the surface concrete layer can be “mushy” with complete replacement of the cement paste by thaumasite.

Sulfate attack is a particular problem in arid areas, such as the Northern Great Plains and parts of the Western United States. Seawater also contains sulfates but is not as severe an exposure as sulfates in groundwater.

Resistance to sulfates can best be achieved by using a low water-to-cement ratio and a cement with a limited amount of tricalcium aluminates. As outlined in ASTM C 150, Type II cement contains less than 8% C₃A, and Type V cement contains less than 5%. Cements meeting the ASTM C 1157 requirements of Type MS cement (moderate sulfate resistant) and Type HS cement (high sulfate resistant) can also be used to provide sulfate resistance, as well as moderate sulfate-resistant cements per ASTM C 595.

Studies have shown that some pozzolans and ground-granulated blast-furnace slags increase the life expectancy of concrete exposed to sulfates. Good results have been obtained with fly ash.

### Sulfate Attack

Naturally occurring sulfates of sodium, potassium, calcium, or magnesium are sometimes found in soil or dissolved in groundwater. Sulfates can attack concrete by reacting with hydrated compounds in the hardened cement. These reactions can induce sufficient pressure to disrupt the cement paste, resulting in loss of cohesion and strength. Calcium sulfate attacks calcium aluminate hydrate and forms ettringite. Sodium sulfate reacts with calcium hydroxide and calcium aluminate hydrate forming ettringite and gypsum. Magnesium sulfate attacks in a manner similar to sodium sulfate and forms ettringite, gypsum, and brucite (magnesium hydroxide). Brucite forms primarily on the concrete surface, consumes calcium hydroxide, lowers the pH of the pore solution, and then decomposes the calcium silicate hydrates.

### Chemicals That Deteriorate Concrete

#### Promote rapid deterioration of concrete:
- Aluminum Chloride
- Calcium Bisulfite
- Hydrochloric Acid (all concentrations)*
- Hydrofluoric Acid (all concentrations)
- Nitric Acid (all concentrations)
- Sulfuric Acid, 10-80 percent*
- Sulfurous Acid

#### Promote moderate deterioration of concrete:
- Aluminum Sulfate*
- Ammonium Bisulfate
- Ammonium Nitrate
- Ammonium Sulfate*
- Ammonium Sulfide
- Ammonium Sulfite
- Ammonium Superphosphate
- Ammonium Thiourea
- Castor Oil
- Cocoa Bean Oil*
- Cocoa Butter*
- Coconut Oil*
- Cottonseed Oil*
- Fish Liquor*
- Mustard Oil*
- Perchloric Acid, 10%
- Potassium Dichromate
- Potassium Hydroxide (>25%)
- Rapeseed Oil*
- Slaughterhouse Waste2
- Sodium Bisulfate
- Sodium Bisulfite
- Sodium Hydroxide (>20%)
- Sulfite Liquor
- Sulfuric Acid, 80% Oleum*
- Tanning Liquor (if acid)
- Zinc Refining Solutions3

* Sometimes used in food processing or as food or beverage ingredient. Ask for advisory opinion of Food and Drug Administration regarding coatings for use with food ingredients.

1 Contains carbonic acid, fish oils, hydrogen sulfide, methyl amine, brine, other potentially active materials

2 May contain various mixtures of blood, fats and oils, bile and other digestive juices, partially digested vegetable matter, urine, and manure, with varying amounts of water.

3 Usually contains zinc sulfate in sulfuric acid. Sulfuric acid concentration may be low (about 6 percent in “low current density” process) or higher (about 22-28% in “high current density” process).

---

Fig 12. The bases of these concrete posts have suffered from sulfate attack. (66900)
meeting the requirements of ASTM C 618 Class F. Slags should conform to ASTM C 989. However, some pozzolans, especially some Class C fly ashes, decrease sulfate resistance. Therefore, pozzolans chosen to improve sulfate resistance should be tested to confirm their behavior.

Calcium chloride reduces sulfate resistance, so it should not be used as an accelerating admixture in concrete exposed to severe and very severe sulfate environments. Table 5 shows the requirements for concrete exposed to sulfates.

### Table 5. Type of Cement Required for Concrete Exposed to Sulfates in Soil or Water

<table>
<thead>
<tr>
<th>Sulfate exposure</th>
<th>Water-soluble sulfate (SO₄) in soil, percent by mass</th>
<th>Sulfate (SO₄) in water, ppm</th>
<th>Cement type¹²</th>
<th>Maximum water-cementitious material ratio, by mass</th>
<th>Minimum design compressive strength, MPA (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>Less than 0.10</td>
<td>Less than 150</td>
<td>No special type required</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Moderate¹</td>
<td>0.10 to 0.20</td>
<td>150 to 1500</td>
<td>II, MS, IP(MS), IS(MS), P(MS)</td>
<td>0.50</td>
<td>28 (4000)</td>
</tr>
<tr>
<td>Severe</td>
<td>0.20 to 2.00</td>
<td>1500 to 10,000</td>
<td>V, HS</td>
<td>0.45</td>
<td>31 (4500)</td>
</tr>
<tr>
<td>Very severe</td>
<td>Over 2.00</td>
<td>Over 10,000</td>
<td>V, HS</td>
<td>0.40</td>
<td>35 (5000)</td>
</tr>
</tbody>
</table>

¹ Seawater.

² Pozzolans or slags that have been determined by test or service record to improve sulfate resistance may also be used.

Test method: *Method for Determining the Quantity of Soluble Sulfate in Solid (Soil or Rock) and Water Samples*, Bureau of Reclamation, 1977.

Source: Adapted from Bureau of Reclamation 1981 and ACI 318.

---

### ALKALI-AGGREGATE REACTIVITY

In most concrete, aggregates are more or less chemically inert. However, some aggregates react with the alkali hydroxides in concrete, causing expansion and cracking over a period of years. This alkali-aggregate reactivity has two forms—alkali-silica reaction (ASR) and alkali-carbonate reaction (ACR). ASR is of more concern than ACR because aggregates containing reactive silica materials are more common.

---

**Heat-Induced Delayed Expansion**

Heat-induced delayed expansion (HIDE)—also called delayed ettringite formation (DEF)—is a rare condition of internal sulfate attack in which mature concretes undergo expansion and cracking (Fig. 13). Concretes may be affected when they have reached high temperatures (over 70°C [158°F]) depending on the concrete ingredients and the time the temperature is reached after casting), usually after the first few hours of placement.

The mechanism causing the expansion is not fully understood. At high temperatures, some of the initial ettringite in the cement paste may be converted to monosulfoaluminate and, upon cooling, revert back to ettringite. Because ettringite occupies more space than monosulfoaluminate, the reversion is expansive. The mechanism responsible for this concrete degradation is still being investigated.

Only concretes in massive elements that retain the heat of hydration or elements exposed to very high temperatures at an early age are at risk of HIDE; and of these, only a few have the chemical makeup or temperature profile to cause detrimental expansion. Normal-sized concrete elements cast and maintained near ambient temperatures cannot experience HIDE.

Fly ash and slag may help control heat-induced delayed expansion, along with control over early-age temperature development.

---

**Fig. 13. Heat-induced delayed expansion is characterized by expanding paste that becomes detached from the aggregate.** (69154)
Alkali-Silica Reactivity

Aggregates containing certain forms of silica will react with alkali hydroxide in concrete to form a gel that swells as it draws water from the surrounding cement paste or the environment. In absorbing water, these gels can swell and induce enough expansive pressure to damage concrete:

1. Alkalies + Reactive Silica $\rightarrow$ Gel Reaction Product
2. Gel Reaction Product + Moisture $\rightarrow$ Expansion

Typical indicators of alkali-silica reactivity are map (random pattern) cracking and, in advanced cases, closed joints and spalled concrete surfaces (Fig. 14). Cracking usually appears in areas with a frequent supply of moisture, such as close to the waterline in piers, from the ground behind retaining walls, near joints and free edges in pavements, or in piers or columns subject to wick action.

Because sufficient moisture is needed to promote destructive expansion, alkali-silica reactivity can be significantly reduced by keeping the concrete as dry as possible. The reactivity can be virtually stopped if the internal relative humidity of the concrete is kept below 80%. In most cases, however, this condition is difficult to achieve and maintain. Warm seawater, due to the presence of dissolved alkalies, can particularly aggravate alkali-silica reactivity.

Alkali-silica reactivity can be controlled using certain mineral admixtures. Silica fume, fly ash, and ground-granulated blast-furnace slag have significantly reduced alkali-silica reactivity. Class F fly ashes have reduced reactivity expansion up to 70% or more in some cases. In some cases, lithium compounds have been shown to effectively reduce ASR.

Although potentially reactive aggregates exist throughout North America, ASR distress in concrete is not common because of measures taken to control it. It is also important to note that not all ASR gel reaction products undergo destructive swelling.

Alkali-Carbonate Reactivity

Reactions observed with certain dolomitic rocks are associated with alkali-carbonate reaction (ACR). Dedolomitization, or the breaking down of dolomite, is normally associated with expansive alkali-carbonate reactivity. This reaction and subsequent crystallization of brucite may cause considerable expansion. The deterioration caused by alkali-carbonate reaction is similar to that caused by alkali-silica reaction (Fig. 15); however, alkali-carbonate reaction is relatively rare because aggregates susceptible to this reaction are less common and are usually unsuitable for use in concrete for other reasons, such as strength potential.

Abrasion/Erosion

Abrasion damage occurs when the surface of concrete is unable to resist wear caused by rubbing and friction. As the outer paste of concrete wears, the fine and coarse aggregate are exposed and abrasion and impact will cause additional degradation that is related to aggregate-to-paste bond strength and hardness of the aggregate.

Although wind-borne particles can cause abrasion of concrete, the two most damaging forms of abrasion occur on vehicular traffic surfaces and in hydraulic structures, such as dams, spillways, and tunnels.

Traffic Surfaces

Abrasion of floors and pavements may result from production operations or vehicular traffic. Many industrial floors are subjected to abrasion by steel or hard rubber wheeled traffic, which can cause significant rutting.

Tire chains and studded snow tires cause considerable wear to concrete surfaces (Fig. 16). In the case of tire chains, wear is caused by flailing and scuffing as the rotating tire brings the metal in contact with the concrete surface.
In some areas, abrasive materials such as sand are applied to pavements to improve traction, but experience has shown that this causes little wear if the concrete is of good quality and the aggregates are wear resistant.

Compressive strength is the most important factor controlling the abrasion resistance of concrete, with abrasion resistance increasing with increase in compressive strength. The service life of some concrete, such as warehouse floors subjected to abrasion by steel or hard rubber wheels, may be greatly increased by the use of specially hard or tough aggregate.

**Hydraulic Structures**

_Abrasion damage_ in hydraulic structures is caused by the abrasive effects of waterborne silt, sand, gravel, rocks, ice, and other debris impinging on the concrete surface. Although high-quality concrete can resist high water velocities for many years with little or no damage, the concrete may not withstand the abrasive action of debris grinding or repeatedly impacting on its surface (Fig. 17). In such cases, abrasion erosion ranging from a few millimeters (inches) to several meters (feet) can result, depending on flow conditions. Spillway aprons, stilling basins, sluiceways, drainage conduits or culverts, and tunnel linings are particularly susceptible to abrasion erosion. Abrasion erosion is readily recognized by its smooth, worn appearance, which is distinguished from the small holes and pits formed by cavitation erosion.

As is the case with traffic wear, abrasion damage in hydraulic structures can be reduced by using strong concrete with hard aggregates.

_Cavitation_ is the formation of bubbles or cavities in a liquid. In hydraulic structures, the liquid is water and the cavities are filled with water vapor and air. The cavities form where the local pressure drops to a value that will cause the water to vaporize at the prevailing fluid temperature. Cavitation damage is produced when the vapor cavities collapse, causing very high instantaneous pressures that impact on the concrete surfaces, causing pitting, noise, and vibration.

Once cavitation damage has substantially altered water flow, other deterioration mechanisms come into play. Fatigue due to vibration, rushing water striking irregular surfaces, and mechanical failure due to vibrating reinforcing steel can cause significant concrete damage.

Pitting by cavitation is readily distinguished from the worn appearance caused by abrasion because cavitation pits cut around the harder coarse aggregate particles and have irregular and rough edges. Severe cavitation damage will typically form a “Christmas tree” configuration on spillway chute surfaces downstream from the point of origin.

Although proper material selection can increase the cavitation resistance of concrete, the only completely effective solution is to design hydraulic structures to reduce or eliminate the factors that trigger cavitation. Even the strongest materials cannot withstand the forces of cavitation indefinitely.

**FIRE/HEAT**

Concrete performs exceptionally well at the temperatures encountered in almost all applications. But when exposed to fire or unusually high temperatures, concrete can lose strength and stiffness (Fig. 18).

Fig. 19 shows the effect of high temperatures on the compressive strength, flexural strength, and modulus of elasticity of cured concrete, as determined by various investigators (Lankard 1968). As shown in the graphs, modulus of elasticity is the most sensitive to elevated temperature, followed by flexural strength and compressive strength.

The graphs represent a wide range of values because several factors influence the performance of concrete at elevated temperatures. Numerous studies have found the following general trends:

- Concrete that undergoes thermal cycling suffers greater loss of strength than concrete that is held at a constant temperature, although much of the strength loss occurs in the first few cycles. This is attributed to incompatible dimensional changes between the cement paste and the aggregate.
- Concrete that is under design load while heated loses less strength than unloaded concrete, the theory being that
imposed compressive stresses inhibit development of cracks that would be free to develop in unrestrained concrete.

- Concrete that is allowed to cool before testing loses more compressive strength than concrete that is tested hot. Concrete loses more strength when quickly cooled (quenched) from high temperatures than when it is allowed to cool gradually.

- Concrete containing limestone and calcareous aggregates performs better at high temperatures than concrete containing siliceous aggregates (Abrams 1956). One study showed no difference in the performance of dolostone and limestone (Carette 1982). Another study showed the following relative aggregate performance, from best to worst: firebrick, expanded shale, limestone, gravel, sandstone and expanded slag.

- Proportional strength loss is independent of compressive strength of concrete.

- Concrete with a higher aggregate-cement ratio suffers less reduction in compressive strength; however, the opposite is true for modulus of elasticity. The lower the water-cement ratio, the less loss of elastic modulus.

- If residual water in the concrete is not allowed to evaporate, compressive strength is greatly reduced. If heated too quickly, concrete can spall as the moisture tries to escape.
RESTRAINT TO VOLUME CHANGES

Concrete changes slightly in volume for various reasons, the most common causes being fluctuations in moisture content and temperature. Restraint to volume changes, especially contraction, can cause cracking if the tensile stresses that develop exceed the tensile strength of the concrete.

Plastic Shrinkage Cracking

When water evaporates from the surface of freshly placed concrete faster than it is replaced by bleed water, the surface concrete shrinks. Due to the restraint provided by the concrete below the drying surface layer, tensile stresses develop in the weak, stiffening plastic concrete, resulting in shallow cracks of varying depth (Fig. 20). These cracks are often fairly wide at the surface.

Plastic shrinkage cracks can be prevented by taking measures to prevent rapid water loss from the concrete surface. Fog nozzles, plastic sheeting, windbreaks, and sunshades can all be used to prevent excessive evaporation.

Drying Shrinkage Cracking

Because almost all concrete is mixed with more water than is needed to hydrate the cement, much of the remaining water evaporates, causing the concrete to shrink. Restraint to shrinkage, provided by the subgrade, reinforcement, or another part of the structure, causes tensile stresses to develop in the hardened concrete. Restraint to drying shrinkage is the most common cause of concrete cracking (Fig. 21).

In many applications, drying shrinkage cracking is inevitable. Therefore, control joints are placed in concrete to predetermine the location of drying shrinkage cracks. Drying shrinkage can be limited by keeping the water content of concrete as low as possible and maximizing the coarse aggregate content.

OVERLOAD AND IMPACT

Properly designed and constructed concrete members are usually strong enough to support the loads for which they are intended. But overloading can occur for a variety of reasons — a change in use of a structure without proper structural upgrades, unintentional overloading, and other unusual circumstances. Earthquake damage is a classic example of the overloading of concrete structures.

Overload damage can occur during construction when concrete has not yet reached design strength. Early removal of formwork or the storage of heavy materials or operation of equipment on and around the structure can result in the overloading of certain concrete members. A common error occurs when precast members are not properly supported during transport and erection. Errors in post-tensioned construction, such as improperly timed or sequenced strand release, can also cause overload cracking.

Damage caused by impact is another form of overload. A common form of impact overload occurs at slab edges of joints on vehicular traffic surfaces (Fig. 22).
Even in properly designed reinforced concrete, load-induced tensile stresses can occur. This point is readily acknowledged and accepted in concrete design. Current design procedures use reinforcing steel to not only carry tensile loads, but to obtain both an adequate distribution of cracks and a reasonable limit on crack width.

**LOSS OF SUPPORT**

Loss of support beneath concrete structures, usually caused by settling or washout of soils and subbase materials, can cause a variety of problems in concrete structures, from cracking and performance problems to structural failure (Fig. 23). Loss of support can also occur during construction due to inadequate formwork support or premature removal of forms.

A common problem related to loss of support is **slab curling**. Curling is the rise of a slab’s edges and corners caused by differences in moisture content or temperature between the top and bottom of a slab. The top dries out or cools, and contracts more than the wetter, warmer bottom. Curling results in a loss of contact between the slab and the subbase, which can lead to cracking, slab deflection, and joint deterioration when vehicular traffic crosses the joints.

**FORMED SURFACES**

Surface air voids, also known as **bugholes**, are small cavities that are the result of entrapped air bubbles in the surface of formed concrete during placement and consolidation (Fig. 24). They can be up to 25 mm (1 in.) wide, but are usually no more than 15 mm (⅝ in.) wide. Bug holes on vertical surfaces are more likely to occur in sticky or stiff concrete mixes of low workability that may have an excessive fine aggregate content, entrapped air content, or both. Also, the use of vibrators with too high of an amplitude, or the lack of complete insertion of the vibrator head may result in an increased quantity of bug holes. Bugholes are also aggravated by the heavy application of form release agent.

**FORMED SURFACES**

**Surface air voids**, also known as **bugholes**, are small cavities that are the result of entrapped air bubbles in the surface of formed concrete during placement and consolidation (Fig. 24). They can be up to 25 mm (1 in.) wide, but are usually no more than 15 mm (⅝ in.) wide. Bug holes on vertical surfaces are more likely to occur in sticky or stiff concrete mixes of low workability that may have an excessive fine aggregate content, entrapped air content, or both. Also, the use of vibrators with too high of an amplitude, or the lack of complete insertion of the vibrator head may result in an increased quantity of bug holes. Bugholes are also aggravated by the heavy application of form release agent.

**SURFACE DEFECTS**

Various defects can occur on the surface of formed or finished concrete. Many of these defects are avoidable by using proper materials and construction practices; others are difficult or impossible to eliminate completely.

**Formed Surfaces**

**Surface air voids**, also known as **bugholes**, are small cavities that are the result of entrapped air bubbles in the surface of formed concrete during placement and consolidation (Fig. 24). They can be up to 25 mm (1 in.) wide, but are usually no more than 15 mm (⅝ in.) wide. Bug holes on vertical surfaces are more likely to occur in sticky or stiff concrete mixes of low workability that may have an excessive fine aggregate content, entrapped air content, or both. Also, the use of vibrators with too high of an amplitude, or the lack of complete insertion of the vibrator head may result in an increased quantity of bug holes. Bugholes are also aggravated by the heavy application of form release agent.

**Formed Surfaces**

**Surface air voids**, also known as **bugholes**, are small cavities that are the result of entrapped air bubbles in the surface of formed concrete during placement and consolidation (Fig. 24). They can be up to 25 mm (1 in.) wide, but are usually no more than 15 mm (⅝ in.) wide. Bug holes on vertical surfaces are more likely to occur in sticky or stiff concrete mixes of low workability that may have an excessive fine aggregate content, entrapped air content, or both. Also, the use of vibrators with too high of an amplitude, or the lack of complete insertion of the vibrator head may result in an increased quantity of bug holes. Bugholes are also aggravated by the heavy application of form release agent.

**Formed Surfaces**

**Surface air voids**, also known as **bugholes**, are small cavities that are the result of entrapped air bubbles in the surface of formed concrete during placement and consolidation (Fig. 24). They can be up to 25 mm (1 in.) wide, but are usually no more than 15 mm (⅝ in.) wide. Bug holes on vertical surfaces are more likely to occur in sticky or stiff concrete mixes of low workability that may have an excessive fine aggregate content, entrapped air content, or both. Also, the use of vibrators with too high of an amplitude, or the lack of complete insertion of the vibrator head may result in an increased quantity of bug holes. Bugholes are also aggravated by the heavy application of form release agent.
concern if they allow moisture penetration or if the loss of tensile strength of the concrete across the joint is deemed detrimental to the performance of the structure.

Form streaks are areas of fine or coarse aggregate left on the concrete surface after mortar leaks through form joints and tie holes. Overvibration and the use of excessively wet or high-slump concrete increases the chances of form streaking, as do unsealed formwork joints.

Sand streaking is a streak of fine aggregate in the concrete surface caused by heavy bleeding along the form. It often results from the use of harsh, wet mixes, particularly those deficient in aggregate sizes of 300 µm (No. 50) and smaller.

Form offsets are abrupt to gradual surface irregularities that are usually caused by inadequate stiffness or anchorage of the forms and can be aggravated by an excessive rate of placement or by an excessively powerful vibrator.

Delaminations are very difficult to detect during finishing and become apparent after the concrete surface has dried and the delaminated area is crushed under traffic. A smaller and more noticeable form of delamination is a blister, a bump that forms at the concrete surface from trapped air and bleed water (Fig. 27).

The primary cause of delaminations is finishing the surface before bleeding is complete. Delaminations are more likely to occur when factors that extend the bleeding time of concrete are combined with factors that accelerate surface setting.

Dusting is the development of a fine, powdery material that easily rubs off the surface of hardened concrete (Fig. 28). It is the result of a thin, weak surface layer, called laitance, which is composed of water, cement, and fine particles.

Floating and troweling bleed water back into the concrete surface can cause dusting. Other causes include using too wet a mix, spreading dry cement over the surface to accelerate finishing, and allowing rapid drying of the surface. Unvented heaters can also contribute to dusting by supplying carbon dioxide, which reacts with calcium hydroxide in fresh concrete to form a weak layer of calcium carbonate on the surface.

A popout is a fragment that breaks out of the surface of concrete, leaving a hole that is usually 6 to 50 mm (¼ to 2 in.) in diameter.
(see Fig. 8). The cause of a popout usually is a piece of porous rock having a high rate of absorption and relatively low specific gravity. As the offending aggregate absorbs moisture or freezing occurs under moist conditions, its swelling creates internal pressures sufficient to rupture the concrete surface. Pyrite, hard-burned dolomite, coal, shale, soft fine grained limestone, or chert commonly cause popouts.

Some popouts are caused by alkali-silica reactivity. In some areas, sand-sized ASR-induced popouts are a common problem on floors that receive impermeable coverings.

Subsidence cracks may develop over embedded items, such as reinforcing steel, or adjacent to forms or hardened concrete as the concrete settles or subsides (Fig. 29). Subsidence cracking results from insufficient consolidation (vibration), high slumps (overly wet concrete), or a lack of adequate cover over embedded items.

Crazing is a pattern of fine cracks that do not penetrate much below the surface and are usually a cosmetic problem only (Fig. 30). They are barely visible, except when the concrete is drying after the surface has been wet. Preventing excessive evaporation during placement and proper curing can prevent crazing.

REFERENCES


ACI Committee 116, Cement and Concrete Terminology, ACI 116R-90, American Concrete Institute, Farmington Hills, Michigan, 1990.

ACI Committee 201, Guide to Durable Concrete, ACI 201.2R-92, American Concrete Institute, Farmington Hills, Michigan, 1992.

ACI Committee 210, Erosion of Concrete in Hydraulic Structures, ACI 210R-93, American Concrete Institute, Farmington Hills, Michigan 1993.

ACI Committee 222, Protection of Metals in Concrete Against Corrosion, ACI 222R-01, American Concrete Institute, Farmington Hills, Michigan, 2001.

ACI Committee 224, Causes, Prevention, and Repair of Cracks in Concrete, ACI 224.1R-93, American Concrete Institute, Farmington Hills, Michigan, 1993.

ACI Committee 302, Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, Michigan, 1996.

ACI Committee 309, Identification and Control of Visible Effects of Consolidation on Formed Concrete Surfaces, ACI 309.2R-98, American Concrete Institute, Farmington Hills, Michigan, 1998.

ACI Committee 318, Building Code Requirements for Structural Concrete, ACI 318-02, American Concrete Institute, Farmington Hills, Michigan, 2002.

ACI Committee 515, A Guide to the Use of Waterproofing, Damp Proofing, Protective, and Decorative Barrier Systems for Concrete, ACI 515.1R-79, American Concrete Institute, Farmington Hills, Michigan, 1979.


---

**WARNING:** Contact with wet (unhardened) concrete, mortar, cement, or cement mixtures can cause SKIN IRRITATION, SEVERE CHEMICAL BURNS (THIRD-DEGREE), or SERIOUS EYE DAMAGE. Frequent exposure may be associated with irritant and/or allergic contact dermatitis. Wear waterproof gloves, a long-sleeved shirt, full-length trousers, and proper eye protection when working with these materials. If you have to stand in wet concrete, use waterproof boots that are high enough to keep concrete from flowing into them. Wash wet concrete, mortar, cement, or cement mixtures from your skin immediately. Flush eyes with clean water immediately after contact. Indirect contact through clothing can be as serious as direct contact, so promptly rinse out wet concrete, mortar, cement, or cement mixtures from clothing. Seek immediate medical attention if you have persistent or severe discomfort.

This publication is intended SOLELY for use by PROFESSIONAL PERSONNEL who are competent to evaluate the significance and limitations of the information provided herein, and who will accept total responsibility for the application of this information. The Portland Cement Association DISCLAIMS any and all RESPONSIBILITY and LIABILITY for the accuracy of and the application of the information contained in this publication to the full extent permitted by law.
EFFECTS OF DEICERS ON CONCRETE DETERIORATION

By

David Darwin
JoAnn Browning
Lien Gong
Sean R. Hughes

A Report on Research Sponsored by the Structural Engineering and Materials Laboratory
University of Kansas

Structural Engineering and Materials Laboratory
SL Report 07-3
December 2007
EFFECTS OF DEICERS ON CONCRETE DETERIORATION

By

David Darwin
JoAnn Browning
Lien Gong
Sean R. Hughes

A Report on Research Sponsored by the
Structural Engineering and Materials Laboratory
University of Kansas

Structural Engineering and Engineering Materials
SL Report 07-3

THE UNIVERSITY OF KANSAS CENTER FOR RESEARCH, INC.
LAWRENCE, KANSAS

December 2007
ABSTRACT

Concrete specimens were exposed to weekly cycles of wetting and drying in distilled water and in solutions of sodium chloride, calcium chloride, magnesium chloride, and calcium magnesium acetate with either a 6.04 molal ion concentration, equivalent in ion concentration to a 15% solution of NaCl, or a 1.06 molal ion concentration, equivalent in ion concentration to a 3% solution of NaCl, for periods of up to 95 weeks. Specimens were also exposed to air only. The effects of exposure were evaluated based on changes in the dynamic modulus of elasticity and the physical appearance of the specimens at the conclusion of the tests.

Concretes exposed to distilled water and air show, respectively, an increase and a decrease in dynamic modulus of elasticity, due principally to changes in moisture content; overall, no negative impact on the concrete properties of these specimens is observed. At lower concentrations, sodium chloride and calcium chloride have a relatively small negative impact on the properties of concrete. At high concentrations, sodium chloride has a greater but still relatively small negative effect. At low concentrations, magnesium chloride and calcium magnesium acetate can cause measurable damage to concrete. At high concentrations, calcium chloride, magnesium chloride, and calcium magnesium acetate cause significant changes in concrete that result in loss of material and a reduction in stiffness and strength.

Key words: chlorides, concrete, deicing salts, calcium chloride, calcium magnesium acetate, magnesium chloride, sodium chloride
INTRODUCTION

The application of deicing chemicals can result in the deterioration of concrete roads and bridges by causing scaling when the concrete is subjected to cycles of freezing and thawing. Deicing chemicals can also cause concrete to deteriorate as the result of physical and chemical effects that occur whether or not the deicers cause significant scaling damage. Studies (Verbek and Kleiger 1957, Marchand et al. 1999) have demonstrated that sodium chloride and calcium chloride, the two principle deicing chemicals, cause maximum scaling under freeze-thaw conditions at concentrations in water between 2 and 4% by weight, with NaCl having the greater effect. Concentrations outside of this range, both lower and higher, have less effect on scaling. In contrast, studies of concrete deterioration caused by cycles of wetting and drying show that deterioration increases with an increasing concentration of the solution (Cody et al. 1996). The latter observations have important implications because high concentration solutions are often used for deicing and because the concentrated deicers will build up in concrete over time.

One drawback in studies of the effects of wetting and drying with deicers is that comparisons are typically made using solutions that have either an equal weight of deicing chemical or an equal molar concentration (equal number of molecules for a given volume of solution) (Cody et al. 1996, Lee et al. 2000). The problem with this approach is that the ice melting capability of a deicer is more closely related to the number of ions in a given quantity of water than to either the weight or molar concentration. For example, at the same molar concentration, CaCl$_2$ will have 50% more ions in solution than NaCl. The test procedures used in this study account for the number of ions produced when a deicer goes into solution.

A number of different test procedures have been used to evaluate the effects of wetting and drying. These have included cycles at room temperature, cycles at elevated temperatures, as
high as 58°C (135°F), and wetting and drying cycles that include changes in temperature during both the wet and dry cycles. Specimens are usually evaluated based on physical changes at the macroscopic and microscopic level, as well as chemical changes that are observed using petrographic analysis, scanning electron microscopy, and x-ray microanalysis.

Previous studies (Cody et al. 1996, Taylor 1997, Lee et al. 2000, Sutter et al. 2006) have indicated that deicers can affect the chemistry of hardened cement paste. Chloride solutions tend to cause the formation of calcium chloride hydrate and calcium oxychloride, while magnesium chloride, in particular, results in the conversion of calcium silicate hydrate to non-cementitious magnesium silicate hydrate. In mixtures of calcium and magnesium acetate (CMA), magnesium acetate has been shown to cause the most severe damage, due to the formation of magnesium silicate hydrate, with little negative effect demonstrated by calcium acetate (Lee et al. 2000).

The effects of CMA on concrete have been observed in on-going corrosion research at the University of Kansas, with molal ion concentrations (based on the number of ions for a given quantity of water) equivalent to a 15% sodium chloride solution causing severe damage, not only to the concrete in corrosion specimens, but also to the adjacent concrete floor. CMA solutions with molal ion concentrations equivalent to a 3% sodium chloride solution have resulted in much less damage.

This report describes the results of a study in which the effects of four deicers, sodium chloride, calcium chloride, magnesium chloride, and calcium magnesium acetate, on concrete are compared using a technique that combines exposure procedures that were originally developed to allow deicing chemicals to rapidly penetrate concrete corrosion specimens with techniques that are used to evaluate the physical effects of cyclic freezing and thawing on concrete.
EXPERIMENTAL STUDY

Materials

In the study, the effects on concrete of cyclic wetting and drying with solutions containing sodium chloride (NaCl), calcium chloride (CaCl₂), magnesium chloride (MgCl₂), and calcium magnesium acetate (CMA) (4:6 molar ratio of calcium acetate to magnesium acetate) are evaluated. The study also includes control specimens that are exposed to air or to distilled water throughout the test period. Two concentrations are tested for each deicing chemical, a 6.04 molal ion concentration, equivalent in ion concentration to a 15% solution of NaCl, and a 1.06 molal ion concentration, equivalent to a 3% solution of NaCl. The compositions of the solutions are shown in Table 1.

<table>
<thead>
<tr>
<th>6.04 molal ion concentration solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaCl</td>
</tr>
<tr>
<td>MgCl₂</td>
</tr>
<tr>
<td>CaCl₂</td>
</tr>
<tr>
<td>CMA</td>
</tr>
<tr>
<td>1.06 molal ion concentration solutions</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>NaCl</td>
</tr>
<tr>
<td>MgCl₂</td>
</tr>
<tr>
<td>CaCl₂</td>
</tr>
<tr>
<td>CMA</td>
</tr>
</tbody>
</table>

* distilled water used for all solutions

The concrete mixture used in the study contained Type I/II portland cement and had a water cement ratio of 0.45 and an air content of 6 percent. Mix proportions and aggregate properties are shown in Table 2.

Prismatic test specimens [3 in.² × 12 in. (76 mm² ×305 mm)] are used. The concrete is mixed and the specimens fabricated in accordance with ASTM C 192. Specimens are cast horizontally in two layers with each layer consolidated for 30 seconds on a vibrating table with
Table 2 Concrete mixture proportions (SSD basis)

<table>
<thead>
<tr>
<th></th>
<th>Cement</th>
<th>Water</th>
<th>Fine Aggregate</th>
<th>Coarse Aggregate</th>
<th>Vinsol Resin</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/yd³ (kg/m³)</td>
<td>598 (355)</td>
<td>270 (160)</td>
<td>1436 (852)</td>
<td>1473 (874)</td>
<td>0.024 (90)</td>
</tr>
<tr>
<td>gal/yd³ (mL/m³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Concrete Properties: w/c = 0.45, 6 ± 1% entrained air, and 3 ± 0.5 in. (76 ± 13 mm) slump
Cement: Type I/II portland cement
Fine Aggregate: Kansas River sand with bulk specific gravity (SSD) = 2.62, absorption = 0.78%, fineness modulus = 2.51
Coarse Aggregate: Crushed limestone from Fogle Quarry with ¾ in. (19 mm) nominal maximum size, bulk specific gravity (SSD) = 2.58, absorption = 2.27 %, and unit weight of 95.9 lb/ft³ (1536 kg/m³)
Air-entraining Agent: Daravair 1400, from W. R. Grace, Inc.

an amplitude of 0.006 in. (0.15 mm) and a frequency of 60 Hz. The upper surface of the specimens is finished using a wooden float.

After casting, the specimens are covered with plastic, cured for 24 hours at room temperature, and then removed from the molds and cured in lime-saturated water at 73 ± 3°F (23 ± 1.7°C) for six days. After six days, the specimens are removed from the curing tank and allowed to dry at a temperature of 73 ± 3°F (23 ± 1.7°C) and a relative humidity of 50% ± 4% for 48 days.

The control specimens were cast separately from those exposed to deicers. For the specimens exposed to air, specimens 1 through 4 were cast in one batch and specimens 5 and 6 in another. For the specimens exposed to distilled water, specimens 1 and 2 were cast in one batch and specimens 3 through 6 in another. To limit variations in performance that might occur due to differences in concrete properties, the specimens exposed to deicers were cast in groups of four, eight, or 16 specimens, with equal numbers of specimens from each batch exposed to one of the four deicers. For the 6.04 molal ion deicer concentrations, specimens 1 and 2 were cast in batches of four, while specimens 3 through 16 were cast in a single batch of 16. For the 1.06 molal ion deicer concentrations, specimens 1 and 2, 3 and 4, and 5 and 6 were cast in batches of eight.
Test Procedure

The test procedure involves wet/dry exposure similar to that used for Southern Exposure corrosion test specimens (McDonald et al., 1998, Darwin et al. 2007a, 2007b), while the effect of the cycles is evaluated by measuring changes in the dynamic modulus of elasticity in accordance to the ASTM C 215, as used for freeze-thaw specimens in ASTM C 666.

Six specimens are used for each of the solutions shown in Table 1, along with six specimens each in air and distilled water. The specimens are submerged in the solutions (or distilled water) for four days at a temperature of 73 ± 4°F (23 ± 2°C). After four days, they are removed from the solution and dried in air at a temperature of 100 ± 3°F (38 ± 1.7°C) for three days under a portable heating tent. The deicer solutions and distilled water are replaced every five weeks. Specimens exposed to air are subjected to the temperature cycles. Cycles are repeated for up to a maximum of 95 weeks. Based on chloride concentrations obtained at a depth of 1 in. (25 mm) in the corrosion specimens (Ji et al. 2005, Darwin et al. 2007b) and on bridge decks (Lindquist et al. 2006), exposure to cyclic wetting and drying using this regimen simulates 10 years of exposure for bridge decks within the first 30 weeks and 30 years within the 95-week maximum duration of the test.

The fundamental transverse resonance frequency of each specimen is measured at the initiation of the tests and every five weeks thereafter (after the three-day drying period) using the procedures described in ASTM C 215. The dynamic modulus of elasticity (Dynamic $E$) can be calculated based on the fundamental transverse frequency, the mass, and dimensions of the test specimens [Equation (1) is taken directly from ASTM C 215]:

$$\text{Dynamic } E = CMn^2$$

where:
$M$ = mass of specimen, kg

$n$ = fundamental transverse frequency, Hz

$C = 0.9464(L^3T^2bt^3)$, N•s² (kg•m²)

$L$ = length of specimen, m

t, b = dimensions of cross section of prism, m, t being the direction in which it is driven

$T$ = a correction factor which depends on the ratio of the radius of gyration, $K (= t/3.464)$, to the length of the specimen, $L$, and on Poisson’s ratio. Values of $T$ for Poisson’s ratio of 1/6 may be obtained from Table 1 in ASTM C 215.

The masses $M$ of specimens 3 through 6 exposed to the 6.04 molal ion deicer concentrations were not measured. For the calculation in Eq. (1), $M$ for these specimens is replaced by a value calculated using the dimensions of the specimens and the average density of the 24 specimens subjected to the 1.06 molal ion deicer concentrations.

A total of 60 specimens were subjected to cycles of wetting and drying, temperature change, or both. As noted above, these included six specimens subjected to the same temperature history as the others while remaining in air throughout the test period. Changes in concrete properties are evaluated based on the ratio of the dynamic modulus of elasticity at the given number of cycles to the dynamic modulus of elasticity at the initiation of the wet/dry cycles. This ratio is referred to as the relative dynamic modulus of elasticity (wet-dry), or $P_{wd}$, to distinguish it from the value of $P$ obtained using ASTM C 666 for specimens subjected to cycles of freezing and thawing. Wet/dry cycles continue for a total of 95 weeks or until the $P_{wd}$ drops below 0.9, at which point the tests are terminated.
TEST RESULTS

The moduli of elasticity of the specimens are tabulated in Appendix A (Tables A.1 through A.10). The tables include the individual values, along with the average, standard deviation, and coefficient of variation for specimens of each type at five week intervals. The average values are used to calculate $P_{wd}$. The consistency of the procedure is supported by the low coefficients of variation, which are generally at or below 4% except for specimens undergoing significant damage. The latter specimens exhibit coefficients of variation between 7.5 and 10% for values of $P_{wd}$ below 0.9. The average relative dynamic moduli of elasticity (wet-dry) are presented in Fig. 1 and 2, which show the values of $P_{wd}$ for specimens exposed to 6.04 and 1.06 molal ion concentration deicer solutions, respectively. The figures also include the results for specimens subjected to wet/dry temperature cycles in distilled water and temperature cycles in air.

Control Specimens

The specimens subjected to wet/dry cycles with distilled water exhibited an increase in the $P_{wd}$ from 1.0 at the beginning of the test to approximately 1.1 at week 5, increased to 1.2 at week 35, and then remained approximately constant through week 95. The increase in the dynamic modulus of elasticity may be attributed in part to an increase in the degree of hydration but most likely resulted from the absorption of water. The specimens subjected to the temperature variations, but otherwise stored in air, exhibited a small but consistent drop in the dynamic modulus of elasticity throughout the test due to the loss in water (with accompanying microcracking), reaching a $P_{wd}$ of 0.95 at 95 weeks.
Fig. 1 Relative dynamic modulus of elasticity (wet-dry) $P_{w/d}$ versus number of weekly wet-dry cycles for specimens exposed to 6.04 molal ion concentration deicer solutions.

Fig. 2 Relative dynamic modulus of elasticity (wet-dry) $P_{w/d}$ versus number of weekly wet-dry cycles for specimens exposed to 1.06 molal ion concentration deicer solutions.
**High Concentration of Deicers**

As shown in Fig. 1, the specimens exposed to the high concentrations of calcium chloride (CaCl$_2$) and magnesium chloride (MgCl$_2$) deteriorated rapidly, with the $P_{wd}$ dropping below 0.9 by week 10. The specimens exposed to calcium magnesium acetate (CMA) deteriorated more slowly, with the $P_{wd}$ dropping below 0.9 by week 55; in this case, the wet/dry cycles were continued for another five weeks. The concrete subjected to the high concentration NaCl solution exhibited a rise in the $P_{wd}$ through week 30, to 1.14, likely due to the absorption of water and perhaps the formation of salt crystals, which filled some of the pore space within the cement paste, followed by a gradual drop to a value of 1.04 at week 95, indicating damage, also likely due to salt crystal formation (see Visual Evaluation).

**Low Concentration of Deicers**

As shown in Fig. 2, the use of lower concentrations of deicers reduced the negative effects of all four deicers compared to that obtained at the high concentration, in some cases significantly. During the early weeks of the tests, all specimens submerged in the lower concentration deicer solutions exhibited an increase $P_{wd}$, as described for the specimens exposed to distilled water. The specimens exposed to CaCl$_2$ and NaCl exhibited the greatest increase, with peak values of $P_{wd}$ of 1.11. After week 45, $P_{wd}$ for these specimens began to drop very slowly, indicating some damage, reaching a value of 1.07 at week 95. $P_{wd}$ of 1.07 is higher than that observed for the higher concentration solutions (0.86 at week 10 for CaCl$_2$ and 1.04 at week 95 for NaCl). The peak value of $P_{wd}$ for the high concentration NaCl specimens (1.14) was slightly higher than the value observed at the lower concentration (1.11). The difference may be due to the effects of increased crystallization within the pores for the specimens exposed to the higher concentration solution.
$P_{w/d}$ for specimens exposed to CMA and MgCl$_2$ reached values as high as 1.07 and 1.09, respectively, remaining nearly constant through week 45 and then dropping thereafter. $P_{w/d}$ for the CMA specimens dropped below 1.0 at week 50, reaching a value of 0.91 at week 95. The MgCl$_2$ specimens, which initially exhibited a slightly higher value of $P_{w/d}$ than the CMA specimens and maintained $P_{w/d}$ above 1.0 until week 55, exhibited a more rapid drop in dynamic modulus after week 70, reaching a value of $P_{w/d}$ below 0.9 by week 80.

**Visual Evaluation**

The specimens were evaluated for physical damage and photographs were taken at the conclusion of the tests. The appearance of the specimens is largely in agreement with the performance represented in Fig. 1 and 2.

Specimens subjected to temperature cycles in air (not shown) and wet-dry cycles in distilled water or in 1.06 molal ion concentration NaCl and CaCl$_2$ solutions (Fig. 3, 4 and 5, respectively) show few signs of damage. The only apparent change is a slight discoloration of the CaCl$_2$ specimens (Fig. 5). In contrast to the NaCl and CaCl$_2$ specimens, the specimens subjected to MgCl$_2$ and CMA exhibit signs of damage, as shown in Fig. 6 and 7, respectively. The MgCl$_2$ specimens (Fig. 6) were subjected to wet-dry cycles for 80 weeks, after which the test was terminated because the modulus of elasticity had dropped below 90% of its initial value. The CMA specimen (Fig. 7) completed 95 weeks of wet-dry cycling.

All of the specimens subjected to the 6.04 molal ion concentration solutions exhibited damage at the conclusion of the test. Of these specimens, only the specimens in the NaCl solution lasted for the full 95 weeks. As shown in Fig. 8, the NaCl specimens exhibited some surface scaling, likely the result of crystal growth in the concrete pores. The specimens subjected to 6.04 molal ion concentration CaCl$_2$ and MgCl$_2$ solutions (Fig. 9 and 10) exhibited the greatest
Fig. 3 Specimen subjected to 95 weeks of exposure to distilled water

Fig. 4 Specimen subjected to 95 weeks of exposure to a 1.06 molal ion concentration solution of NaCl

Fig. 5 Specimen subjected to 95 weeks of exposure to a 1.06 molal ion concentration solution of CaCl₂
Fig. 6 Specimen subjected to 80 weeks of exposure to a 1.06 molal ion concentration solution of MgCl$_2$

Fig. 7 Specimen subjected to 95 weeks of exposure to a 1.06 molal ion concentration solution of CMA

Fig. 8 Specimen subjected to 95 weeks of exposure to a 6.04 molal ion concentration solution of NaCl
Fig. 9 Specimen subjected to 10 weeks of exposure to a 6.04 molal ion concentration solution of \textit{CaCl}_2

Fig. 10 Specimen subjected to 10 weeks of exposure to a 6.04 molal ion concentration solution of \textit{MgCl}_2

Fig. 11 Specimen subjected to 60 weeks of exposure to a 6.04 molal ion concentration solution of \textit{CMA}
degree of damage, with a loss of material from the ends and edges of the specimens, as well as some delamination. As suggested in earlier studies (Cody et al. 1996, Taylor 1997, Lee et al. 2000, Sutter et al. 2006), the damage to the CaCl₂ and MgCl₂ specimens appears to be the result of both physical damage due to crystal formation in the concrete pores and chemical changes in the cement paste. The CaCl₂ and MgCl₂ specimens also exhibited the greatest reduction in modulus of elasticity, with the tests terminating at 10 weeks, as shown in Fig. 1. The specimens subjected to the 6.04 molal ion concentration CMA solution (Fig. 11) exhibited a nearly uniform loss of material on all exposed surfaces – a change that appears to result primarily from chemical changes in the cement paste (Lee et al. 2000). The relative dynamic modulus of these specimens dropped below 1.0 at week 55 (Fig. 1).

Overall, the results of this study, as represented by the measured changes in modulus of elasticity and observable damage to the test specimens, indicate that calcium chloride, magnesium chloride, and calcium magnesium acetate have a negative impact on the long-term durability of concrete. As shown in Fig. 2, 7, and 8, the effects of magnesium chloride and CMA should become apparent at an earlier age than the effects of calcium chloride (Fig. 6). In the longer-term, all three deicers will significantly weaken concrete (Fig. 1, 9-11). Sodium chloride, the most widely used deicer in U.S. practice, has a more benign impact in both the short and long term.

**SUMMARY AND CONCLUSIONS**

Concrete specimens were exposed to weekly Southern Exposure-type cycles of wetting and drying in distilled water and in solutions of sodium chloride, calcium chloride, magnesium chloride, and calcium magnesium acetate with either a 6.04 molal ion concentration, equivalent
in ion concentration to a 15% solution of NaCl, or a 1.06 molal ion concentration, equivalent in ion concentration to a 3% solution of NaCl, for periods of up to 95 weeks. Specimens were also exposed to air only. The effects of exposure were evaluated based on changes in the dynamic modulus of elasticity and the physical appearance of the specimens at the conclusion of the tests.

The following conclusions are based on the tests and analyses presented in this report.

1. Concretes exposed to distilled water and air show, respectively, an increase and a decrease in dynamic modulus of elasticity, due principally to changes in moisture content. Overall, no negative impact on concrete properties is observed.

2. At lower concentrations, sodium chloride and calcium chloride have a relatively small negative impact on the properties of concrete. At high concentrations, sodium chloride has a greater but still relatively small negative effect. Damage appears to be primarily due to the effects of crystal growth within concrete pores.

3. At low concentrations, magnesium chloride and calcium magnesium acetate can cause measurable damage to concrete.

4. At high concentrations, calcium chloride, magnesium chloride, and calcium magnesium acetate cause significant changes in concrete that result in loss of material and a reduction in stiffness and strength. The damage caused by calcium chloride and magnesium chloride appears to be the result of both physical damage, due to crystal formation in the concrete pores, and chemical changes in the cement paste. The damage caused by calcium magnesium acetate appears to be primarily caused by chemical changes in the cement paste.

5. The application of significant quantities of calcium chloride, magnesium chloride, and calcium magnesium acetate over the life of a structure or pavement will negatively impact the long-term durability of concrete.
ACKNOWLEDGMENTS

The research described in this report was supported by the Structural Engineering and Materials Laboratory of the University of Kansas.

REFERENCES


### Appendix A

Table A.1 Moduli of elasticity of specimens in air (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4352</td>
<td>4410</td>
<td>4263</td>
<td>4241</td>
<td>4184</td>
<td>4034</td>
<td>4247</td>
<td>132</td>
<td>0.031</td>
</tr>
<tr>
<td>5</td>
<td>4264</td>
<td>4325</td>
<td>4213</td>
<td>4089</td>
<td>4164</td>
<td>3985</td>
<td>4173</td>
<td>123</td>
<td>0.029</td>
</tr>
<tr>
<td>10</td>
<td>4224</td>
<td>4275</td>
<td>4133</td>
<td>3985</td>
<td>4168</td>
<td>4005</td>
<td>4132</td>
<td>116</td>
<td>0.028</td>
</tr>
<tr>
<td>15</td>
<td>4244</td>
<td>4292</td>
<td>4140</td>
<td>4011</td>
<td>4168</td>
<td>4008</td>
<td>4144</td>
<td>117</td>
<td>0.028</td>
</tr>
<tr>
<td>20</td>
<td>4247</td>
<td>4332</td>
<td>4153</td>
<td>4027</td>
<td>4076</td>
<td>4024</td>
<td>4143</td>
<td>125</td>
<td>0.030</td>
</tr>
<tr>
<td>25</td>
<td>4278</td>
<td>4215</td>
<td>4179</td>
<td>4060</td>
<td>4174</td>
<td>3982</td>
<td>4148</td>
<td>108</td>
<td>0.026</td>
</tr>
<tr>
<td>30</td>
<td>4278</td>
<td>4359</td>
<td>4193</td>
<td>4070</td>
<td>4148</td>
<td>3988</td>
<td>4173</td>
<td>135</td>
<td>0.032</td>
</tr>
<tr>
<td>35</td>
<td>4247</td>
<td>4312</td>
<td>4163</td>
<td>4011</td>
<td>4083</td>
<td>3879</td>
<td>4116</td>
<td>159</td>
<td>0.039</td>
</tr>
<tr>
<td>40</td>
<td>4237</td>
<td>4302</td>
<td>4153</td>
<td>4005</td>
<td>3980</td>
<td>3879</td>
<td>4093</td>
<td>164</td>
<td>0.040</td>
</tr>
<tr>
<td>45</td>
<td>4227</td>
<td>4305</td>
<td>4163</td>
<td>3995</td>
<td>4106</td>
<td>3870</td>
<td>4111</td>
<td>159</td>
<td>0.039</td>
</tr>
<tr>
<td>50</td>
<td>4261</td>
<td>4302</td>
<td>4163</td>
<td>3988</td>
<td>4089</td>
<td>3828</td>
<td>4105</td>
<td>177</td>
<td>0.043</td>
</tr>
<tr>
<td>55</td>
<td>4224</td>
<td>4298</td>
<td>4048</td>
<td>3963</td>
<td>4102</td>
<td>3828</td>
<td>4077</td>
<td>171</td>
<td>0.042</td>
</tr>
<tr>
<td>60</td>
<td>4214</td>
<td>4218</td>
<td>4156</td>
<td>3979</td>
<td>4067</td>
<td>3854</td>
<td>4081</td>
<td>144</td>
<td>0.035</td>
</tr>
<tr>
<td>65</td>
<td>4224</td>
<td>4191</td>
<td>4068</td>
<td>3988</td>
<td>4089</td>
<td>3841</td>
<td>4067</td>
<td>140</td>
<td>0.034</td>
</tr>
<tr>
<td>70</td>
<td>4183</td>
<td>4185</td>
<td>4064</td>
<td>3950</td>
<td>4096</td>
<td>3835</td>
<td>4052</td>
<td>138</td>
<td>0.034</td>
</tr>
<tr>
<td>75</td>
<td>4120</td>
<td>4178</td>
<td>4038</td>
<td>3930</td>
<td>4083</td>
<td>3841</td>
<td>4032</td>
<td>125</td>
<td>0.031</td>
</tr>
<tr>
<td>80</td>
<td>4110</td>
<td>4151</td>
<td>4015</td>
<td>3898</td>
<td>4106</td>
<td>3844</td>
<td>4021</td>
<td>125</td>
<td>0.031</td>
</tr>
<tr>
<td>85</td>
<td>4130</td>
<td>4205</td>
<td>4032</td>
<td>3905</td>
<td>4109</td>
<td>3819</td>
<td>4033</td>
<td>146</td>
<td>0.036</td>
</tr>
<tr>
<td>90</td>
<td>4150</td>
<td>4235</td>
<td>4035</td>
<td>3918</td>
<td>4112</td>
<td>3835</td>
<td>4047</td>
<td>150</td>
<td>0.037</td>
</tr>
<tr>
<td>95</td>
<td>4150</td>
<td>4086</td>
<td>4084</td>
<td>3921</td>
<td>4132</td>
<td>3825</td>
<td>4033</td>
<td>130</td>
<td>0.032</td>
</tr>
</tbody>
</table>

Table A.2 Moduli of elasticity of specimens in distilled water (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4388</td>
<td>4522</td>
<td>4624</td>
<td>4661</td>
<td>4808</td>
<td>4661</td>
<td>4549</td>
<td>142</td>
<td>0.031</td>
</tr>
<tr>
<td>5</td>
<td>5230</td>
<td>4988</td>
<td>4987</td>
<td>4974</td>
<td>5170</td>
<td>5112</td>
<td>5045</td>
<td>109</td>
<td>0.022</td>
</tr>
<tr>
<td>10</td>
<td>5332</td>
<td>5088</td>
<td>5174</td>
<td>5184</td>
<td>5378</td>
<td>5341</td>
<td>5194</td>
<td>116</td>
<td>0.022</td>
</tr>
<tr>
<td>15</td>
<td>5511</td>
<td>5294</td>
<td>5305</td>
<td>5316</td>
<td>5491</td>
<td>5469</td>
<td>5357</td>
<td>103</td>
<td>0.019</td>
</tr>
<tr>
<td>20</td>
<td>5480</td>
<td>5279</td>
<td>5309</td>
<td>5361</td>
<td>5541</td>
<td>5507</td>
<td>5357</td>
<td>111</td>
<td>0.021</td>
</tr>
<tr>
<td>25</td>
<td>5620</td>
<td>5389</td>
<td>5272</td>
<td>5313</td>
<td>5507</td>
<td>5454</td>
<td>5398</td>
<td>129</td>
<td>0.024</td>
</tr>
<tr>
<td>30</td>
<td>5608</td>
<td>5366</td>
<td>5420</td>
<td>5413</td>
<td>5591</td>
<td>5568</td>
<td>5452</td>
<td>106</td>
<td>0.019</td>
</tr>
<tr>
<td>35</td>
<td>5550</td>
<td>5324</td>
<td>5272</td>
<td>5305</td>
<td>5514</td>
<td>5575</td>
<td>5363</td>
<td>137</td>
<td>0.026</td>
</tr>
<tr>
<td>40</td>
<td>5596</td>
<td>5362</td>
<td>5379</td>
<td>5387</td>
<td>5575</td>
<td>5641</td>
<td>5431</td>
<td>127</td>
<td>0.023</td>
</tr>
<tr>
<td>45</td>
<td>5635</td>
<td>5412</td>
<td>5349</td>
<td>5335</td>
<td>5518</td>
<td>5587</td>
<td>5433</td>
<td>126</td>
<td>0.023</td>
</tr>
<tr>
<td>50</td>
<td>5523</td>
<td>5313</td>
<td>5272</td>
<td>5228</td>
<td>5453</td>
<td>5469</td>
<td>5334</td>
<td>121</td>
<td>0.023</td>
</tr>
<tr>
<td>55</td>
<td>5461</td>
<td>5267</td>
<td>5272</td>
<td>5309</td>
<td>5484</td>
<td>5394</td>
<td>5327</td>
<td>95</td>
<td>0.018</td>
</tr>
<tr>
<td>60</td>
<td>5519</td>
<td>5275</td>
<td>5287</td>
<td>5265</td>
<td>5438</td>
<td>5511</td>
<td>5336</td>
<td>121</td>
<td>0.023</td>
</tr>
<tr>
<td>65</td>
<td>5519</td>
<td>5267</td>
<td>5305</td>
<td>5287</td>
<td>5476</td>
<td>5477</td>
<td>5345</td>
<td>113</td>
<td>0.021</td>
</tr>
<tr>
<td>70</td>
<td>5542</td>
<td>5309</td>
<td>5346</td>
<td>5316</td>
<td>5545</td>
<td>--</td>
<td>5378</td>
<td>121</td>
<td>0.023</td>
</tr>
<tr>
<td>75</td>
<td>5573</td>
<td>5374</td>
<td>5320</td>
<td>5335</td>
<td>5552</td>
<td>--</td>
<td>5400</td>
<td>122</td>
<td>0.023</td>
</tr>
<tr>
<td>80</td>
<td>5592</td>
<td>5381</td>
<td>5320</td>
<td>5379</td>
<td>5571</td>
<td>--</td>
<td>5418</td>
<td>124</td>
<td>0.023</td>
</tr>
<tr>
<td>85</td>
<td>5631</td>
<td>5431</td>
<td>5364</td>
<td>5335</td>
<td>5571</td>
<td>--</td>
<td>5440</td>
<td>130</td>
<td>0.024</td>
</tr>
<tr>
<td>90</td>
<td>5620</td>
<td>5378</td>
<td>5309</td>
<td>5383</td>
<td>5587</td>
<td>--</td>
<td>5422</td>
<td>139</td>
<td>0.026</td>
</tr>
<tr>
<td>95</td>
<td>5616</td>
<td>5416</td>
<td>5316</td>
<td>5350</td>
<td>5575</td>
<td>--</td>
<td>5424</td>
<td>134</td>
<td>0.025</td>
</tr>
</tbody>
</table>
Table A.3 Moduli of elasticity of specimens in 6.04 molal ion concentration solution of NaCl (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4500</td>
<td>4785</td>
<td>4834</td>
<td>4956</td>
<td>5018</td>
<td>5107</td>
<td>4867</td>
<td>215</td>
<td>0.044</td>
</tr>
<tr>
<td>5</td>
<td>4985</td>
<td>5165</td>
<td>5347</td>
<td>5476</td>
<td>5413</td>
<td>5510</td>
<td>5197</td>
<td>284</td>
<td>0.055</td>
</tr>
<tr>
<td>10</td>
<td>4949</td>
<td>5286</td>
<td>5382</td>
<td>5409</td>
<td>5491</td>
<td>5565</td>
<td>5347</td>
<td>217</td>
<td>0.041</td>
</tr>
<tr>
<td>15</td>
<td>4996</td>
<td>5297</td>
<td>5428</td>
<td>5594</td>
<td>5561</td>
<td>5668</td>
<td>5424</td>
<td>247</td>
<td>0.046</td>
</tr>
<tr>
<td>20</td>
<td>5256</td>
<td>5366</td>
<td>5466</td>
<td>5455</td>
<td>5620</td>
<td>5719</td>
<td>5481</td>
<td>168</td>
<td>0.031</td>
</tr>
<tr>
<td>25</td>
<td>5155</td>
<td>5481</td>
<td>5416</td>
<td>5618</td>
<td>5609</td>
<td>5731</td>
<td>5502</td>
<td>203</td>
<td>0.037</td>
</tr>
<tr>
<td>30</td>
<td>5298</td>
<td>5532</td>
<td>5458</td>
<td>5629</td>
<td>5551</td>
<td>5679</td>
<td>5526</td>
<td>136</td>
<td>0.025</td>
</tr>
<tr>
<td>35</td>
<td>5137</td>
<td>5439</td>
<td>5366</td>
<td>5579</td>
<td>5506</td>
<td>5644</td>
<td>5445</td>
<td>180</td>
<td>0.033</td>
</tr>
<tr>
<td>40</td>
<td>5200</td>
<td>5316</td>
<td>5374</td>
<td>5594</td>
<td>5565</td>
<td>5656</td>
<td>5451</td>
<td>180</td>
<td>0.033</td>
</tr>
<tr>
<td>45</td>
<td>5207</td>
<td>5420</td>
<td>5393</td>
<td>5375</td>
<td>5546</td>
<td>5675</td>
<td>5436</td>
<td>160</td>
<td>0.029</td>
</tr>
<tr>
<td>50</td>
<td>5237</td>
<td>5435</td>
<td>5305</td>
<td>5303</td>
<td>5522</td>
<td>5636</td>
<td>5406</td>
<td>153</td>
<td>0.028</td>
</tr>
<tr>
<td>55</td>
<td>5174</td>
<td>5309</td>
<td>5252</td>
<td>5269</td>
<td>5609</td>
<td>5612</td>
<td>5371</td>
<td>191</td>
<td>0.036</td>
</tr>
<tr>
<td>60</td>
<td>5185</td>
<td>5082</td>
<td>4998</td>
<td>5130</td>
<td>5514</td>
<td>5628</td>
<td>5256</td>
<td>254</td>
<td>0.048</td>
</tr>
<tr>
<td>65</td>
<td>5207</td>
<td>5071</td>
<td>5046</td>
<td>5104</td>
<td>5483</td>
<td>5483</td>
<td>5232</td>
<td>202</td>
<td>0.039</td>
</tr>
<tr>
<td>70</td>
<td>5230</td>
<td>5176</td>
<td>4958</td>
<td>5096</td>
<td>5429</td>
<td>5549</td>
<td>5240</td>
<td>217</td>
<td>0.041</td>
</tr>
<tr>
<td>75</td>
<td>5207</td>
<td>5172</td>
<td>4991</td>
<td>5074</td>
<td>5371</td>
<td>5510</td>
<td>5221</td>
<td>191</td>
<td>0.037</td>
</tr>
<tr>
<td>80</td>
<td>5193</td>
<td>5184</td>
<td>5039</td>
<td>5063</td>
<td>5351</td>
<td>5518</td>
<td>5225</td>
<td>182</td>
<td>0.035</td>
</tr>
<tr>
<td>85</td>
<td>5126</td>
<td>5124</td>
<td>5039</td>
<td>4760</td>
<td>5440</td>
<td>5420</td>
<td>5152</td>
<td>254</td>
<td>0.049</td>
</tr>
<tr>
<td>90</td>
<td>4862</td>
<td>5150</td>
<td>5057</td>
<td>4760</td>
<td>5405</td>
<td>5190</td>
<td>5071</td>
<td>233</td>
<td>0.046</td>
</tr>
<tr>
<td>95</td>
<td>4902</td>
<td>4967</td>
<td>5046</td>
<td>4804</td>
<td>5386</td>
<td>5137</td>
<td>5040</td>
<td>205</td>
<td>0.041</td>
</tr>
</tbody>
</table>

Table A.4 Moduli of elasticity of specimens in 1.06 molal ion concentration solution of NaCl (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4922</td>
<td>5069</td>
<td>4954</td>
<td>5059</td>
<td>5060</td>
<td>4968</td>
<td>5005</td>
<td>65</td>
<td>0.013</td>
</tr>
<tr>
<td>5</td>
<td>5036</td>
<td>5242</td>
<td>5183</td>
<td>5288</td>
<td>5176</td>
<td>5034</td>
<td>5160</td>
<td>105</td>
<td>0.020</td>
</tr>
<tr>
<td>10</td>
<td>5352</td>
<td>5460</td>
<td>5288</td>
<td>5480</td>
<td>5485</td>
<td>5327</td>
<td>5399</td>
<td>87</td>
<td>0.016</td>
</tr>
<tr>
<td>15</td>
<td>5321</td>
<td>5506</td>
<td>5307</td>
<td>5404</td>
<td>5465</td>
<td>5331</td>
<td>5389</td>
<td>83</td>
<td>0.015</td>
</tr>
<tr>
<td>20</td>
<td>5452</td>
<td>5608</td>
<td>5363</td>
<td>5461</td>
<td>5582</td>
<td>5449</td>
<td>5486</td>
<td>92</td>
<td>0.017</td>
</tr>
<tr>
<td>25</td>
<td>5580</td>
<td>5639</td>
<td>5318</td>
<td>5420</td>
<td>5625</td>
<td>5495</td>
<td>5513</td>
<td>126</td>
<td>0.023</td>
</tr>
<tr>
<td>30</td>
<td>5541</td>
<td>5663</td>
<td>5424</td>
<td>5495</td>
<td>5621</td>
<td>5522</td>
<td>5544</td>
<td>86</td>
<td>0.016</td>
</tr>
<tr>
<td>35</td>
<td>5421</td>
<td>5479</td>
<td>5447</td>
<td>5537</td>
<td>5601</td>
<td>5411</td>
<td>5483</td>
<td>74</td>
<td>0.013</td>
</tr>
<tr>
<td>40</td>
<td>5490</td>
<td>5584</td>
<td>5428</td>
<td>5530</td>
<td>5691</td>
<td>5511</td>
<td>5539</td>
<td>90</td>
<td>0.016</td>
</tr>
<tr>
<td>45</td>
<td>5556</td>
<td>5468</td>
<td>5417</td>
<td>5618</td>
<td>5465</td>
<td>5550</td>
<td>5512</td>
<td>75</td>
<td>0.014</td>
</tr>
<tr>
<td>50</td>
<td>5133</td>
<td>5322</td>
<td>5183</td>
<td>5307</td>
<td>5446</td>
<td>5323</td>
<td>5286</td>
<td>112</td>
<td>0.021</td>
</tr>
<tr>
<td>55</td>
<td>5306</td>
<td>5368</td>
<td>5217</td>
<td>5488</td>
<td>5434</td>
<td>5476</td>
<td>5381</td>
<td>106</td>
<td>0.020</td>
</tr>
<tr>
<td>60</td>
<td>5452</td>
<td>5429</td>
<td>5205</td>
<td>5518</td>
<td>5519</td>
<td>5395</td>
<td>5420</td>
<td>116</td>
<td>0.021</td>
</tr>
<tr>
<td>65</td>
<td>5291</td>
<td>5487</td>
<td>5217</td>
<td>5473</td>
<td>5543</td>
<td>5411</td>
<td>5403</td>
<td>126</td>
<td>0.023</td>
</tr>
<tr>
<td>70</td>
<td>5268</td>
<td>5510</td>
<td>5213</td>
<td>5348</td>
<td>5574</td>
<td>5426</td>
<td>5390</td>
<td>140</td>
<td>0.026</td>
</tr>
<tr>
<td>75</td>
<td>5363</td>
<td>5503</td>
<td>5299</td>
<td>5450</td>
<td>5512</td>
<td>5395</td>
<td>5420</td>
<td>83</td>
<td>0.015</td>
</tr>
<tr>
<td>80</td>
<td>5386</td>
<td>5518</td>
<td>5288</td>
<td>5469</td>
<td>5547</td>
<td>5380</td>
<td>5431</td>
<td>97</td>
<td>0.018</td>
</tr>
<tr>
<td>85</td>
<td>5379</td>
<td>5506</td>
<td>5262</td>
<td>5473</td>
<td>5539</td>
<td>5426</td>
<td>5431</td>
<td>101</td>
<td>0.019</td>
</tr>
<tr>
<td>90</td>
<td>5498</td>
<td>5545</td>
<td>5390</td>
<td>5465</td>
<td>5489</td>
<td>5415</td>
<td>5467</td>
<td>57</td>
<td>0.010</td>
</tr>
<tr>
<td>95</td>
<td>5463</td>
<td>5549</td>
<td>5394</td>
<td>5281</td>
<td>5206</td>
<td>5323</td>
<td>5369</td>
<td>125</td>
<td>0.023</td>
</tr>
</tbody>
</table>
Table A.5 Moduli of elasticity of specimens in 6.04 molal ion concentration solution of CaCl₂ (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4704</td>
<td>4637</td>
<td>5235</td>
<td>4725</td>
<td>5093</td>
<td>5119</td>
<td>4879</td>
<td>258</td>
<td>0.053</td>
</tr>
<tr>
<td>5</td>
<td>4181</td>
<td>4361</td>
<td>4677</td>
<td>4387</td>
<td>4663</td>
<td>4488</td>
<td>4454</td>
<td>191</td>
<td>0.043</td>
</tr>
<tr>
<td>10</td>
<td>3536</td>
<td>4222</td>
<td>4475</td>
<td>4270</td>
<td>4398</td>
<td>4470</td>
<td>4180</td>
<td>355</td>
<td>0.085</td>
</tr>
</tbody>
</table>

Table A.6 Moduli of elasticity of specimens in 1.06 molal ion concentration solution of CaCl₂ (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5069</td>
<td>5075</td>
<td>5175</td>
<td>5221</td>
<td>4956</td>
<td>4939</td>
<td>5072</td>
<td>113</td>
<td>0.022</td>
</tr>
<tr>
<td>5</td>
<td>5285</td>
<td>5268</td>
<td>5456</td>
<td>5523</td>
<td>5244</td>
<td>5231</td>
<td>5334</td>
<td>123</td>
<td>0.023</td>
</tr>
<tr>
<td>10</td>
<td>5564</td>
<td>5514</td>
<td>5598</td>
<td>5639</td>
<td>5536</td>
<td>5466</td>
<td>5553</td>
<td>62</td>
<td>0.011</td>
</tr>
<tr>
<td>15</td>
<td>5598</td>
<td>5465</td>
<td>5661</td>
<td>5702</td>
<td>5548</td>
<td>5435</td>
<td>5568</td>
<td>106</td>
<td>0.019</td>
</tr>
<tr>
<td>20</td>
<td>5645</td>
<td>5530</td>
<td>5681</td>
<td>5722</td>
<td>5638</td>
<td>5566</td>
<td>5630</td>
<td>71</td>
<td>0.013</td>
</tr>
<tr>
<td>25</td>
<td>5653</td>
<td>5645</td>
<td>5645</td>
<td>5624</td>
<td>5642</td>
<td>5581</td>
<td>5632</td>
<td>27</td>
<td>0.005</td>
</tr>
<tr>
<td>30</td>
<td>5641</td>
<td>5634</td>
<td>5729</td>
<td>5777</td>
<td>5646</td>
<td>5577</td>
<td>5667</td>
<td>72</td>
<td>0.013</td>
</tr>
<tr>
<td>35</td>
<td>5521</td>
<td>5503</td>
<td>5621</td>
<td>5749</td>
<td>5486</td>
<td>5378</td>
<td>5543</td>
<td>128</td>
<td>0.023</td>
</tr>
<tr>
<td>40</td>
<td>5537</td>
<td>5584</td>
<td>5701</td>
<td>5714</td>
<td>5689</td>
<td>5577</td>
<td>5634</td>
<td>76</td>
<td>0.014</td>
</tr>
<tr>
<td>45</td>
<td>5676</td>
<td>5649</td>
<td>5729</td>
<td>5726</td>
<td>5618</td>
<td>5462</td>
<td>5643</td>
<td>99</td>
<td>0.018</td>
</tr>
<tr>
<td>50</td>
<td>5483</td>
<td>5468</td>
<td>5653</td>
<td>5616</td>
<td>5332</td>
<td>5401</td>
<td>5492</td>
<td>123</td>
<td>0.022</td>
</tr>
<tr>
<td>55</td>
<td>5606</td>
<td>5488</td>
<td>5629</td>
<td>5639</td>
<td>5455</td>
<td>5439</td>
<td>5543</td>
<td>92</td>
<td>0.017</td>
</tr>
<tr>
<td>60</td>
<td>5802</td>
<td>5434</td>
<td>5598</td>
<td>5608</td>
<td>5439</td>
<td>5355</td>
<td>5539</td>
<td>162</td>
<td>0.029</td>
</tr>
<tr>
<td>65</td>
<td>5456</td>
<td>5396</td>
<td>5598</td>
<td>5632</td>
<td>5424</td>
<td>5370</td>
<td>5479</td>
<td>109</td>
<td>0.020</td>
</tr>
<tr>
<td>70</td>
<td>5483</td>
<td>5446</td>
<td>5605</td>
<td>5624</td>
<td>5431</td>
<td>5389</td>
<td>5496</td>
<td>97</td>
<td>0.018</td>
</tr>
<tr>
<td>75</td>
<td>5460</td>
<td>5449</td>
<td>5590</td>
<td>5608</td>
<td>5466</td>
<td>5386</td>
<td>5493</td>
<td>87</td>
<td>0.016</td>
</tr>
<tr>
<td>80</td>
<td>5471</td>
<td>5465</td>
<td>5609</td>
<td>5639</td>
<td>5486</td>
<td>5427</td>
<td>5516</td>
<td>86</td>
<td>0.016</td>
</tr>
<tr>
<td>85</td>
<td>5448</td>
<td>5392</td>
<td>5590</td>
<td>5620</td>
<td>5420</td>
<td>5382</td>
<td>5475</td>
<td>103</td>
<td>0.019</td>
</tr>
<tr>
<td>90</td>
<td>5448</td>
<td>5453</td>
<td>5574</td>
<td>5604</td>
<td>5416</td>
<td>5355</td>
<td>5475</td>
<td>95</td>
<td>0.017</td>
</tr>
<tr>
<td>95</td>
<td>5441</td>
<td>5423</td>
<td>5574</td>
<td>5600</td>
<td>5397</td>
<td>5276</td>
<td>5452</td>
<td>120</td>
<td>0.022</td>
</tr>
<tr>
<td>TIME (weeks)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>Average</td>
<td>Std Dev</td>
<td>COV</td>
</tr>
<tr>
<td>-------------</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>---------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>0</td>
<td>5080</td>
<td>4606</td>
<td>5177</td>
<td>4932</td>
<td>5098</td>
<td>5086</td>
<td>4978</td>
<td>207</td>
<td>0.042</td>
</tr>
<tr>
<td>5</td>
<td>4450</td>
<td>4464</td>
<td>4780</td>
<td>4714</td>
<td>4618</td>
<td>4520</td>
<td>4605</td>
<td>136</td>
<td>0.030</td>
</tr>
<tr>
<td>10</td>
<td>4092</td>
<td>4283</td>
<td>4504</td>
<td>4384</td>
<td>3691</td>
<td>3667</td>
<td>4191</td>
<td>356</td>
<td>0.085</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4964</td>
<td>5123</td>
<td>5089</td>
<td>5019</td>
<td>5091</td>
<td>5012</td>
<td>5050</td>
<td>61</td>
<td>0.012</td>
</tr>
<tr>
<td>5</td>
<td>5248</td>
<td>5334</td>
<td>5429</td>
<td>5429</td>
<td>5199</td>
<td>5295</td>
<td>5322</td>
<td>94</td>
<td>0.018</td>
</tr>
<tr>
<td>10</td>
<td>5497</td>
<td>5568</td>
<td>5448</td>
<td>5352</td>
<td>5568</td>
<td>5485</td>
<td>5486</td>
<td>81</td>
<td>0.015</td>
</tr>
<tr>
<td>15</td>
<td>5420</td>
<td>5414</td>
<td>5452</td>
<td>5413</td>
<td>5452</td>
<td>5403</td>
<td>5426</td>
<td>21</td>
<td>0.004</td>
</tr>
<tr>
<td>20</td>
<td>5470</td>
<td>5595</td>
<td>5409</td>
<td>5410</td>
<td>5491</td>
<td>5438</td>
<td>5469</td>
<td>70</td>
<td>0.013</td>
</tr>
<tr>
<td>25</td>
<td>5316</td>
<td>5448</td>
<td>5248</td>
<td>5220</td>
<td>5533</td>
<td>5477</td>
<td>5374</td>
<td>130</td>
<td>0.024</td>
</tr>
<tr>
<td>30</td>
<td>5412</td>
<td>5502</td>
<td>5479</td>
<td>5444</td>
<td>5552</td>
<td>5532</td>
<td>5487</td>
<td>53</td>
<td>0.010</td>
</tr>
<tr>
<td>35</td>
<td>5259</td>
<td>5311</td>
<td>5267</td>
<td>5292</td>
<td>5537</td>
<td>5462</td>
<td>5355</td>
<td>116</td>
<td>0.022</td>
</tr>
<tr>
<td>40</td>
<td>5290</td>
<td>5368</td>
<td>5375</td>
<td>5254</td>
<td>5319</td>
<td>5485</td>
<td>5348</td>
<td>81</td>
<td>0.015</td>
</tr>
<tr>
<td>45</td>
<td>5389</td>
<td>5525</td>
<td>5348</td>
<td>5421</td>
<td>5338</td>
<td>5485</td>
<td>5418</td>
<td>75</td>
<td>0.014</td>
</tr>
<tr>
<td>50</td>
<td>4814</td>
<td>4916</td>
<td>5153</td>
<td>5123</td>
<td>5162</td>
<td>5181</td>
<td>5058</td>
<td>154</td>
<td>0.031</td>
</tr>
<tr>
<td>55</td>
<td>4890</td>
<td>4960</td>
<td>4988</td>
<td>5205</td>
<td>5069</td>
<td>5155</td>
<td>5045</td>
<td>121</td>
<td>0.024</td>
</tr>
<tr>
<td>60</td>
<td>4861</td>
<td>5019</td>
<td>4786</td>
<td>4837</td>
<td>4857</td>
<td>4971</td>
<td>4889</td>
<td>88</td>
<td>0.018</td>
</tr>
<tr>
<td>65</td>
<td>4626</td>
<td>4986</td>
<td>4692</td>
<td>4848</td>
<td>4836</td>
<td>5027</td>
<td>4836</td>
<td>157</td>
<td>0.033</td>
</tr>
<tr>
<td>70</td>
<td>4450</td>
<td>4909</td>
<td>4570</td>
<td>4891</td>
<td>4803</td>
<td>5087</td>
<td>4785</td>
<td>235</td>
<td>0.049</td>
</tr>
<tr>
<td>75</td>
<td>4294</td>
<td>4880</td>
<td>4059</td>
<td>4740</td>
<td>4626</td>
<td>4867</td>
<td>4578</td>
<td>333</td>
<td>0.073</td>
</tr>
<tr>
<td>80</td>
<td>4243</td>
<td>4865</td>
<td>3594</td>
<td>4496</td>
<td>4430</td>
<td>4596</td>
<td>4371</td>
<td>432</td>
<td>0.099</td>
</tr>
</tbody>
</table>
Table A.9  Moduli of elasticity of specimens in 6.04 molal ion concentration solution of CMA (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4613</td>
<td>4742</td>
<td>5027</td>
<td>4871</td>
<td>4972</td>
<td>5062</td>
<td>4881</td>
<td>175</td>
<td>0.036</td>
</tr>
<tr>
<td>5</td>
<td>4719</td>
<td>4793</td>
<td>4975</td>
<td>4850</td>
<td>4997</td>
<td>5028</td>
<td>4894</td>
<td>125</td>
<td>0.026</td>
</tr>
<tr>
<td>10</td>
<td>4592</td>
<td>4807</td>
<td>4780</td>
<td>4618</td>
<td>4943</td>
<td>4932</td>
<td>4779</td>
<td>150</td>
<td>0.031</td>
</tr>
<tr>
<td>15</td>
<td>4536</td>
<td>4651</td>
<td>4719</td>
<td>4608</td>
<td>4738</td>
<td>4797</td>
<td>4675</td>
<td>95</td>
<td>0.020</td>
</tr>
<tr>
<td>20</td>
<td>4547</td>
<td>4547</td>
<td>4599</td>
<td>4567</td>
<td>4845</td>
<td>4815</td>
<td>4653</td>
<td>138</td>
<td>0.030</td>
</tr>
<tr>
<td>25</td>
<td>4557</td>
<td>4713</td>
<td>4582</td>
<td>4574</td>
<td>4716</td>
<td>4764</td>
<td>4651</td>
<td>90</td>
<td>0.019</td>
</tr>
<tr>
<td>30</td>
<td>4498</td>
<td>4605</td>
<td>4820</td>
<td>4530</td>
<td>4816</td>
<td>4667</td>
<td>4566</td>
<td>139</td>
<td>0.030</td>
</tr>
<tr>
<td>35</td>
<td>4488</td>
<td>4651</td>
<td>4677</td>
<td>4371</td>
<td>4631</td>
<td>4650</td>
<td>4578</td>
<td>122</td>
<td>0.027</td>
</tr>
<tr>
<td>40</td>
<td>4463</td>
<td>4385</td>
<td>4716</td>
<td>4421</td>
<td>4713</td>
<td>4822</td>
<td>4587</td>
<td>185</td>
<td>0.040</td>
</tr>
<tr>
<td>45</td>
<td>4467</td>
<td>4515</td>
<td>4620</td>
<td>4371</td>
<td>4816</td>
<td>4928</td>
<td>4620</td>
<td>214</td>
<td>0.046</td>
</tr>
<tr>
<td>50</td>
<td>4235</td>
<td>4288</td>
<td>4656</td>
<td>4276</td>
<td>4568</td>
<td>4761</td>
<td>4464</td>
<td>225</td>
<td>0.051</td>
</tr>
<tr>
<td>55</td>
<td>4119</td>
<td>4188</td>
<td>4443</td>
<td>3986</td>
<td>4238</td>
<td>4575</td>
<td>4258</td>
<td>216</td>
<td>0.051</td>
</tr>
<tr>
<td>60</td>
<td>3916</td>
<td>3949</td>
<td>4154</td>
<td>3806</td>
<td>4068</td>
<td>4379</td>
<td>4045</td>
<td>203</td>
<td>0.050</td>
</tr>
</tbody>
</table>

Table A.10  Moduli of elasticity of specimens in 1.06 molal ion concentration solution of CMA (ksi)

<table>
<thead>
<tr>
<th>TIME (weeks)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>Std Dev</th>
<th>COV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5201</td>
<td>4868</td>
<td>5128</td>
<td>5010</td>
<td>5485</td>
<td>4816</td>
<td>5085</td>
<td>245</td>
<td>0.048</td>
</tr>
<tr>
<td>5</td>
<td>5420</td>
<td>5119</td>
<td>5360</td>
<td>5196</td>
<td>5693</td>
<td>5028</td>
<td>5302</td>
<td>241</td>
<td>0.045</td>
</tr>
<tr>
<td>10</td>
<td>5386</td>
<td>5130</td>
<td>5295</td>
<td>5169</td>
<td>5869</td>
<td>5225</td>
<td>5346</td>
<td>272</td>
<td>0.051</td>
</tr>
<tr>
<td>15</td>
<td>5469</td>
<td>5107</td>
<td>5333</td>
<td>5181</td>
<td>5805</td>
<td>5154</td>
<td>5342</td>
<td>263</td>
<td>0.049</td>
</tr>
<tr>
<td>20</td>
<td>5562</td>
<td>5276</td>
<td>5322</td>
<td>5188</td>
<td>5873</td>
<td>5176</td>
<td>5399</td>
<td>271</td>
<td>0.050</td>
</tr>
<tr>
<td>25</td>
<td>5562</td>
<td>5276</td>
<td>5291</td>
<td>5139</td>
<td>5845</td>
<td>5214</td>
<td>5388</td>
<td>266</td>
<td>0.049</td>
</tr>
<tr>
<td>30</td>
<td>5562</td>
<td>5227</td>
<td>5368</td>
<td>5294</td>
<td>5805</td>
<td>5225</td>
<td>5413</td>
<td>229</td>
<td>0.042</td>
</tr>
<tr>
<td>35</td>
<td>5265</td>
<td>4978</td>
<td>5276</td>
<td>5102</td>
<td>5765</td>
<td>5024</td>
<td>5235</td>
<td>287</td>
<td>0.055</td>
</tr>
<tr>
<td>40</td>
<td>5250</td>
<td>4985</td>
<td>5166</td>
<td>5002</td>
<td>5717</td>
<td>5039</td>
<td>5193</td>
<td>276</td>
<td>0.053</td>
</tr>
<tr>
<td>45</td>
<td>5462</td>
<td>5126</td>
<td>5283</td>
<td>5143</td>
<td>5781</td>
<td>4976</td>
<td>5295</td>
<td>289</td>
<td>0.055</td>
</tr>
<tr>
<td>50</td>
<td>4977</td>
<td>4706</td>
<td>4879</td>
<td>4698</td>
<td>4761</td>
<td>5206</td>
<td>4871</td>
<td>196</td>
<td>0.040</td>
</tr>
<tr>
<td>55</td>
<td>4937</td>
<td>4699</td>
<td>4774</td>
<td>4563</td>
<td>4703</td>
<td>5142</td>
<td>4803</td>
<td>206</td>
<td>0.043</td>
</tr>
<tr>
<td>60</td>
<td>4882</td>
<td>4688</td>
<td>4748</td>
<td>4542</td>
<td>4664</td>
<td>5251</td>
<td>4796</td>
<td>249</td>
<td>0.052</td>
</tr>
<tr>
<td>65</td>
<td>4893</td>
<td>4692</td>
<td>4669</td>
<td>4549</td>
<td>4682</td>
<td>5187</td>
<td>4779</td>
<td>229</td>
<td>0.048</td>
</tr>
<tr>
<td>70</td>
<td>4918</td>
<td>4681</td>
<td>4583</td>
<td>4538</td>
<td>4675</td>
<td>5165</td>
<td>4760</td>
<td>238</td>
<td>0.050</td>
</tr>
<tr>
<td>75</td>
<td>4980</td>
<td>4603</td>
<td>4698</td>
<td>4598</td>
<td>4768</td>
<td>5308</td>
<td>4826</td>
<td>275</td>
<td>0.057</td>
</tr>
<tr>
<td>80</td>
<td>4947</td>
<td>4572</td>
<td>4752</td>
<td>4472</td>
<td>4657</td>
<td>5184</td>
<td>4764</td>
<td>262</td>
<td>0.055</td>
</tr>
<tr>
<td>85</td>
<td>5061</td>
<td>4565</td>
<td>4752</td>
<td>4472</td>
<td>4628</td>
<td>5079</td>
<td>4759</td>
<td>257</td>
<td>0.054</td>
</tr>
<tr>
<td>90</td>
<td>4882</td>
<td>4649</td>
<td>4694</td>
<td>4531</td>
<td>4592</td>
<td>5199</td>
<td>4758</td>
<td>247</td>
<td>0.052</td>
</tr>
<tr>
<td>95</td>
<td>4693</td>
<td>4519</td>
<td>4683</td>
<td>4337</td>
<td>4413</td>
<td>5102</td>
<td>4624</td>
<td>274</td>
<td>0.059</td>
</tr>
</tbody>
</table>
Mr. Norville,

Thank you so much for taking an interest in city matters and for forwarding these most interesting and informative articles and reports on studies involving use of Brine as a de-icer and its impact on roads and bridges.

Sincerely,
Cyndi Lamm
Lincoln City Council
District 1

---

I am writing you because I want you to know how some Lincoln's citizens feel about the proposed expansion of the Public Works' brine program.

First off, the material itself is not effective. We have seen this numerous times in the last 3 years since its inception. Even the county engineer dismisses the effectiveness of the brine solution. I see it like this - If you use a water based solution to melt ice and snow, it melts the snow, adding more water and diluting the solution. You have now effectively added more water to an icy street, creating a cycle that is hard to break. A prime example is the first storm the brine was used on, with more than 80 reported accidents. It created an ice rink.

Secondly, its fairly obvious, despite what a lawyer (Miki Esposito) and her faithfull assistant (Ty Barger) say, the calcium chloride component of the brine mixture is causing major issues with our streets. Can you remember any time the streets were as bad as they have been in the last 3 or so years? If you ask the big wigs in Public Works, they will tell you its a coincidence that the streets are falling apart at this time. Despite what you may have been lead to believe, the key component to the deicing brine solution - calcium chloride - is extremely corrosive to both concrete and to metal. Pourous concrete absorbs the calcium chloride, degrades the concrete from the inside out and causes concrete scaling, which leads to pot holes. Calcium chloride also agressively attacks the steel rebar substructure of concrete. As the metal rusts, it expands, breaking and popping the concrete, again causing pot holes. The city knew this 25 years ago, and stopped using it then. Knowing what it does to the streets and infrastructure, i can only imagine what it does to my car. Public works dumps upwards of 40,000 gallons of this mixture on our streets, EACH SNOW EVENT! Throw in all of the "oops. we made too much" or "oops its too cold for what we made" and 30,000+ extra gallons are spread on our roads as waste. This happened numerous times this past winter. Ask a few of the guys that are working on the streets for their thoughts. The guys doing concrete and asphalt repairs are the real experts, not lawyers and office workers. Maybe they will tell you about the concrete base that turns into the consistancy of a Wendy's Frosty after the spraying operation, or the cracks in the road, crusted with white residue. The guys that do the spraying and road repairs were purposely kept away from the council members during your tour of the MSC brine facility. Something to think about.

I do not have a laboratory science background. I freely admit that. Perhaps my simple memories of biology and chemistry are a little off, but how seriously can you take an "experiment" like the one being conducted by Ty Barger, being performed in break room refridgerators and storage closets? Throw in the fact that they are being carried out by a guy that is far from unbiased, looking only to prove himself right and the results become questionable at best.

The notion of selling brine to other entities is rediculous. Please dont let the taxpayers of Lincoln get hosed twice, when the city streets and state highways both start falling apart due to the brine!

I am attaching a few studies conducted by real scientists and experts in this field. Although the reading is rather dull and technical in nature, it clearly shows that calcium chloride is bad for our streets, bridges, infrastructure and cars.

Thaks for your time and attention
Present: Leirion Gaylor Baird, Chair; Roy Christensen, Vice Chair; Jon Camp; Carl Eskridge; Cyndi Lamm; and Jane Raybould

Absent: Trent Fellers

Others Present: Teresa Meier, City Clerk; Rick Hoppe, Chief of Staff; Lynn Johnson, Parks & Rec Director; Denise Pearce, Senior Policy Counsel; Jeff Kirkpatrick, City Attorney; Don Gross; Pat Leach, Library Director; and Jeffrey Bliemeister, Chief of Police

Chair Gaylor Baird opened the meeting at 2:03 p.m. and announced the location of the Open Meetings Act.

I. MINUTES
      With no corrections the above minutes placed on file in the City Council Office.

II. ADJUSTMENTS TO AGENDA
    Eskridge stated the Mayor’s Multicultural Advisory Committee met and I’ll report on the meeting.

III. CITY CLERK
     Meier, in review of the formal agenda, stated under Liquor, will call Items 5/6 together, also 7/8, 9/10, 11/12, 13/14, and 16/17 will be called together.

     She noted on page 3 will call Items 23 through 27 together, all related to an event at Haymarket Park, with one individual coming to speak on behalf of all.

     There is a Motion to Amend, No. 1 on Item 34, sent out in the packets. Raybould asked, Item 34, the paperwork in our packet? Yes. Kirkpatrick added what went out was the Motion to Amend, with 2 attachments. One signed on behalf of the County Board by Amundson, the second is a draft. Kirkpatrick said before them today is what is in the draft, assuming they agree on the agreement.

     Item 45 has a Request for Action. Chad Blahak, Building and Safety, or Don Brooks, will come forward.

Don Gross, Bureau of Fire Prevention
     Gross stated they brought an Interlocal agreement put together by the Purchasing Department. The purpose is the Southeast Regional getting Department of Homeland money, used essentially in a 14 county region. Lancaster County is the region’s fiscal agent. Purchases in the past were purchased by the County and given to the City. So the Purchasing Department is creating an Interlocal Agreement for the purchasing process with responsibility for purchases we make for the City of Lincoln, and Lincoln Bomb Squad. The document has a small procedural change on how we make purchases, but funding is still paid by the Southeast Regional with Lancaster County as the fiscal agent. The only small change is it doesn’t cost the County or City money, as the City will make the purchase and will be reimbursed by the Region.

     Gross added they do have some purchases pending.

IV. MAYOR’ CORRESPONDENCE
    1. NEWS RELEASE. Health Department encourages immunizations.
    2. NEWS RELEASE. “A Cast of Blues” opens Friday at Bennett Martin Public Library.
3. NEWS ADVISORY. Mayor Beutler will hold a news conference Thursday, June 16th, 10:00 a.m. at 555 S. 10th Street to discuss three topics: Taking Charge Survey, Uncle Sam Jam July 3rd, and plans for Streets Alive!

4. NEWS RELEASE. “Uncle Sam Jam 2016” features Soul Dawg, Kids’ games and Zambelli fireworks.

Lynn Johnson - Parks & Recreation Director
Johnson stated an offer has been extended from the Nebraska Forest Service, who a year ago organized a bus trip to Kansas City to observe the Emerald Ash Borer response activities. Want to extend an invitation to Council to see if there is interest now. Alternatively, they could see if a Kansas City forester could come speak in Lincoln on their experiences and how they’re proceeding with the Emerald Ash Borer.

The tour last year was all day. The bus stops where Emerald Ash Borer was observed, we see how it affects other trees, and discuss with the forester what they’re doing in response. Johnson will send an email to Council to see if there is interest. Some Council Members replied yes.

Rick Hoppe - Chief of Staff
Hoppe stated he received an email from Wayne Parker, Chief Administrative Officer of Provo, Utah. Apparently Provo will receive a regional facility from Duncan Aviation. They’re sending some Council Members, and other officials, to Lincoln in the next 90 days to look at the operation.

In the email said they’re also a university town, and would like to discuss issues of common interests, such as downtown revitalization, student occupancy, parking management, etc. Hoppe commented he replied he’’s happy to set up meetings and it is something we do as good courteous neighbors. He added it occurred to him Council may want to be involved in the conversations. Thought I’d see if Council would like me to set up, or any ideas? How you would like to be involved?

Eskridge commented to have a luncheon. Christensen added to make sure we all wear Husker gear. Hoppe said he’ll see if he could set up a lunch. Somewhat like the Joint Lincoln Omaha City Council Meetings with joint topics, some staff, giving a brief background. Think about and speak with your colleagues.

Camp asked if Duncan would want to host at their facility? Hoppe thought an excellent idea. Will check.

Leirion Gaylor Baird
Gaylor Baird asked if anyone had changes to Council appointments? Pearce stated an email was sent by Meyer on appointments. Gaylor Baird stated Jane Raybould will be assuming the appointments of the Railroad Transportation Safety Committee and the Performance Audit Committee in her place.

Pat Leach - Library Director
Leach stated a Library Board Member is finishing a partial term at the end of August. Donna Marvin served out a term for a member who left early. This leaves her eligible to serve a full 7 year team, which she is willing to do. In situations where this arose previously we handled a couple of ways. One way was to announce the Library Board Member is willing and able to serve a full term, and don’t accept applications, but make the announcement. In other cases we were advised to accept applications being clear we have a Board Member wishing to seek a full term. Coming today inquiring what would be the best course of action. Not sure if Council has questions or further thoughts?

Camp asked what has been done recently? Leach replied last year did not ask for applications but
reappointed a member to the Library Board. Camp asked if this was the only one up? Leach said for this year. Camp asked if there are people wanting to be on the Library Board? A waiting list? Pearce responded they have on-going applications/list, and can give to Leach. People also contact her directly.

Camp asked what she would want to do? Leach recommends reappointing Donna Marvin for a full term. She served well, excellent attendance and interest. Understand people wish to be appointed to the Library Board, a responsibility of the City Council, and do respect that. Today here to seek Council’s advice.

Gaylor Baird stated this has happened, what was the action then? Leach replied they did not accept applications but reappointed the member. If things go as scheduled in the next 3 years will have members completing full terms, and we’ll go through the traditional application process. Gaylor Baird inquired how many? Leach stated there are 7 Library Board members. This is the 2016 appointment. In 2017 Schimek will complete his term, in 2018 Freeman completes his term, in 2019 Spiker completes a full term.

Camp asked if only allowed 1 term with reply of yes, 1 full term. If completing a partial term then may serve a full term of 7 years. Camp thought to keep Marvin, with 3 coming up and we’ll have continuity. Short discussion. Leach said they’ll move forward without accepting applications.

Roy Christensen

Christensen asked, the budget release date for Council, press, and public, could you review? Hoppe said on July 8th have a briefing for the press, which is then embargoed to Sunday night, July 10th, and when media starts to report on it. There is a Council presentation on July 11th laying out more specifics on what is going on. However, in light of our recent discussions thought we would like to give Council the slide show and information possibly on the 7th or 8th, so you have in advance, and see a few things which would happen before the release on the 11th. This is the tentative game plan at this point.

V. DIRECTORS CORRESPONDENCE

COMMISSION ON HUMAN RIGHTS
1. 2015 Annual Report. Also on their website.

HEALTH DEPARTMENT
1. Lincoln-Lancaster County Health Department, Board of Health meeting minutes of May 10, 2016.

WEED AUTHORITY
1. Lancaster County Weed Control - City of Lincoln Weed Abatement newsletter for June, 2016.

WEST HAYMARKET JOINT PUBLIC AGENCY
1. The West Haymarket Joint Public Agency Board meeting scheduled for Thursday, June 23rd has been canceled due to lack of agenda items.

VII. BOARDS/COMMITTEES/COMMISSION REPORTS

1. District Energy Corporation (DEC) - Camp

Camp stated the DEC discussed 2 major items. First, announcement of receiving a check for approximately $400,000 plus, on a sales tax issue. Believe we paid $150,000 for attorneys. No. 2 was the Evergreen Consultants of Minneapolis. Evergreen has been doing studies for us on possible expansion. A couple of items, what can we do legally with District Energy? Now we serve all public entities. The question was if we could do others, like the Journal Star who may have upcoming energy service needs. Discussed the legality. Now have the West Haymarket facility, City-County facility, the State facility and have decided to look at expanding the State facility of Centennial Mall. There are a couple of potential users in the
Foundation building which would qualify those public. Possibly Windstream. A lot of legal elements.

Camp commented also the Cornhusker Hotel and a couple of U.S. Banks. The one on 13th Street has expressed interest and looking at possibly having two trunk lines there. It gets rather expensive as they might be $2 to $3 million each. We’ll investigate and see how it works into the legal perimeters.

2. Public Building Commission (PBC) - Camp, Raybould

Raybould stated they discussed the Bensch building. Change orders for the building were a large concern to the County Board, a little over $200,000. The County was concerned how it broke down. They show about 1.3% were older addition change orders to some fixtures, and cameras. Majority were situations they ran into at 3% of the over cost. The building was old, original construction of 1951, with a remodel in the 70’s. Then another remodel and this final remodel. They were concerned as there were a lot of unforeseen circumstances fortifying retaining walls, interior walls, fire walls required by Building and Safety to bring the building up to code. The recent change orders caused concern and seemed as if Etherton had done his research of the initial project design. A lot of his very specific requests for materials, or cameras, were missed by the architect. Unfortunately some of them were substantiated and some not. Basically a substantial amount of change orders to agree to, but did scrutinized each.

Raybould added another project was the renovations of the jail. Also had a number of change orders we carefully scrutinized. Camp stated costs, with the construction environment now, is very expensive.

Raybould noted they the discussed the K Street Building, records document building, and its’ future. The State of Nebraska would like a renewal of their 3 year lease. The Mayor was concerned and it ties into the PBC Chair and Mayor report. The concern was possibly a better use for the K Street Building. At this time there is no identifiable use or interest in the K Street Building. We met with Nebraska Secretary John Gale and he explained his reasons. They’re going through a management transition over the Records Management position with a new appointee soon. This individual is more technologically savvy and wants to take records management to a better, more responsible level. Now there are departments and agencies doing their own records management and creating silos, ineffectively storing numerous critical documents. They’re trying to encourage working with other departments in the State for all to have a systemic approach. They asked for an additional 3 year renewal. Want the 1st year to get the new person up to speed and the 2nd to come up with a determination. Also would like it to be tied into the State’s 2 year budget.

Raybould commented they also approved vouchers and payments.

Eskridge asked if they’ve moved into the Crisis Center? Raybould replied, no, they’ll move at the end of June as there was 1 change order which would cause a little delay. Camp added they’ll still have ongoing items like cameras, etc. Raybould said there’s a couple changes which would add a few days, maybe extended to July 26th. Think they could open without the items. End of June or the first part of July.

3. Metropolitan Officials Committee (MPO) - Christensen, Gaylor Baird

Christensen stated reviewed items of the Metropolitan Transportation Plan and freight being moved around the City and how we plan to accommodate. Numerous items involve working with State and Federal Government. Listing plans so we can receive financial assistance in putting our transportation in place, and maintaining.

Gaylor Baird commented they reviewed provisions to the Transportation Improvement Program and discussion included 56th Street, Shadow Pines, Old Cheney. The way they convert funds. Local and federal funds. When asked if it meant freed up road dollars for projects, it doesn’t. Slight revisions. They have a self certification process which they complete per Federal law regulations, related to our Capital Improvements Program and includes other items but focused on transportation. Did ask if they’re looking
at more futuristic thinking of transportation, as we went through the Smart Cities, with the reply being they are looking at ideas and Smart Cities is part of the discussions, but not on the short term lists.

4. **PBC Chair and Mayor - Raybould**
Raybould stated in addition to regarding K Street also talked somewhat about the Lincoln Children’s Museum and the problems they’ve having with their parking deck and the storage space below.

Hoppe commented correct if wrong, but one issue in regard to the contract at both K Street and 233 Building was that some tenants wanted 3 year extensions, but we talked about having a year’s notice to get out in case we were successful in moving tenants or interest was expressed by a developer? Raybould replied that was only for the 233 Building. The tenants there, with the State, wanted a 3 year contract which we granted but only the City would give the one year notification of termination. Only that building.

5. **Multicultural Advisory Committee - Eskridge**
Eskridge stated this committee consists of community people specifically concerned with incidents which relates to community minority groups. They discussed Orlando and how it relates to Lincoln. How safe they feel, how they can be protected from events, law enforcement and other issues. Also received a planned presentation, with not much time, from OLLI, Osher Lifelong Learning Institute. The University presented on classes and encouraged participation from a larger group in the community rather than just those participating now. Trying to expand. They take July off and will be back in August.

5. **Board of Health - Raybould**
Raybould noted the hazardous permanent waste collection facility received the grant and will have the design and construction phase. Received a presentation of the REAL program, working with the Lincoln Police Department, Mental Health Associates, having the Board of Health up to speed on the partnership.

Raybould added the Animal Control Advisory Committee spoke, a voluntary committee dealing with euthanizing wildlife, chemical immobilization, bat infestation. They keep track of legislation impactful to wildlife and animal life in Lincoln. Also at dog use facilities, public service announcements on spading and neutering, and ways to partner with the Capital Humane Society. With a goal of increased education.

Received a presentation from Health Hub. Their goal is to work with populations with desperate health needs and engage in preventive screenings for different types of breast, colon, and cholesterol issues. They spoke on reaching out to the new refugee communities to make sure they are invited and welcomed and know how to work with the system for these types of health screenings.

VIII. **MISCELLANEOUS**

1. **Edward Byrne JAG Federal Grant - Chief Of Police Jeffery Bliemeister**
Bliemeister stated, adding couple of points to Councilman Eskridge’s MAC meeting, following the Orlando events we definitely continued communication with the populations affected on both sides. We have good, established relationships with leadership in the Islamic Community as well as the LGBT Community. To Raybould’s point, the Community Health Endowment Awards were held last week. The Police Department received the Horizon Award for their work on the R.E.A.L. program. It gives officers an opportunity for a next step with people having mental health issues. Think it positively impacts the community, minimizing repetitive calls for service.

Raybould stated the Board of Health is proud of the Lincoln Police Department and their progressive approach to defusing situations involving citizens with mental health issues, or substance abuse, plus all the training they take. Very fortunate to have Law Enforcement so engaged in the community and developing the right skills to be proactive and positive. The partnership with R.E.A.L. is a wonderful
approach to provide referrals and support. Bliemeister stated the peers do a great job.

Bliemeister stated for more than 20 years the Lincoln Police Department has applied for the Department of Justice Edward Byrne Memorial Justice Assistance Grant. What does this do? It provides funding. This year we’re eligible for $154,687 used to compliment the Lincoln and Lancaster County Investigative Narcotics Cooperative. They pay to subsidize the cost of 1 Lancaster County Sheriff’s Deputy Investigator, the salary, not benefits. Also 2.9 salaries of the Lancaster County Attorney’s Office. Two of those attorneys are dedicated to a partnership with this cooperative, with their docket completely filled with these cases.

Bliemeister added we apply for, and did the background work for the grant. Why? The reason is it brings in the Lancaster County Sheriff’s office, whose primary jurisdiction wouldn’t be within City Limits. They dedicate a full time investigator to assist us, as does the work of the prosecutors. We also are able to use this cooperative to apply for other federal funding which keeps this narcotics task force afloat.

Raybould asked if a one year grant? Yes. Bliemeister stated they apply annually as it changes. Last year received approximately $148,000, so an increase this year. Never know what amount from year to year. Then we look for alternative forms of funding to facilitate this partnership. Raybould asked if exclusively narcotic cases? Primary? Yes, the cooperative managed by the Lincoln Police Department, with a Captain, and several sergeants. Bliemeister said he participated in the task force two decades ago, from the Sheriffs Office side. A long standing cooperative serving our community on the enforcement level of narcotic complaints very well.

Some of the funding dollars will continue to transition into other forms of collaboration with community members. Working with landlords, problem areas, to educate them on what can be done, and what can’t. Facilitate the partnership.

Gaylor Baird asked if the grant dollars this year are used in new ways from the past, with the landlord type problems, more of a community police approach, or something you’ve been doing? Bliemeister replied they have done in the Southwest Team area, where some ideas originated, and it’s been a success. We want to try in a more directed way at specific offenses, narcotic complaints, to where previously in the Southwest part of town it’s more reoccurring, calls from service on a variety of different platforms.

IX. COUNCIL MEMBERS

JON CAMP
1. Donna Garden, Assistant Director Public Works & Utilities, replying on the concern of ammonia being introduced into Lincoln’s water system.
   a) Councilman Camp requesting Public Works & Utilities to look and reply to the concern of ammonia being introduced into Lincoln’s water – No. 6 on Agenda of 06.13.16.
2. Wall Street Journal article: “Pension Funds Pile on Risk Just to Get a Reasonable Return”

JANE RAYBOULD
1. Thomas Shafer, Design/Construction Section Manager, replying on Horst Hahn’s concerns of the intersection of Pace and Marilynn Avenue with the tree issue answered by Bob Weyhrich, City Forester.
   a) Councilwoman Raybould requesting answers on the street pavement condition at Marilynn Avenue and Pace Boulevard - No.’s 1 and 2 on Agenda of 06.13.16.

X. CORRESPONDENCE FROM CITIZENS
1. Gerald Hood writing with suggestions, comments, on the budget and the Take Charge Survey.
XI. MEETINGS/INVITATIONS
See invitation list.

XII. ADJOURNMENT

Chair Gaylor Baird adjourned the meeting at 2:43 p.m.