

The Cost of Deferred Maintenance

Presented by:

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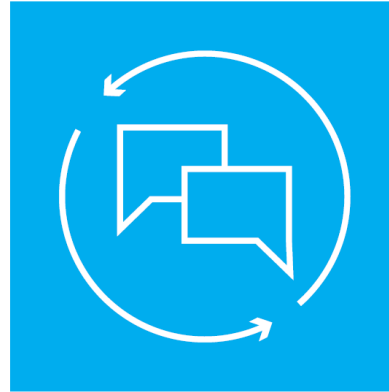
Outline

- Objectives
- Asset Management 101
- Methodology
- Asset Deterioration Curves
- Theoretical Case Studies
- Conclusion
- Questions



Presentation Objectives

1. The life cycle of structures
2. The financial and liability costs associated with deferring a capital repair project
3. The need to undertake life cycle planning for the asset
4. The importance of maintenance



11 CMA's:

- Vancouver, B.C.
- Edmonton, AB
- Calgary, AB
- Saskatoon, SK
- Winnipeg, MB
- Toronto, ON
- Ottawa, ON
- Montréal, QB
- Moncton, NB
- Halifax, NS
- St. John's, NL



Asset Management 101

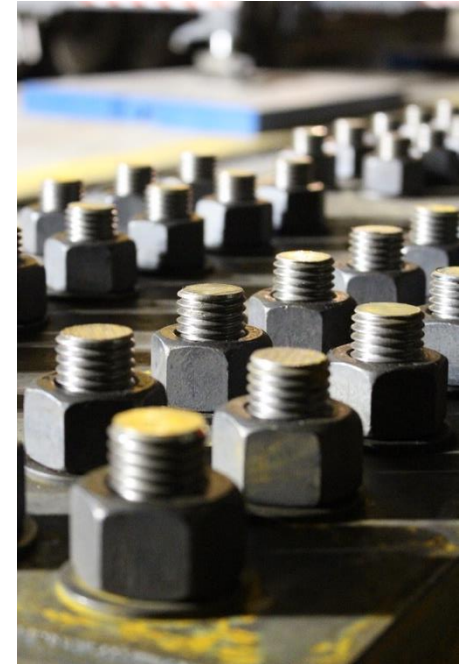
Asset management is the coordinated activities of an organization to realize value from its assets in the achievement of its organizational objectives.¹



Asset Management 101 – Key Fundamentals¹

Value: Assets exist to provide value to the organization and its stakeholders.

Alignment: Asset management aligns the organizational objectives with technical and financial decisions, plans, and activities.



Asset Management 101 – Key Fundamentals¹

Leadership: Leadership and workplace culture are crucial to realize value.

Assurance: Asset management gives assurance that assets will fulfill their required purpose.



Asset Management 101 – Grading System¹

Very Good - Fit for the future

- Well maintained, good condition, new or recently rehabilitated.

Good - Adequate for now

- Acceptable, generally approaching mid stage of expected service life.

Fair - Requires attention

- Signs of deterioration, some elements exhibit deficiencies.



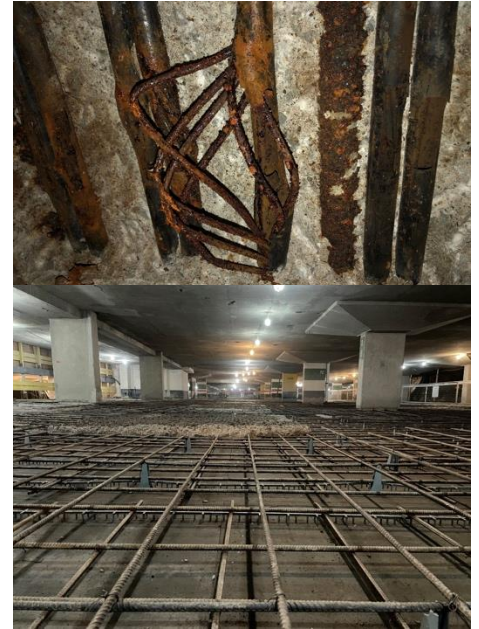
Asset Management 101 – Grading System¹

Poor - At risk of affecting service

- Approaching end of service life, condition below standard, large portion exhibits significant deterioration.

Very Poor/Critical - Unfit for service

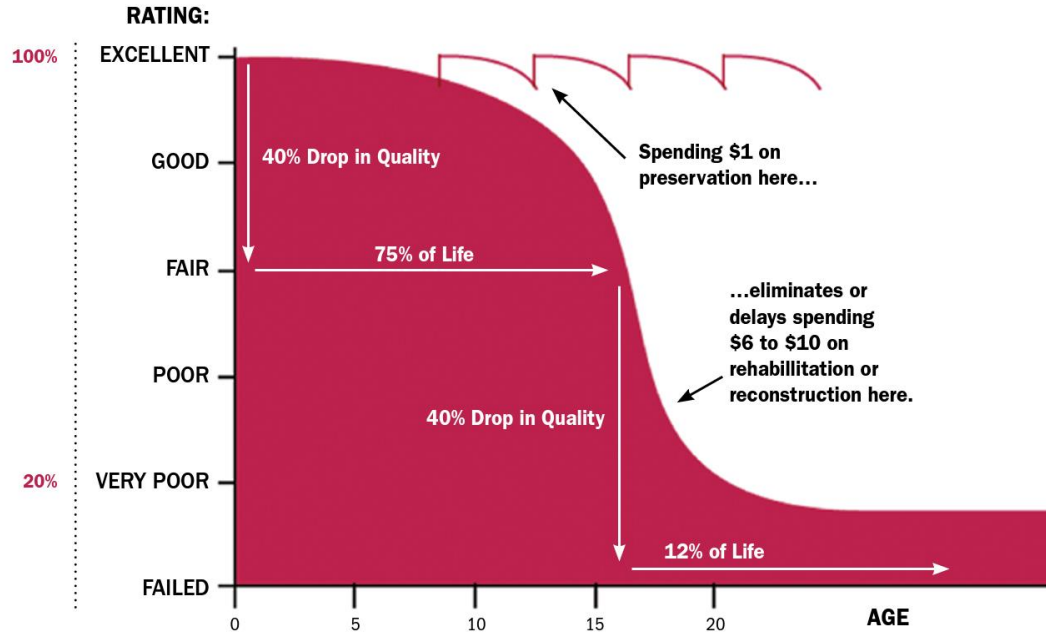
- Near or beyond expected service life, widespread signs of advanced deterioration, may be unusable.



Asset Management 101 – Grading System¹

Condition Grade	% of Estimated Service Life (ESL) Remaining
Very Good	80 to 100%
Good	60 to 79%
Fair	40 to 59%
Poor	20 to 39%
Very Poor	< 19%

Asset Management 101 – Grading System²



Methodology

Over Three Dozen Projects ³

- Localized Repair & Maintenance,
- Major Rehabilitation, &
- Reconstruction / Replacement

Tendered in Toronto CMA

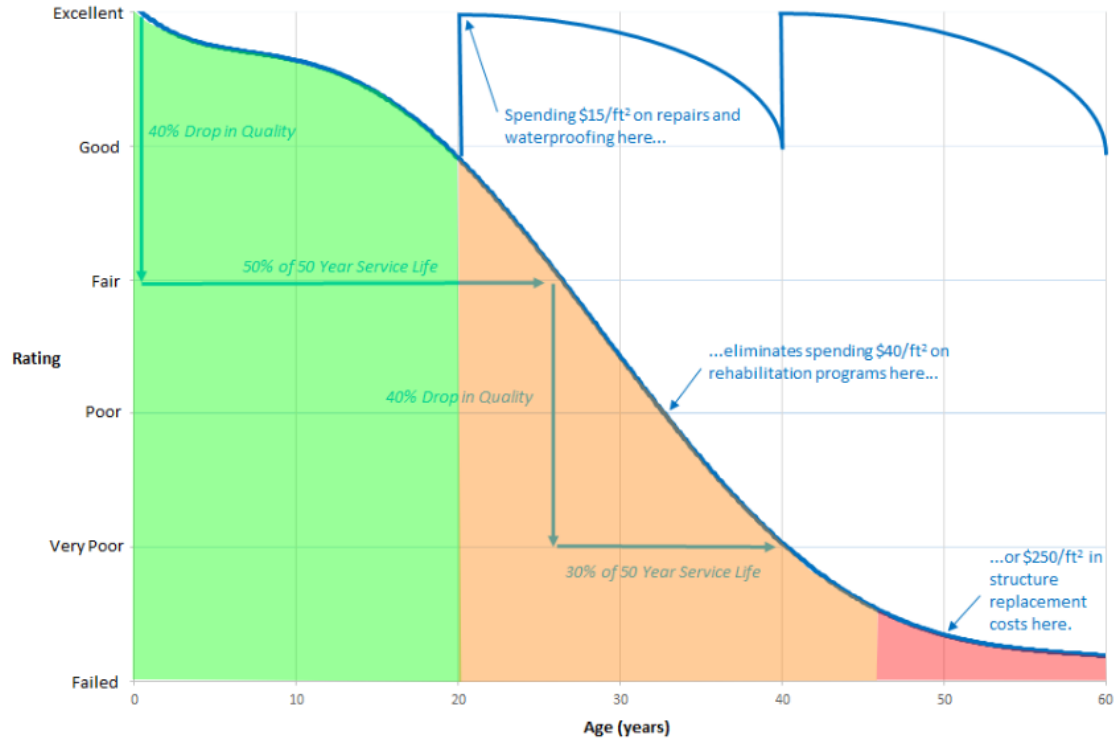
•normalized to Q2 2023 per Statistics Canada building construction price index ⁴

Asset Replacement ⁵

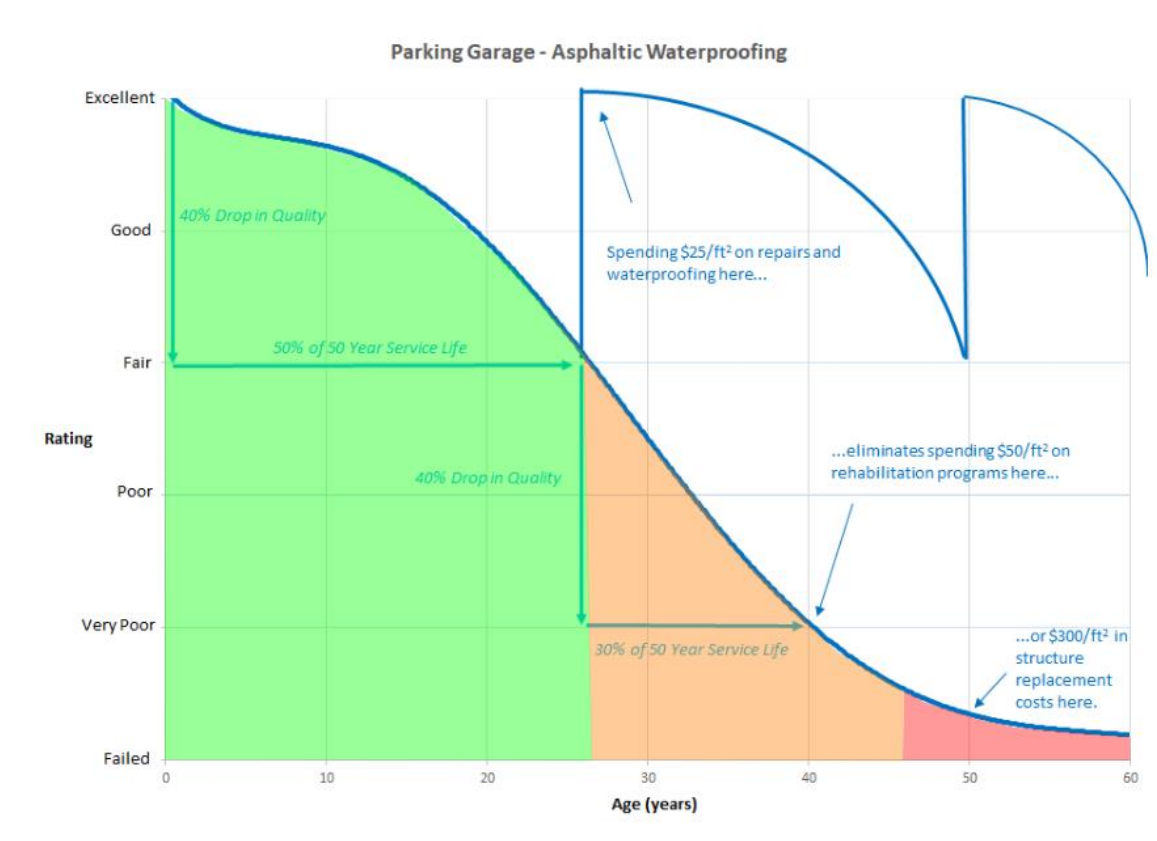


Deterioration Curve – TTDC

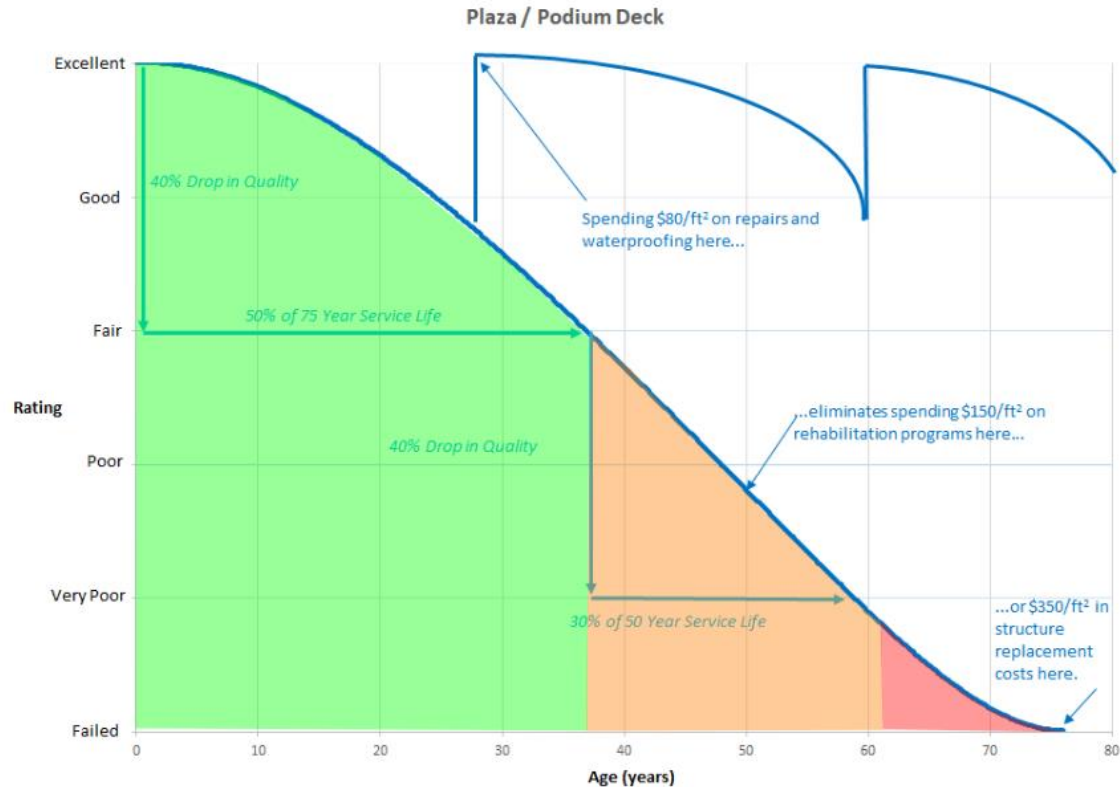
Parking Garage - Thin Traffic Deck Coating



Deterioration Curve – Garage Asphaltic

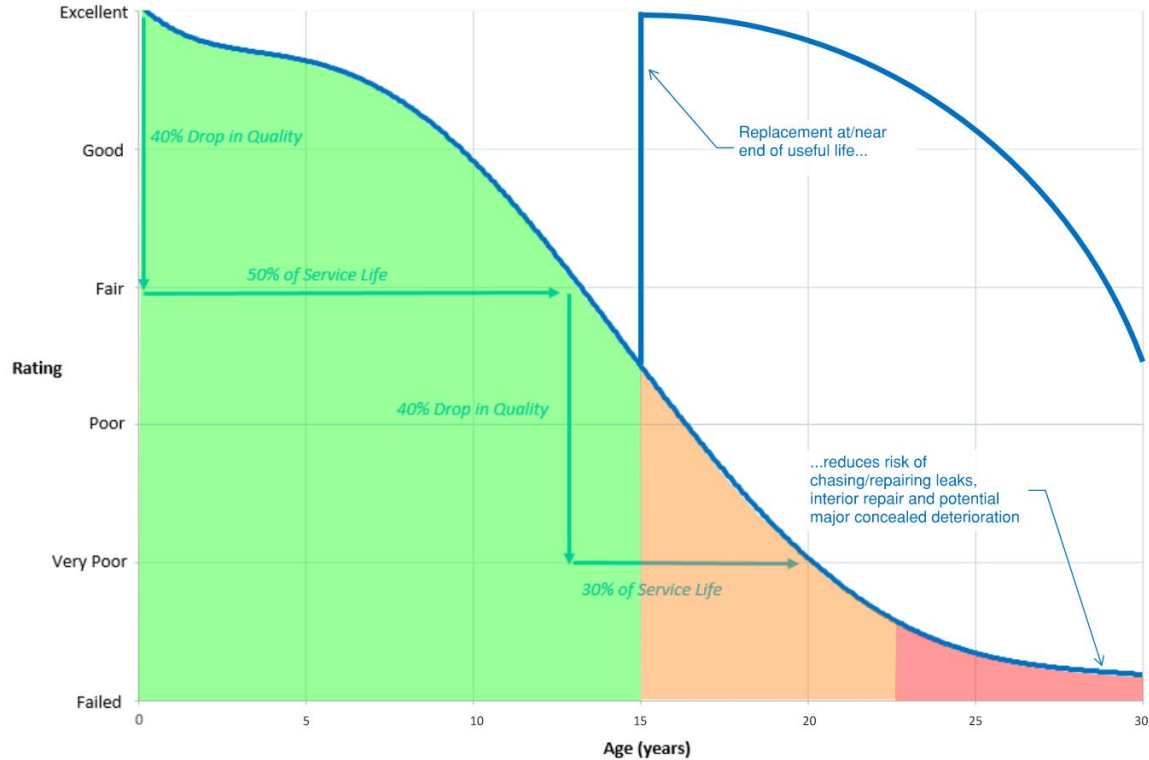


Deterioration Curve – Podium/Plaza



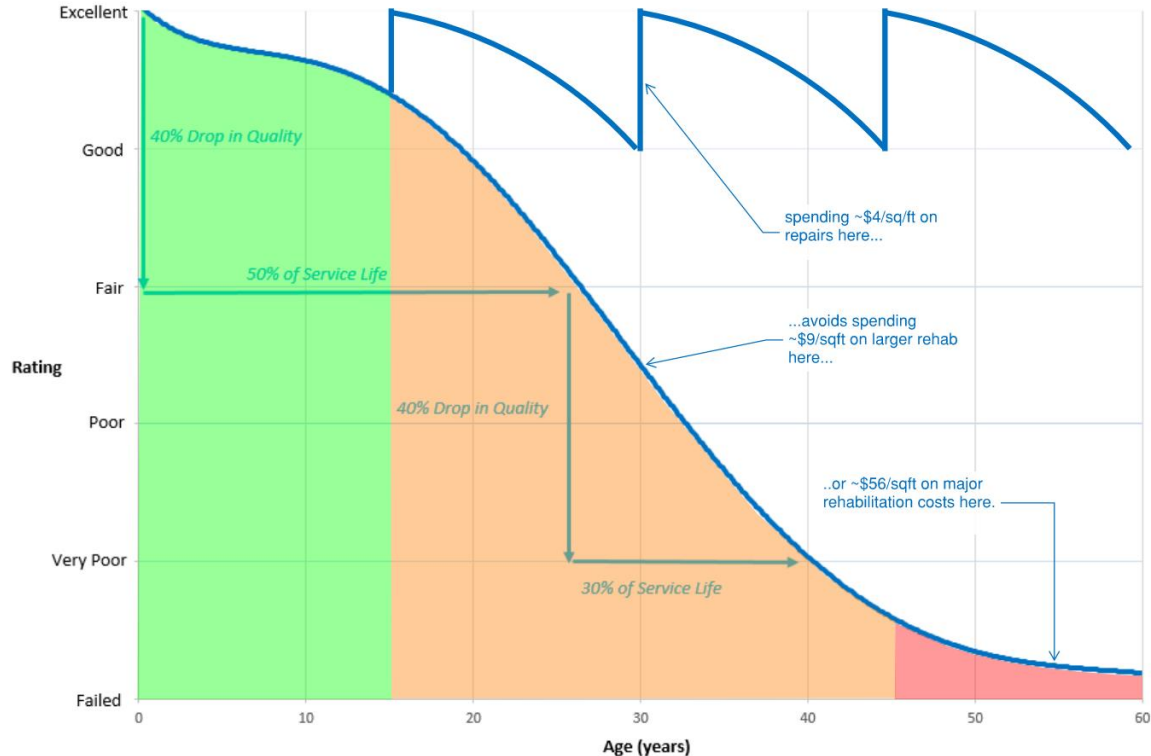
Deterioration Curve – Exterior Sealant

Exterior Sealant



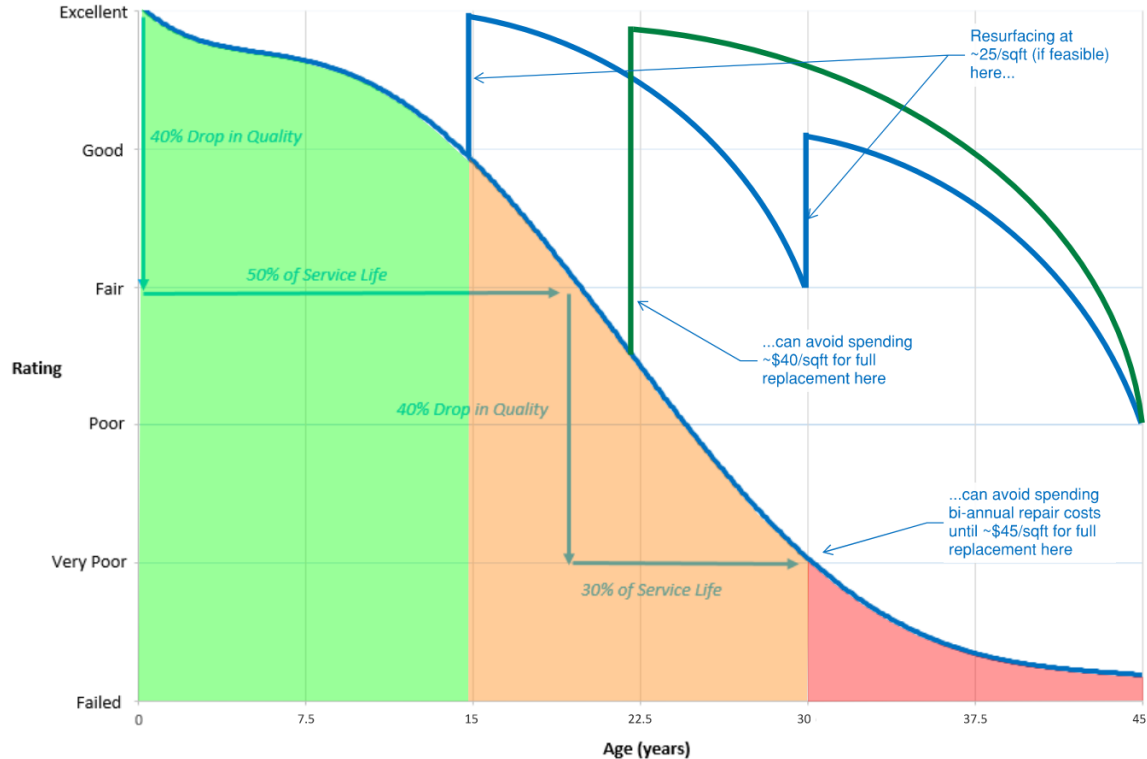
Deterioration Curve – Masonry-Brick

Masonry - Brick



Deterioration Curve – Roofing-Conventional

Roofing - Conventional



Theoretical Case Studies: Modeling

Cost of borrowing vs increase repair costs ^{3 to 7}

- ‘Standard’ (3.97%) Interest Rates & ‘Standard’ (2.5%) Inflation
- Recent Standard Interest Rates (3%) & Low Inflation (1%)
- High Interest Rates (5%) & High Inflation (5%)
- Low Interest Rates (2%) & Medium Inflation (3%)

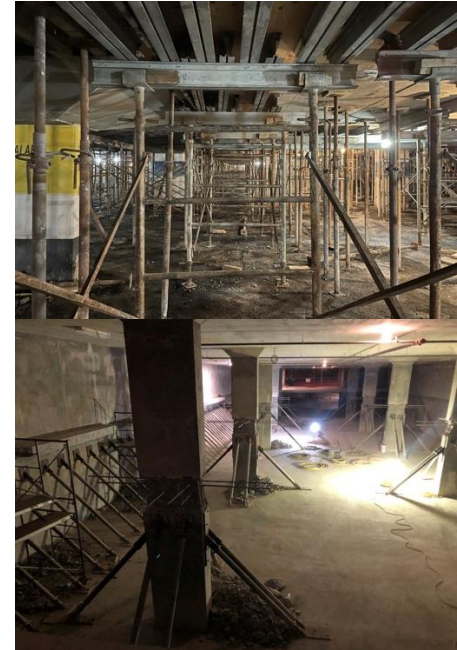
Theoretical Case Studies: Modeling

Maintained in a state of Good repair
Major Rehabilitation project only
“Let it Rot” – Reconstruction



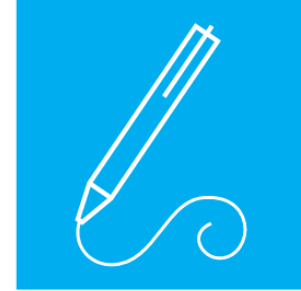
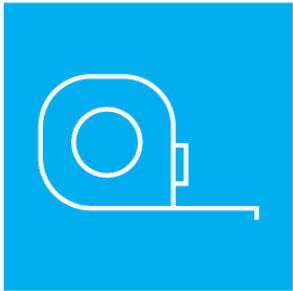
Case Studies: Assumptions

- 100,000 sq.ft. structures
- Life per Asset Depreciation Curves
- Project amortized over 20 years (fixed)
- Future repairs cost indexed to inflation
- Year One is 2024
- **Hard construction costs only**
- **Safety/liability costs not included**
- **Asset revenue generation not included**



Case Studies: Formulas

- PMT, IPMT, PPMT (Borrowing)
- $\text{Future Cost} = \text{Present Cost} * (1 + r)^{n, \text{ years}}$



Case Study: Example

\$1.5M today @ 2.5% inflation
= ~\$2.5M FV in 2044

\$2.5M loan @ 3.97% interest
= ~\$3.6M (2024 PV) or
~\$4.9M (2044 FV)



Theoretical Case Studies: TTDC Example

Single Rehab in Year 35, 2.0% interest 3.0% inflation:

- \$40 / sq.ft. (PV) or \$112.55 / sq.ft. (2058 FV)
- 100,000 sq.ft. x \$112.55 / sq.ft = \$11.255M loan (FV)
- \$11.255M loan over 20 years = 14.46M (2058 PV) or 19.05M (FV annualized)

Theoretical Case Studies: TTDC

Well Maintained

- Year 20 and 40 @ \$15/sq.ft.

Major Rehabilitation Only

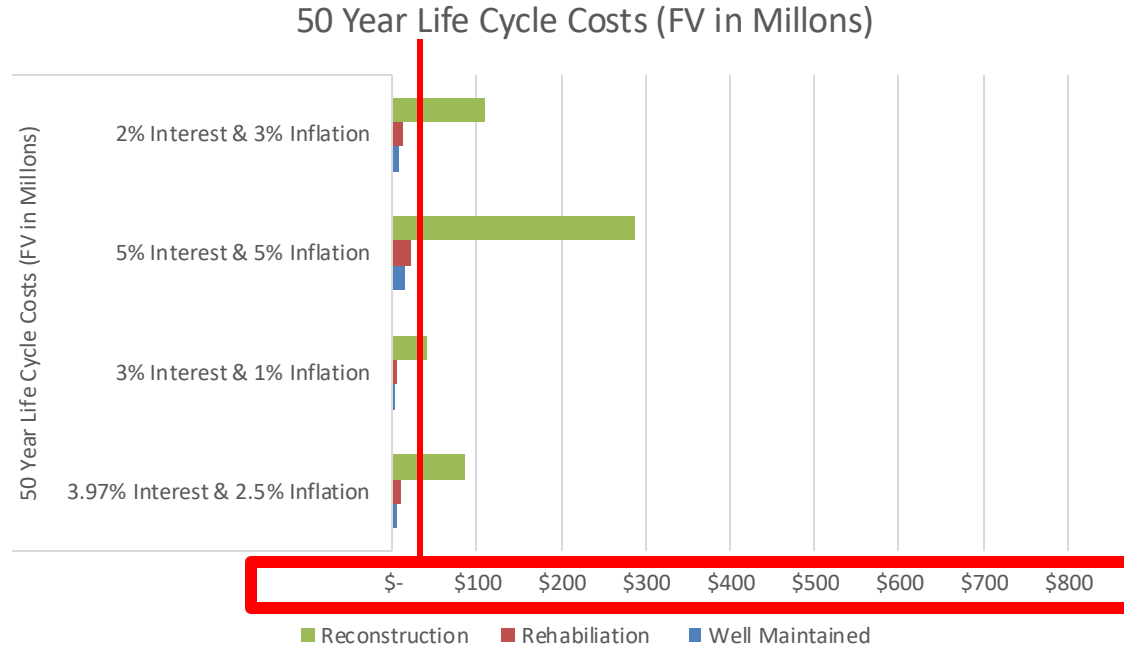
- Year 35 @ \$40/sq.ft.

Asset Replacement Cost

- Year 50 @ \$250/sq.ft.

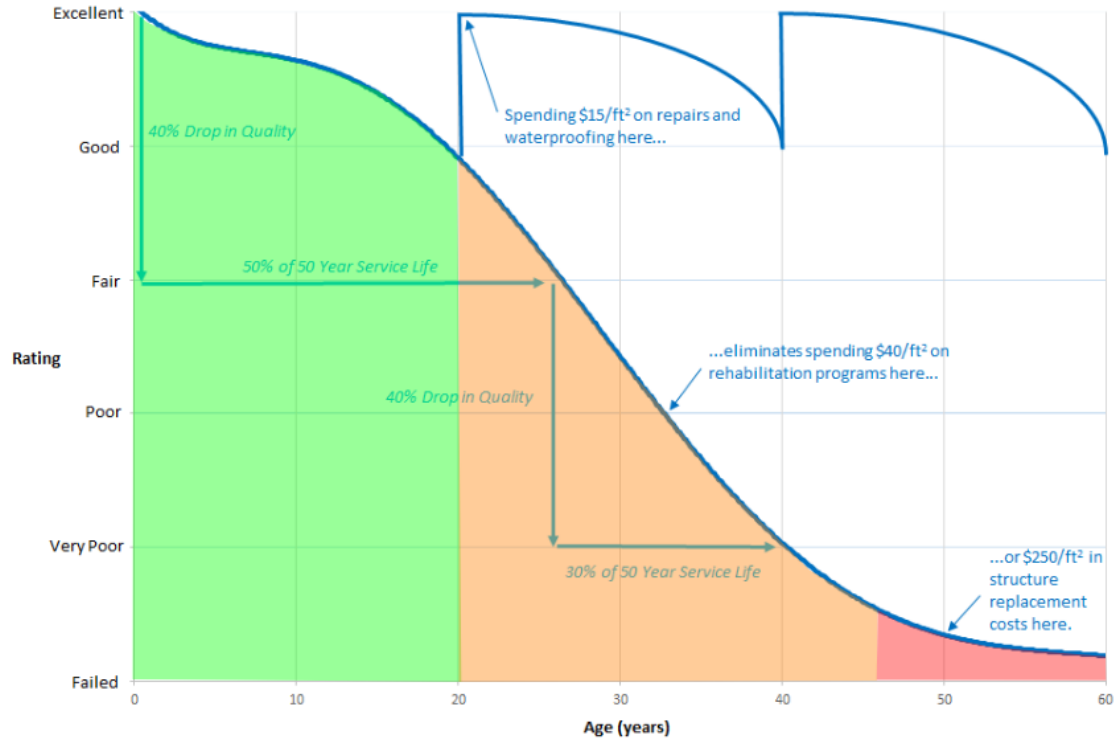


Case Studies: TTDC Garage



Case Studies: TTDC Garage

Parking Garage - Thin Traffic Deck Coating





Theoretical Case Studies: Asphaltic

Well Maintained

- Year 25 and 50 @ \$25/sq.ft

Major Rehabilitation Only

- Year 40 @ \$50/sq.ft.

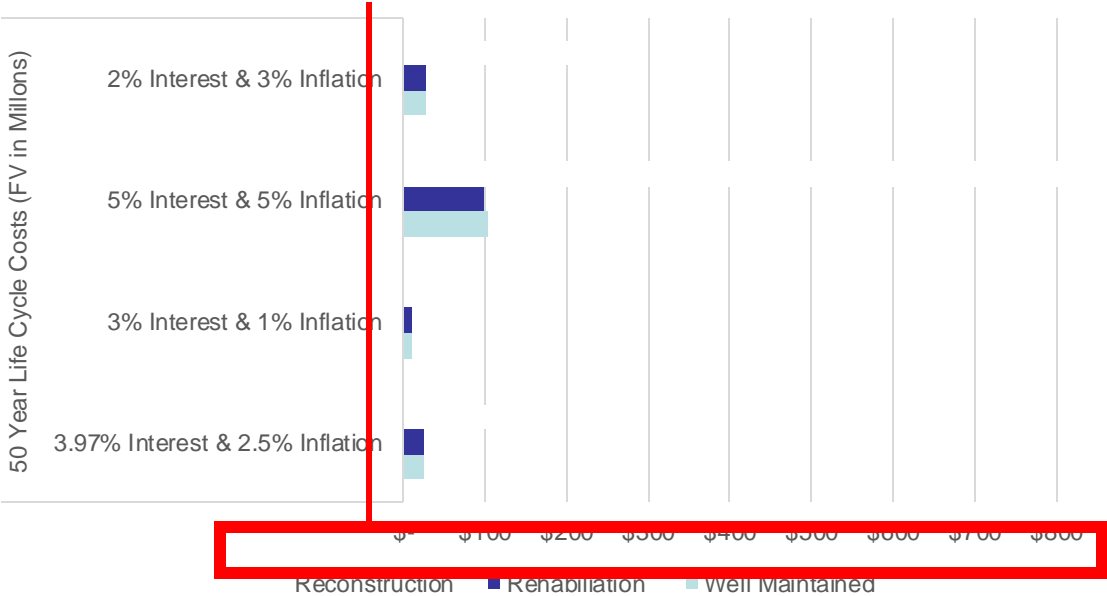
Asset Replacement Cost

- Year 50 @ \$300/sq.ft.

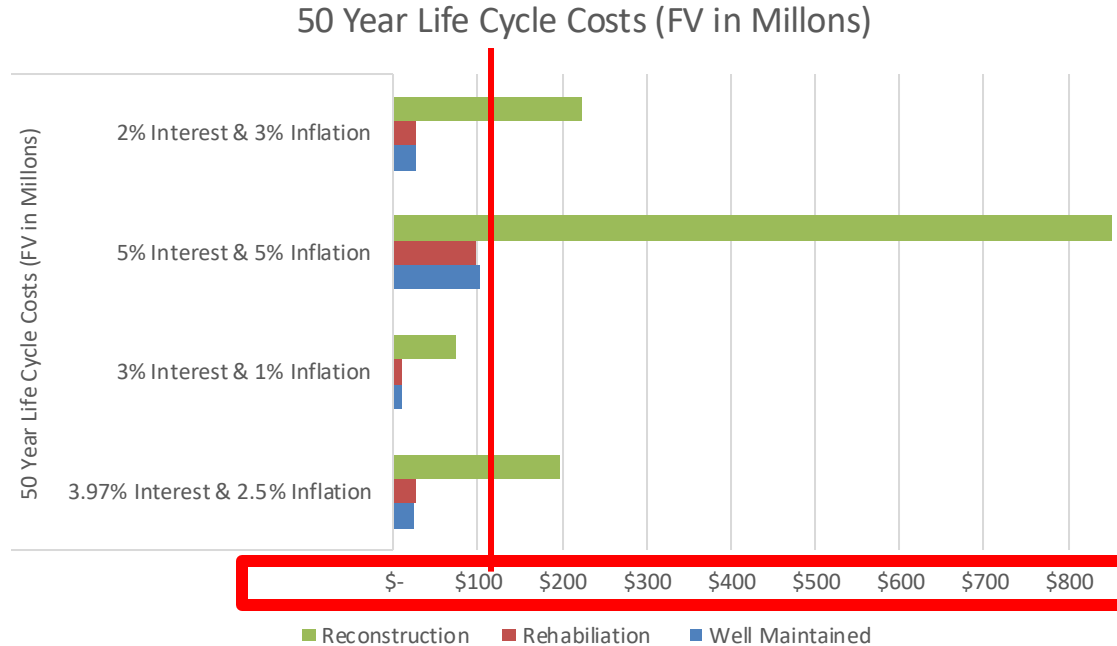


Theoretical Case Studies: Asphaltic

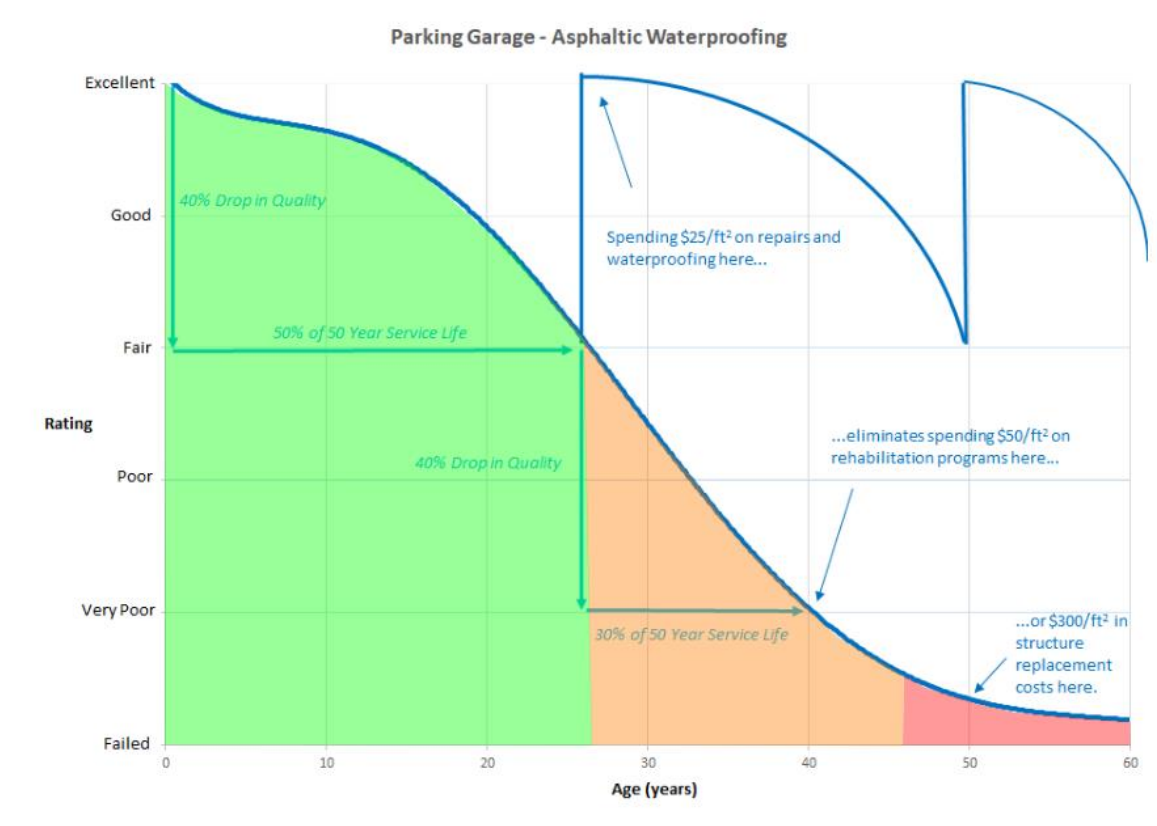
50 Year Life Cycle Costs (FV in Millions)



Theoretical Case Studies: Asphaltic



Theoretical Case Studies: Asphaltic





Case Studies: Podium/Plaza

Well Maintained

- Year 30 and 60 @ \$80/sq.ft

Major Rehabilitation Only

- Year 50 @ \$150/sq.ft.

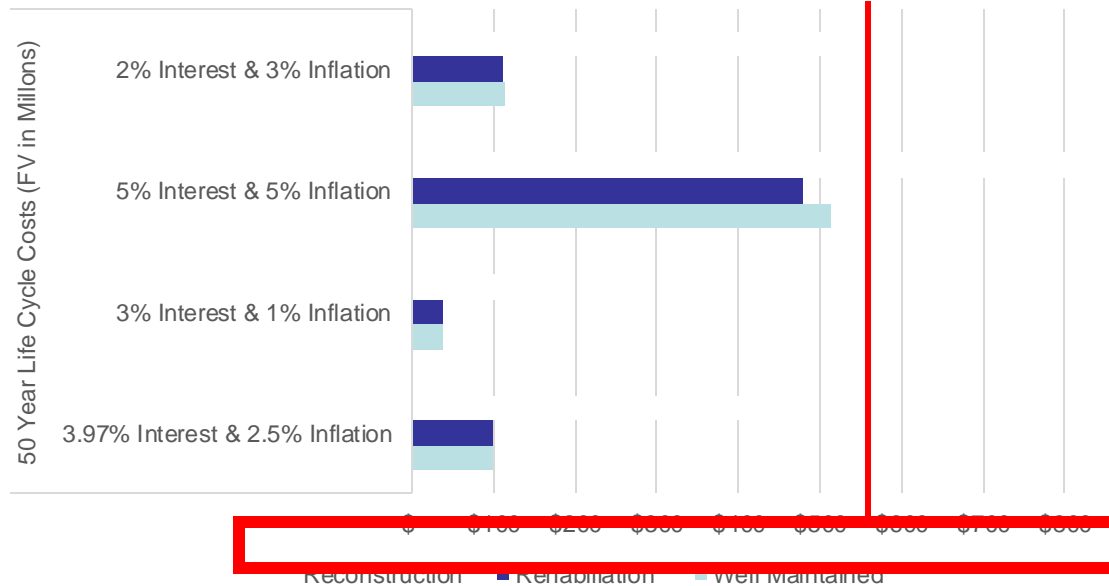
Asset Replacement Cost

- Year 75 @ \$350/sq.ft.



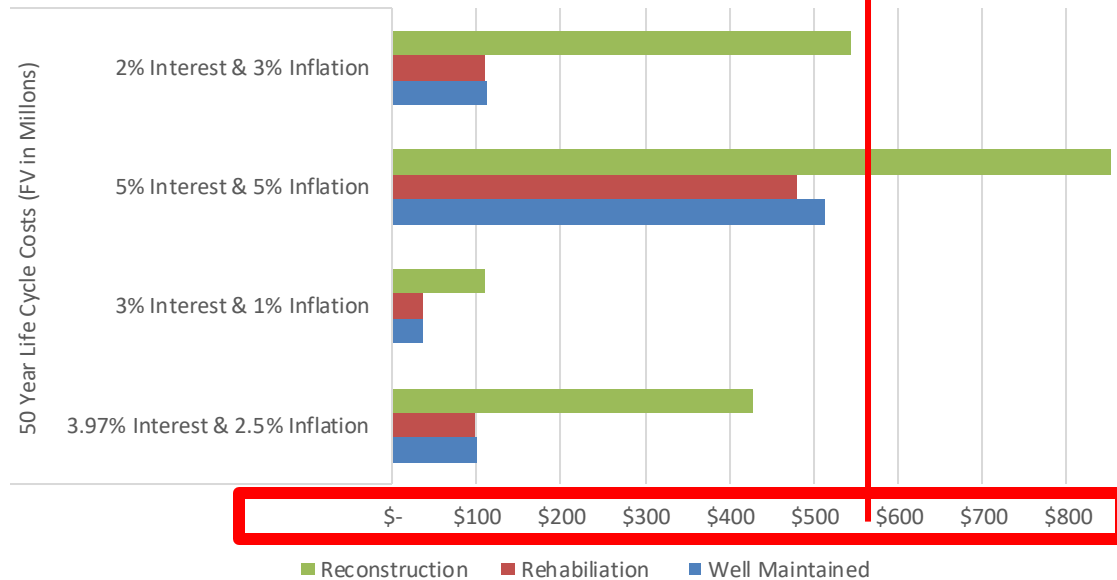
Case Studies: Podium/Plaza

50 Year Life Cycle Costs (FV in Millions)



Case Studies: Podium/Plaza

50 Year Life Cycle Costs (FV in Millions)





Case Studies: Exterior Sealant

Well Maintained

- Replace every 15-18 years @ ~\$10/lin.ft

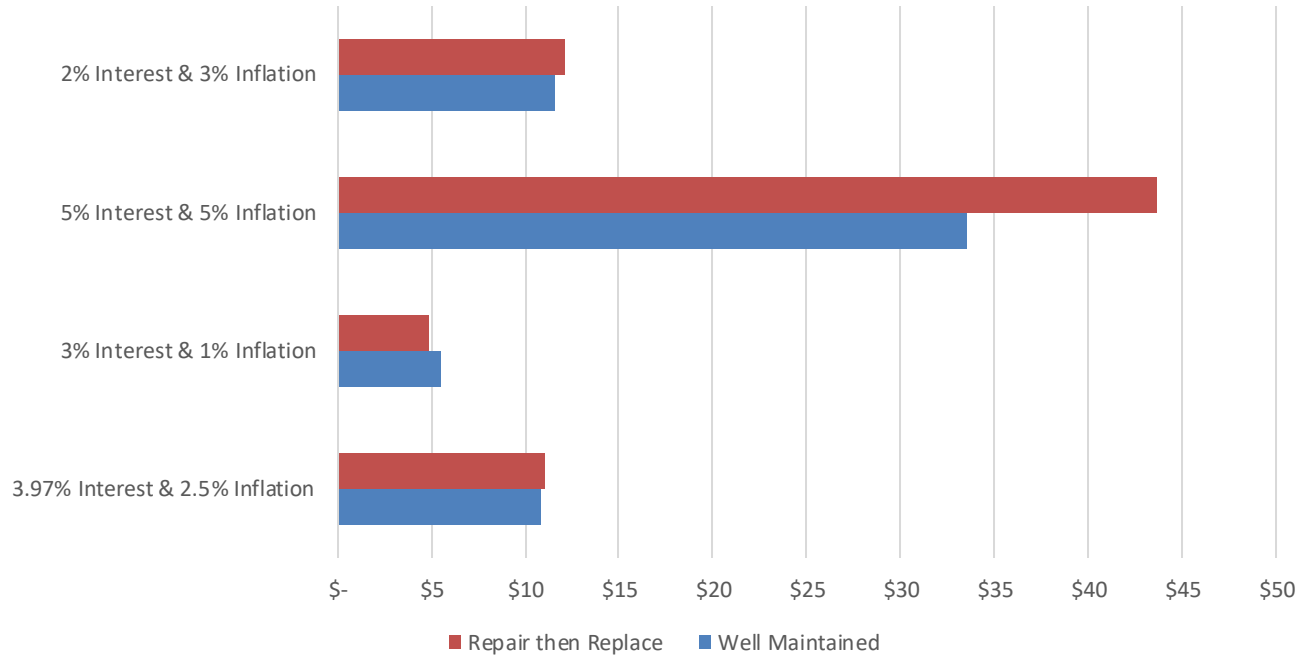
Repair then Replace

- Replace at 25+ years @ ~\$10/lin.ft
- Repair leaks between years 15-25 @ \$20,000 per year



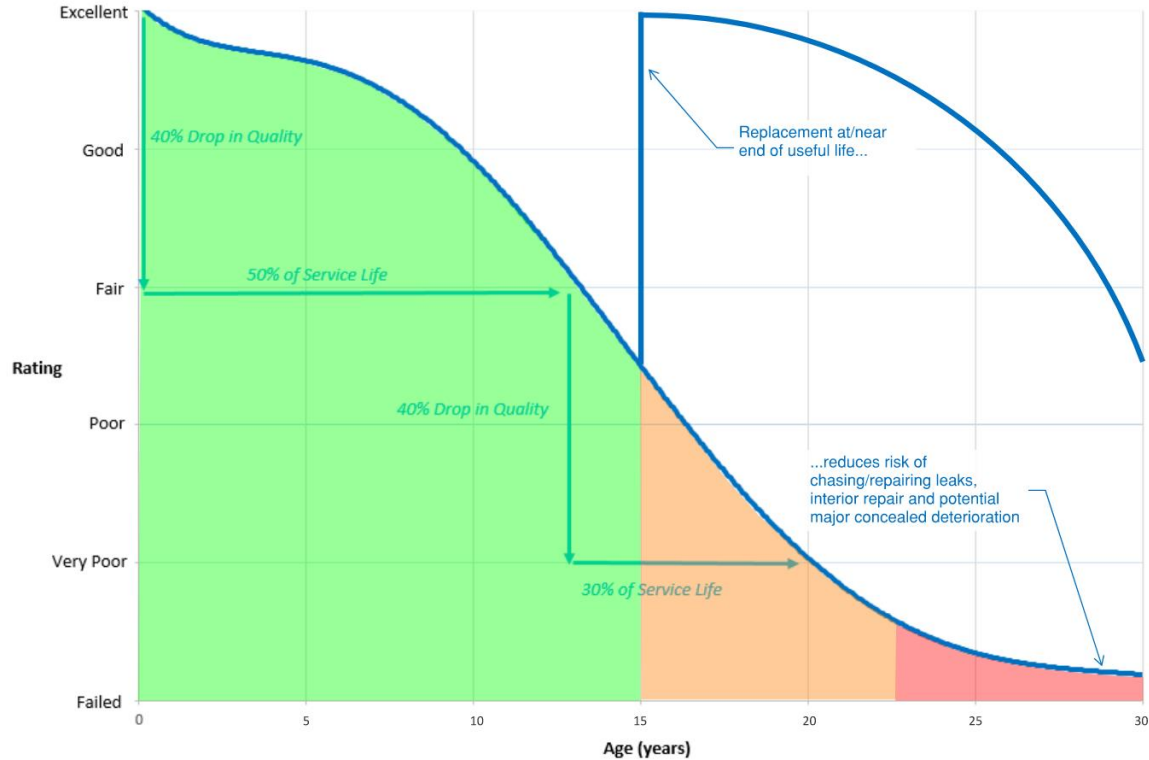
Case Studies: Exterior Sealant

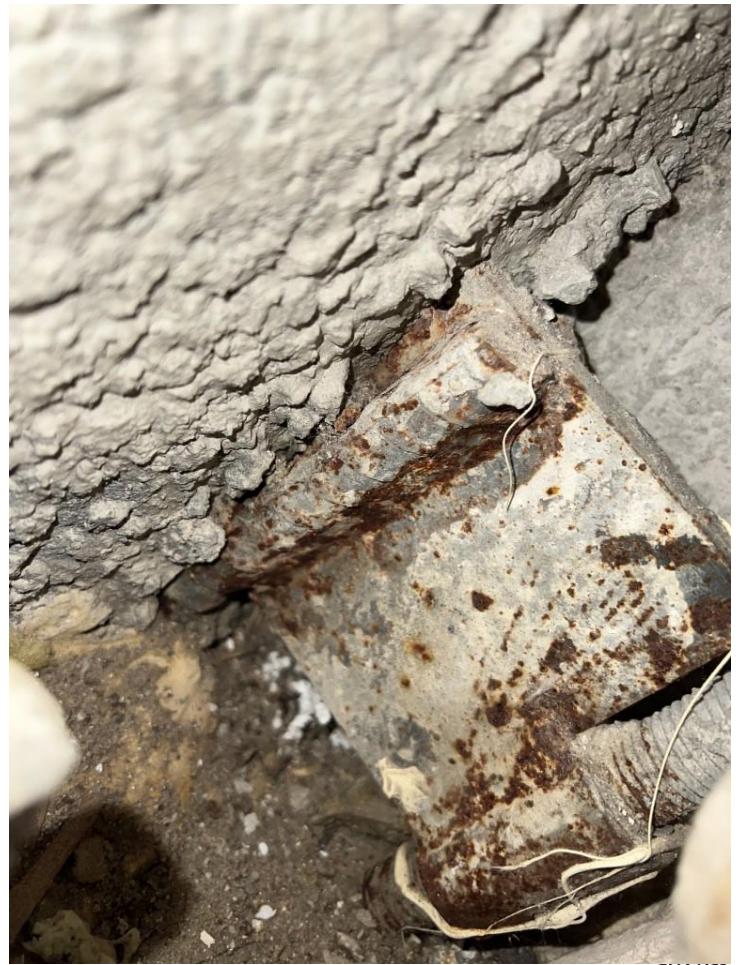
50 Year Life Cycle Costs (FV in Millions)



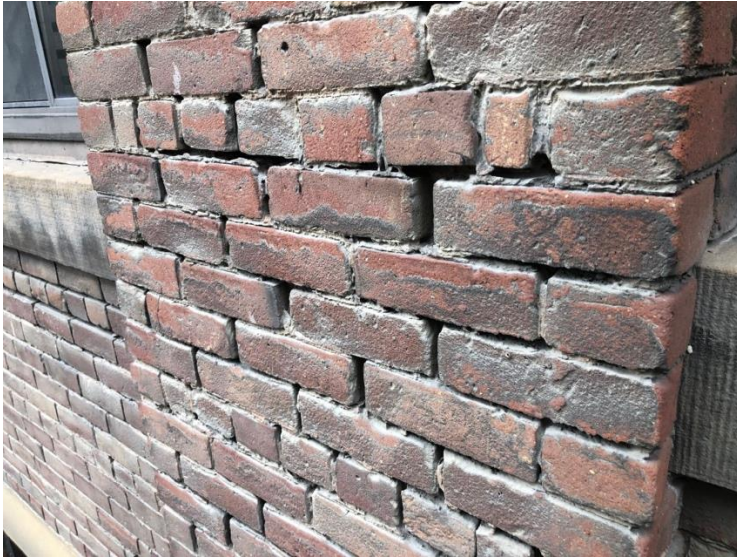
Case Studies: Exterior Sealant

Exterior Sealant





Case Studies: Masonry-Brick



Well Maintained

- Year 15, 30, 45 and 60 @ \$4/sq.ft

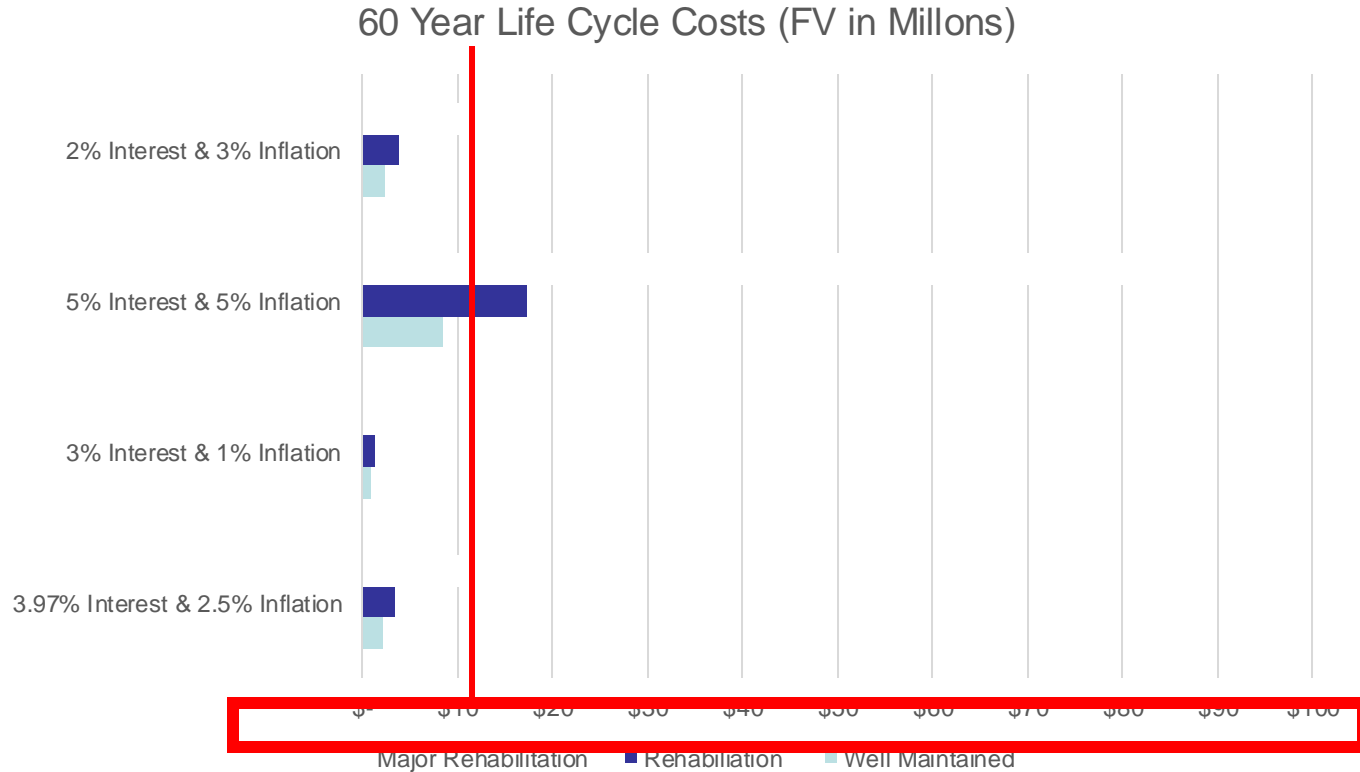
Rehabilitation

- Year 30 and 60 @ \$9/sq.ft.

Major Rehabilitation

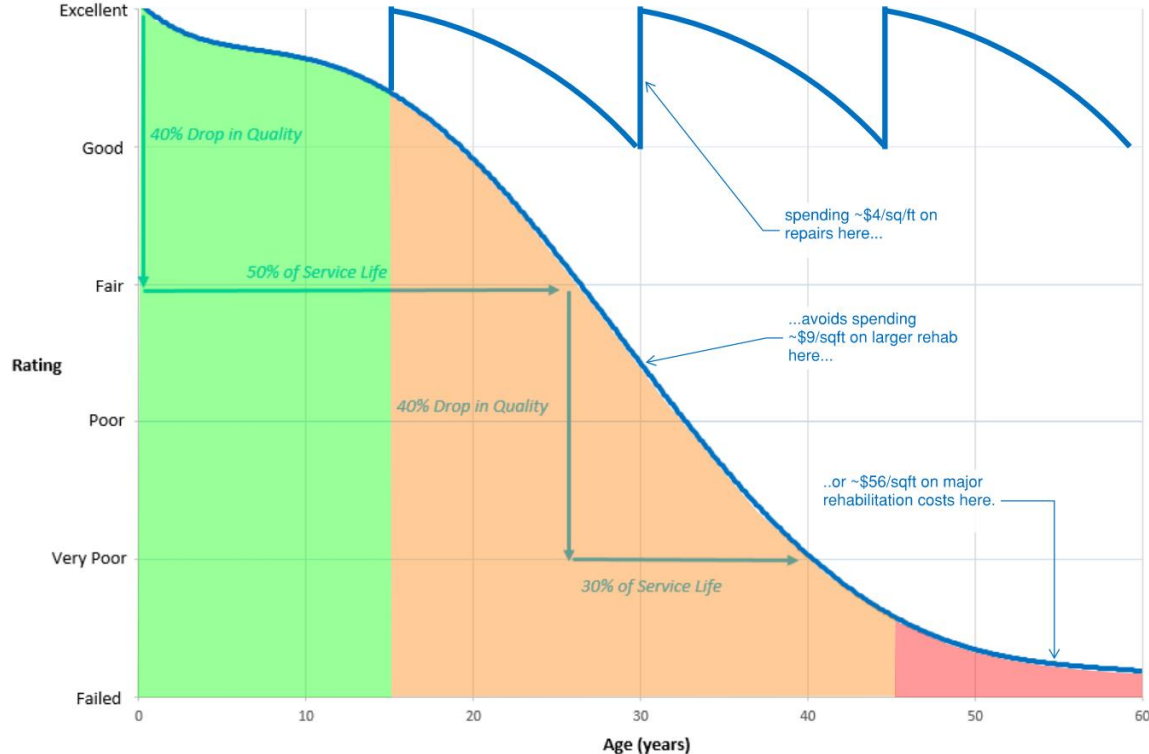
- Year 60 @ \$56/sq.ft.

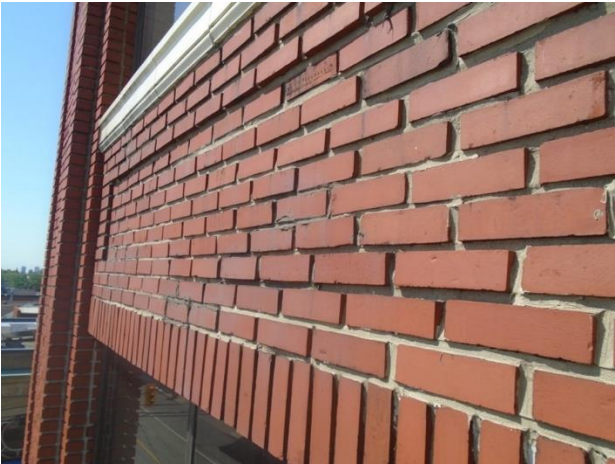
Case Studies: Masonry-Brick



Case Studies: Masonry-Brick

Masonry - Brick





Case Studies: Roofing- Conventional

Resurface

- Year 15, 30 @ \$25/sq.ft then replace at Year 45 @ \$40/sq.ft

Replace

- Year 20, 40, and 60 @ \$40/sq.ft.

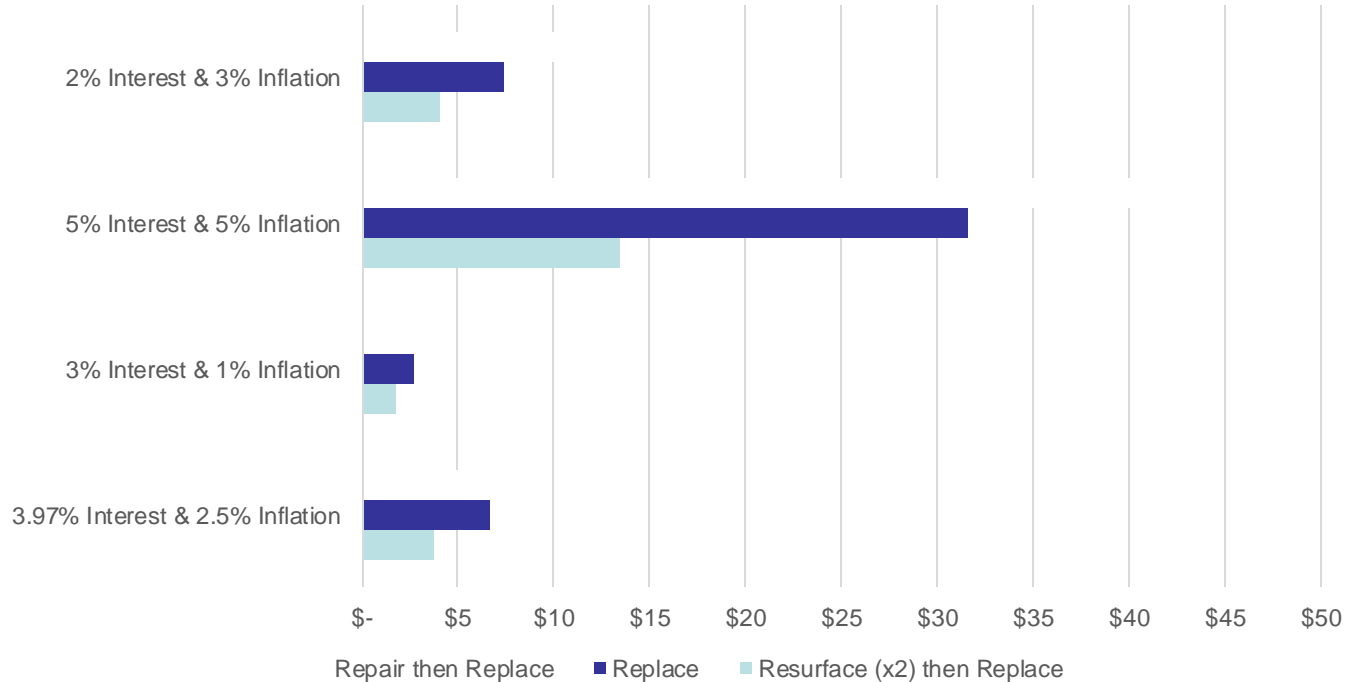
Repair then Replace

- Replace Year 30 and 60 @ \$45/sq.ft. but \$4/sqft repairs bi-annually from Year 20-30 and 50-60

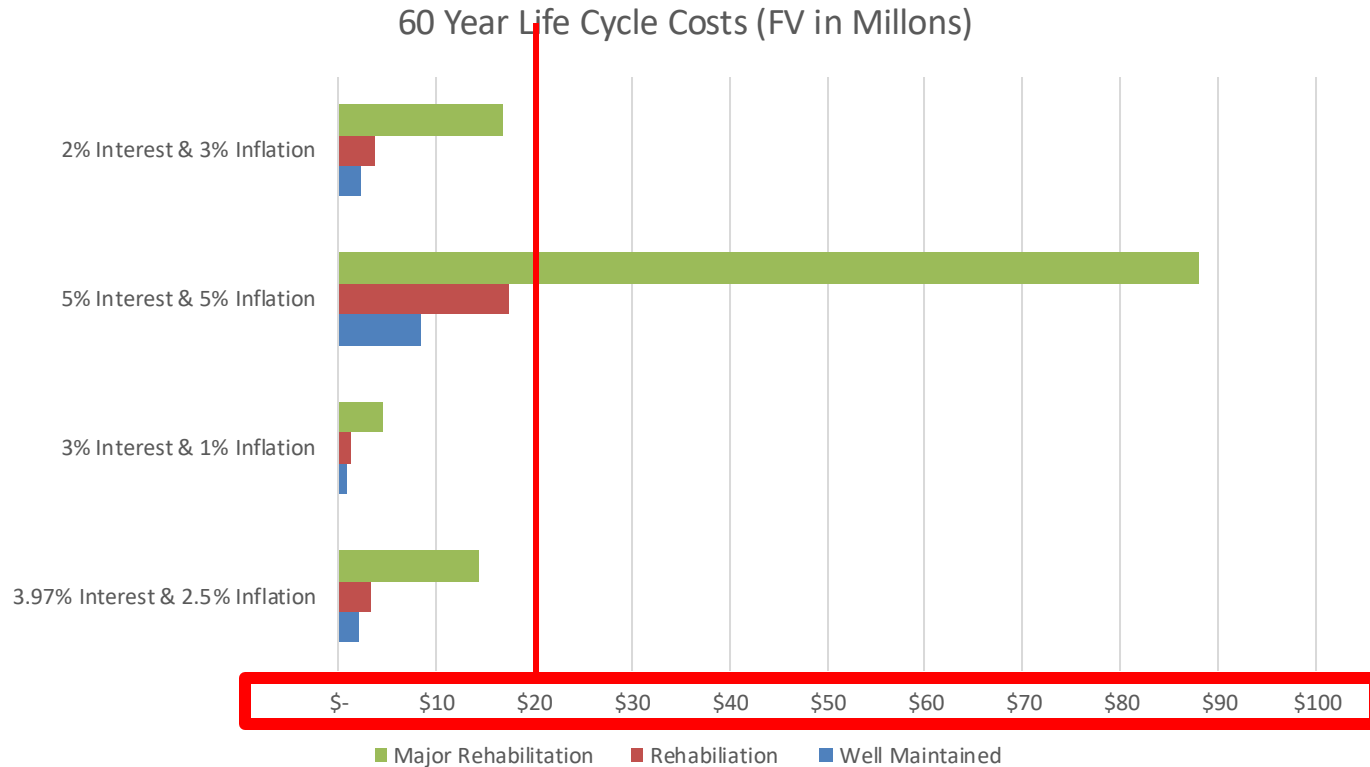


Case Studies: Roofing-Conventional

60 Year Life Cycle Costs (FV in Millions)

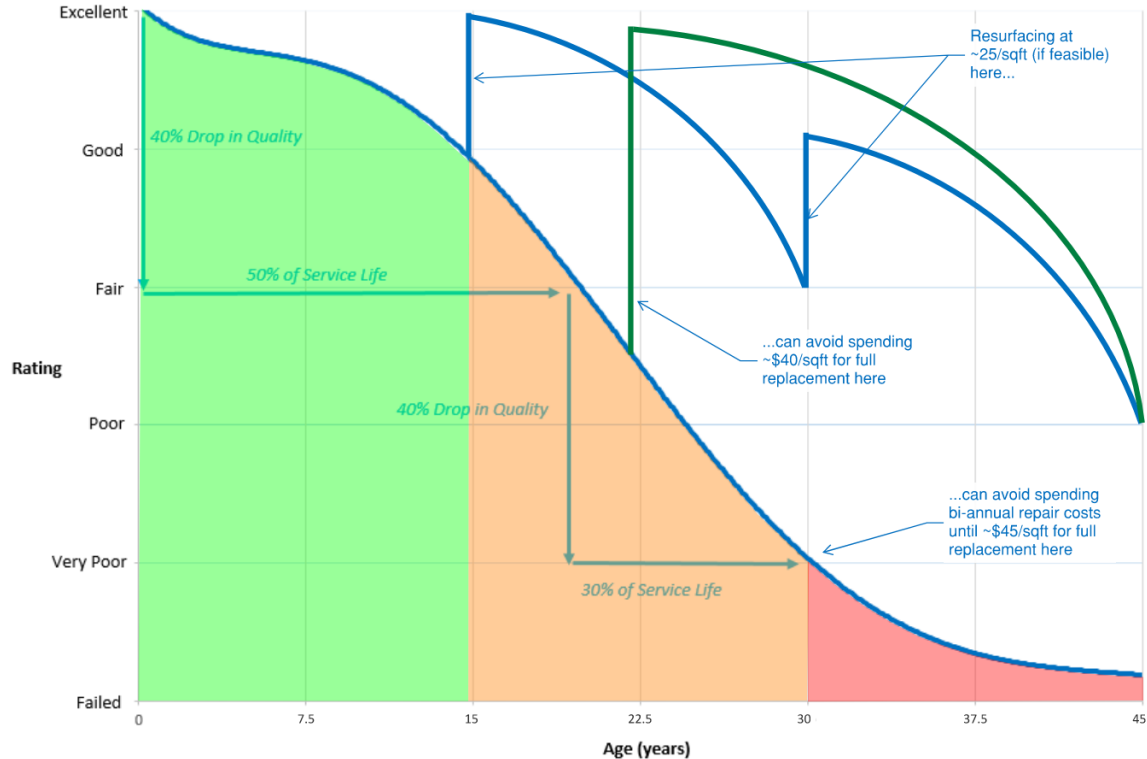


Case Studies: Masonry-Brick



Case Studies: Roofing-Conventional

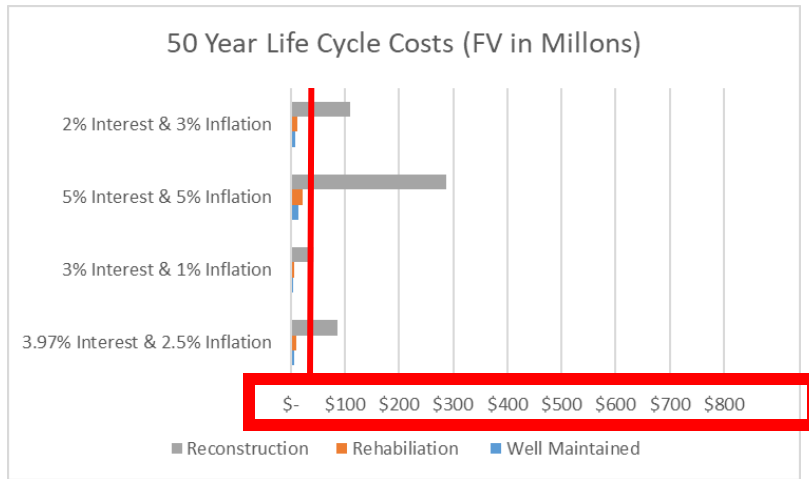
Roofing - Conventional



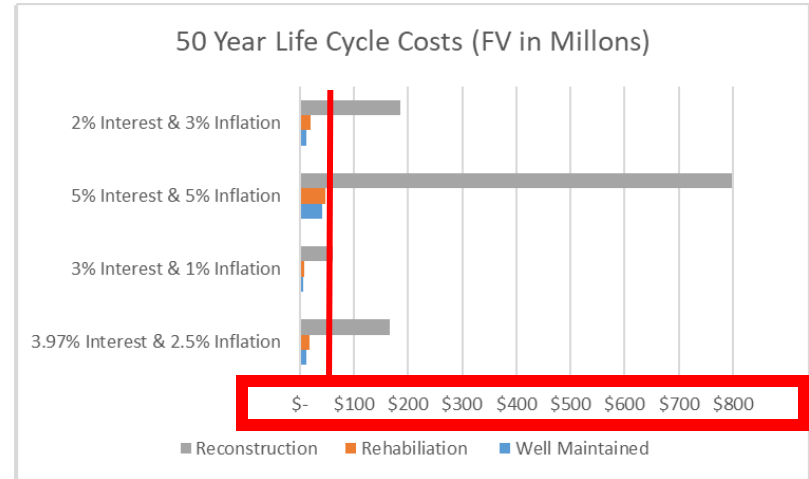


Case Studies: TTDC Garage

No Cost of Borrowing



No cost of borrowing



With Cost of Borrowing

Conclusion

- Maintaining assets in a state of good repair makes **economic and structural sense**
- **Deferring capital repairs results in higher capital costs**
- Condition assessments are required for life cycle planning and identifying repairs



References

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Questions?

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The logo consists of the lowercase letters 'r', 'j', and 'c' in a bold, sans-serif font. The 'r' and 'j' are connected at the bottom, and the 'c' is positioned to the right of the 'j'. The letters are white and set against a blue background.