City Projects - Concepts, Costing & Construction

Dale C. Heglund, PE/PLS - Program Director, NDLTAP
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NDLC Annual Conference, Fargo - Sept 29, 2017
Info Hand-offs

Time
Money
Risk
300 B.C.
Roman Empire
Roadway/Street Sections
Top ten country roadway networks, shown in million miles.
Info Hand-offs

Time
Looking Back...
Project Timeline

- Concept
- Funding
- Process Approvals
- Field Data
- Design
- Construction
- Maintenance
### Municipal Government (40)

<table>
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<th>Chapter</th>
<th>Section Listing</th>
<th>Chapter Name</th>
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<td>40-01</td>
<td>40-01 Sections</td>
<td>General Provisions</td>
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<td>Incorporation of Municipalities in Unorganized Territory</td>
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<td>Council Cities, Procedure for Incorporation [Repealed]</td>
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<td>Change from Council System to Modern Council System</td>
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<td>Commission Cities, Incorporation and Change</td>
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<td>Modern Council Form of Government</td>
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<td>40-06 Sections</td>
<td>Governing Body in Municipalities, General Provisions</td>
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<td>Villages, Governing Body and Other Officers [Repealed]</td>
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<td>Governing Body and Executive Officer in Council Cities</td>
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<td>40-09 Sections</td>
<td>Governing Body and Executive Officer in Commission Cities</td>
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<td>40-10 Sections</td>
<td>City Manager Plan</td>
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<td>Ordinances</td>
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<td>40-13 Sections</td>
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<td>40-14 Sections</td>
<td>Officers in Council Cities, General</td>
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<td>40-15</td>
<td>40-15 Sections</td>
<td>Officers in Commission Cities, General</td>
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<td>40-16</td>
<td>40-16 Sections</td>
<td>City Auditor</td>
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### Bidding and Qualification Based Selection (48)
City Projects - ND Century Code

- Develop a long-term plan
- Inform residents
- Evaluate whole city / divide into regions
- Acquiring financing
- Legal process for project
- Public involvement
- Voting vs. protesting
IMPROVEMENTS BY SPECIAL ASSESSMENT - PROCESS CHECKLIST

___ Create the improvement district by resolution (40-22-08)
___ Direct the engineer to prepare the Engineer’s Report (40-22-10)
___ Approve the Engineer’s Report (40-22-11)
___ Adopt a Resolution of Necessity (except water or sewer or petition of majority) (40-22-15)
___ Publish Resolution of Necessity 1 per week for 2 weeks
___ 30 days to file protests after date of first publication
___ Hearing at next meeting to determine sufficiency of protests and a majority of area protesting is bar to proceeding
___ Direct engineer to prepare detailed plans and specifications (40-22-11)
___ Approve plans and specifications and file with city auditor (40-22-11 and 14)
___ Direct city auditor to advertise for bids (40-22-19 and 48-10.1-03) in official newspaper and in a trade publication
___ Publish ad for bids 1 per week for 2 weeks (40-22-19 and 48-01.1.03)
___ Bid opening not less than 14 days after first publication (49-01.1.03)
___ Determination as to type of paving if applicable (40-22-28)
___ Bidders bond (5%) and contractor’s license required (48-01.1-05)
___ Bids entered on minutes and referred to engineer for statement of estimates costs (40-22-29)
___ Accept bid and award contract (unless more than 40% over estimate) or reject all bids (48-01.1-07)
___ Bond required for performance and payment (48-02-06.2)
___ Construction Contract (40-22-35 and 36)
___ Issue improvement warrants/bonds (40-24-19)

Jerod Klabunde, PE – Project Manager, Moore Engineering
Environmental Review & Permits

- Dept. of Health
- NDDOT
- Game & Fish
- State Water Commission
- USDA / NRCS
- US Fish & Wildlife
- Historical Preservation Office
- Railroads
- Airports
- ND Parks & Rec

- US Army Corps of Engineers
- Tribal Governments
- County/Township Government
- Water Resource Districts (Water Board) / Rural Water Districts
- Other Potential Stakeholders: Wetlands, Utility Companies, Private Landowners, Taxpayers, Gas and Oil Pipelines, Easement Holders, Etc.

*Can be dependent on location, project type and funding source
Street Surveys

Pavement Management Plans (Large Cities)
- Regular evaluations using technology – ride quality, roughness,.....
- GIS database and mapping
- Pavement management software

Plan Regular Inspections (Small Cities)
- Street surveys, 3-5 year interval
- Less technology
- Planning
FLEXIBLE PAVEMENT CONDITION SURVEY RATING FORM (URBAN)

City: ____________________  County: ____________________  Date: ____________
Street ID: ____________________  Location From: ____________  to  ____________

<table>
<thead>
<tr>
<th>RIDE CONDITION</th>
<th>10 (Excellent)</th>
<th>9</th>
<th>8 (Good)</th>
<th>7</th>
<th>6 (Fair)</th>
<th>5</th>
<th>4 (Poor)</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>5</th>
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<tr>
<td>RATING</td>
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<td></td>
<td></td>
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Deduct Value: -0.1

<table>
<thead>
<tr>
<th>PAVEMENT DISTRESS CONDITIONS</th>
<th>SLIGHT</th>
<th>MODERATE</th>
<th>SEVERE</th>
<th>LOW 0-10%</th>
<th>INTERMEDIATE 10-25%</th>
<th>FREQUENT 20-50%</th>
<th>EXTENSIVE &gt;50%</th>
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<tbody>
<tr>
<td>SURFACE DEFECTS</td>
<td>Raveling/Weathering</td>
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<td></td>
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<tr>
<td></td>
<td>Flushing/Bleeding</td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td></td>
<td>Potholes/Patching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
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<tr>
<td>SURFACE DEFORMATIONS</td>
<td>Shoving/Rutting</td>
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<td>x</td>
<td></td>
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<td>Distortions</td>
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<tr>
<td></td>
<td>Utility Trenches</td>
<td></td>
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<td>x</td>
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<tr>
<td>CRACKING</td>
<td>Alligator</td>
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<td>x</td>
<td></td>
<td></td>
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<td></td>
<td>Longitudinal</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Transverse</td>
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<td></td>
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<td>Block</td>
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<td>x</td>
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<tr>
<td></td>
<td>Edge Pavt. / C &amp; G</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
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</tbody>
</table>

Final Surface Condition Rating = 66.0

Chad Petersen – 701-845-9446
chad.petersen@kljeng.com
Americans with Disabilities Act

ADA Guide for Small Towns

A guide for small local governments including towns, townships, and rural counties.
Time to Start is NOW!!
Info Hand-offs

Money
Project Development

Planning - a key to saving money

Project specifications - used to clearly define the material and components
Discovery Phase
Roadway Ailments
Pavement Cross Section

Typical 41’ Asphalt Street Section

- Carriageway
- Traffic lanes
- Shoulder
- Side drain
- Pavement
- Wearing course
- Base course
- Subbase
- Natural formation
Materials
Costs, Funding and Repayment

- Engineer’s Opinion of Cost
  - Single citywide project
  - Phase project, completion date, milestones…

- Project Funding
  - Low Interest Loans for Streets
    - New for 2017: Infrastructure Revolving Loan from Bank of ND (2% Interest Loan)
  - Repayment – Determine Appropriate Length of Time
  - Repayment Options
    - Budget for Work
    - Special assessments
    - Rates / Revenues
    - Sales Tax
    - General Obligation Bonds
Engineer’s Opinion of Project Cost

- Proposed City of Kulm 2016 ($2,000,000)
  - Approximate Assessment per Lineal Footage - $86.96

<table>
<thead>
<tr>
<th>Projected Repayment Scenarios (100% Financed)</th>
<th></th>
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<tr>
<td>Approximate Project Area Front Footage</td>
<td>23,000</td>
</tr>
<tr>
<td>Approximate Assessment per Lineal Footage</td>
<td>$86.96</td>
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<tr>
<td>City's Annual Payment (15 Years @ 4.5% Interest)</td>
<td>$186,227.62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Assessment Per Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>25' Lot</td>
</tr>
<tr>
<td>50' Lot</td>
</tr>
<tr>
<td>75' Lot</td>
</tr>
<tr>
<td>100' Lot</td>
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</table>

<table>
<thead>
<tr>
<th>Annual Payment per Property (Based on 15-Year @ 4.5% Interest)</th>
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</thead>
<tbody>
<tr>
<td>Assessment Per Foot</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>25' Lot</td>
</tr>
<tr>
<td>50' Lot</td>
</tr>
<tr>
<td>75' Lot</td>
</tr>
<tr>
<td>100' Lot</td>
</tr>
</tbody>
</table>

Notes/Assumptions:
1. This assumes 100% of project is financed.
2. This assumes a straight assessment across all areas.
3. Can consider doing project over multiple phases.
4. We assume interest rate will be better than projected 4.0% interest (conservative).
Cost Estimates (Per Block)

Crack Seal - $500 - 1,500
Chip Seal - $2,000 - 4,000
Edge Mill & Asphalt Overlay - $15,000 - 25,000
Curb & Gutter - $20,000 - 30,000
Full Depth Asphalt - $60,000 - 90,000
Full Depth Concrete - $100,000 - 150,000

*Costs are highly variable and dependent on factors such as width of street, type of street, size of project, timing of bids/work, location and competition between contractors!

See cost estimating handout – data provided by Jerod Klabunde, Moore Engineering, and Todd Norton & Mark Lambrecht, Advanced Engineering and Environmental Services, Inc.
Life Cycle Costs

Construction Costs

Maintenance Costs

Salvage Value
Capital Improvements => projects

Maintenance => preserve investments
Pavement Deterioration

Cost of 'Timely' Maintenance

- Each $1.00 of Renovation Cost Will Cost $4.00 to $5.00 if Delayed to Here
- 40% Quality Drop
- 75% Time
- 12% Time
- Total Failure

YEARS (Time Varies for Each Road Section)
Pavement Preservation

Washington State Sample

Pavement Condition Index (PCI)

Pavement Age

- Maintenance ($0.20-$1.25/sf)
- Preservation ($1.75-$2.50/sf)
- Reconstruction ($3.00-$5.00/sf)
- Failed
Alternatives - Investment Strategies
Public Expectations
Outreach Efforts
Info Hand-offs

Risk
Risk Management

identify → assess → control → review
Everyone Loves a .......
Construction Loads
Changed Conditions
Frost Damage in Pavement: Causes and Cures (YouTube video)

Sample expanded from 6 to 10 inches
Total Heaving: 70%
Industry Trends

Asphalt Improvements Per Mile
2004 - 2016

Thousands of Dollars/Mile

- Asphalt Overlay
- Asphalt Surfacing Reconstr.
- Total Reconstr.

Year:
- 2004
- 2006
- 2008
- 2010
- 2012
- 2014
- 2016
## Average Construction Costs - 2016

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Total Dollars/Mile</th>
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<tbody>
<tr>
<td>Non-Interstate seal coat (by contract)</td>
<td>$ 35,000</td>
</tr>
<tr>
<td>Interstate seal coat (by contract)</td>
<td>$ 55,000</td>
</tr>
<tr>
<td>Thin lift overlay</td>
<td>$ 180,000</td>
</tr>
<tr>
<td>3&quot; asphalt overlay</td>
<td>$ 320,000</td>
</tr>
<tr>
<td>Asphalt surfacing reconstruction (includes subgrade repair and resurfacing)</td>
<td>$1,100,000</td>
</tr>
<tr>
<td>Total reconstruction (includes grading and asphalt surfacing)</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>Interstate concrete paving (two lanes in one direction)</td>
<td>$2,400,000</td>
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### Construction Cost Index

![Construction Cost Index Graph](chart.png)

- Index values range from 0 to 350.
- The graph shows a trend from 2005 to 2016.
Maintenance Equipment Needs
Types of Pavement Failures
Band-Aids or Stitches?
Info Hand-offs

- Time
- Money
- Risk
Roman Engineer

Resource List

ND Century Code:
Section 40 (Municipal)
Section 43 (Engineer)
Section 48 (Bid Threshold)

ND Local Government Manual
NDLC ND Officials Handbook
ADA Guide for Small Towns
Handouts

Process Checklist
ADA Guide
Street Assessment
Rough Estimating Info
Presenter Contact Info
NDLTAP TRAINING

Helping communities expand their skills
Delivering all your training needs

NDAPWA | SMALL COMMUNITY OUTREACH PROGRAM

NDSU | UPPER GREAT PLAINS TRANSPORTATION INSTITUTE
NORTH DAKOTA LOCAL TECHNICAL ASSISTANCE PROGRAM

WWW.NDLTAP.ORG
...take charge and create the future you want!
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