Direct Ratings & Remaining Service Life

July 29, 2021

Alpha™
Facilities Solutions
Building perspective.

Have You Read This Document?

Did You See This Table?

Table 1. Condition survey inspection matrix by objective.

No.	Objective	Distress with Quantities	Distress	Direct
1.	Determine condition of Component-Section (CSCI)	Best	Better	Good
2.	Determine rollup condition of system, building, etc.	Best	Better	Good
3.	Provide a condition history	Best	Better	Good
4.	Compute deterioration rates	Best	Better	Limited

No.	Objective	Distress with Quantities	Distress	Direct
5.	Calibrate CSCI prediction curves	Best	Better	Limited
6.	Compute/re-compute RML	Best	Better	Limited
7.	Determine broad scope of work for planning	Good	Limited	Limited
8.	Establish when cost effective to replace	Better	Good	No
9.	Compute/re-compute RSL	Best	Good	Limited
10.	Quality control (post-work assessment)	Better	Good	No

Recall

Most if not all of us ONLY use Direct Ratings

RSL determines if a Section gets replaced or not

- **Replace if RSL < Maximum RSL for Replacement**

RSL Calculation is Limited for Direct Rating!

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10.	Quality control (post-work assessment)	Better	Good	No

Experiment To See What Limited Means

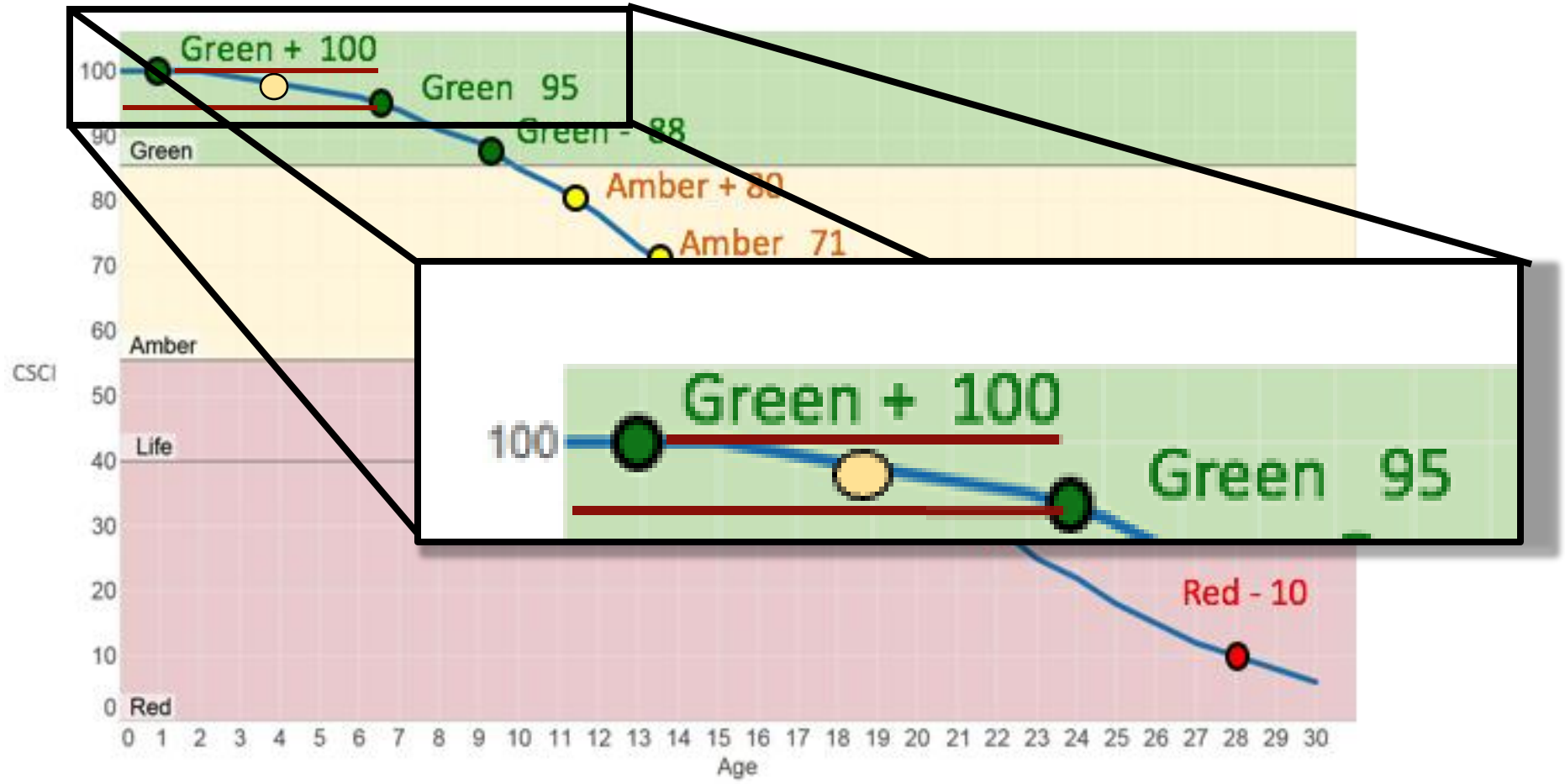
There are three potential RSL errors in BUILDER

1. **Assessor selecting the right rating**
   - **Eliminate by: Have perfect assessors in the experiment**
2. **Error due to installation year**
   - **Eliminate by: Know exactly when sections are installed**
3. **Error due to the 9 ratings**
   - **This is what we want to study**

Thinking About It

Direct Rating

- **Assessor only allowed to select one of 9 points on the curve**
- **What are they supposed to select when the condition is between these points?**
  - **Anything they choose will have an error in it**



Experiment Design

Experiment

- **Start with a section with a Design Life of 50 (Steel Windows)**
- **Created 3 sets of 51 sections of Steel Windows**
- **Each set had**
  - **One section installed in FY2021**
  - **One section installed in FY2020**
  - **And so on for 51 years**

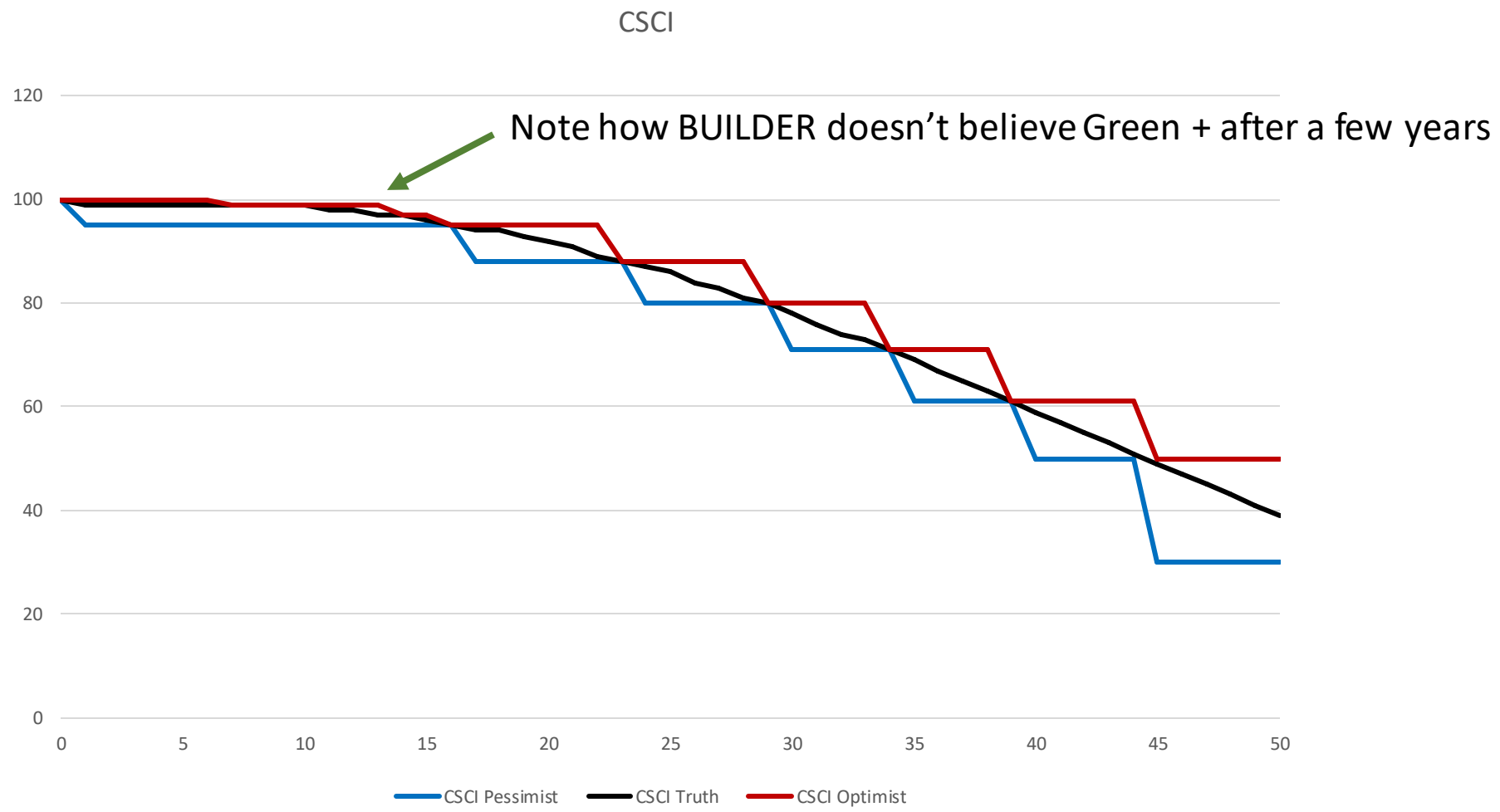
Experiment Design

Experiment

- **What if we**
  - **Assume the actual life of all the sections was the design life**
  - **Didn’t give one set of sections any inspections**
    - **Then the CI and RSL are the Truth for that set**
  - **Had an Optimistic Assessor rate one set of sections in FY2021**
    - **When the section’s condition was between two ratings, they always choose the better rating**
  - **Had a Pessimistic Assessor rate one set of sections in FY2021**
    - **When the section’s condition was between two ratings, they always choose the worse rating**
- **How would the CIs and RSLs compare to the Truth**

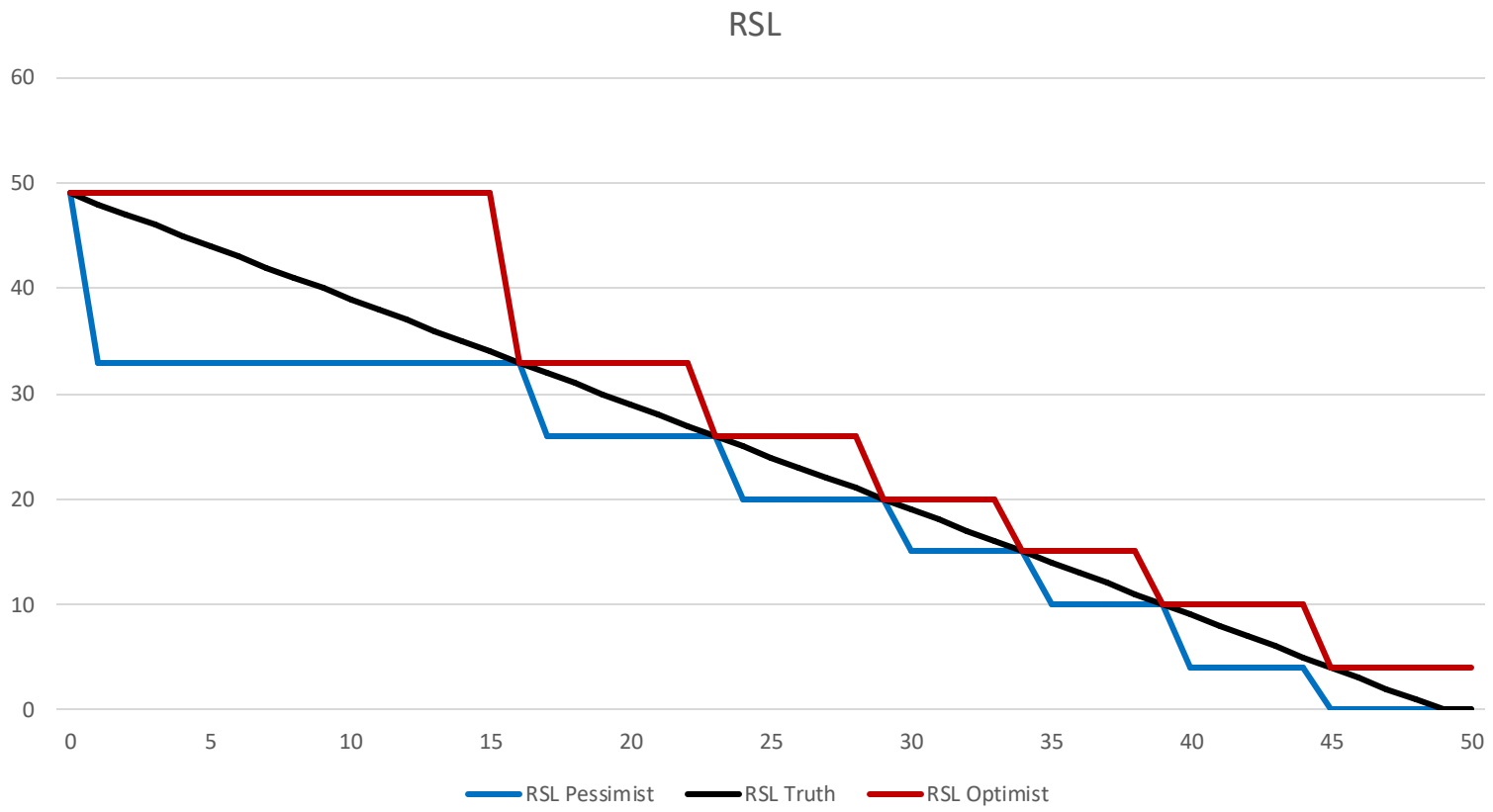
Experiment - CSCI Values

What happens if one assessor always chose the higher rating, and another chose the lower rating



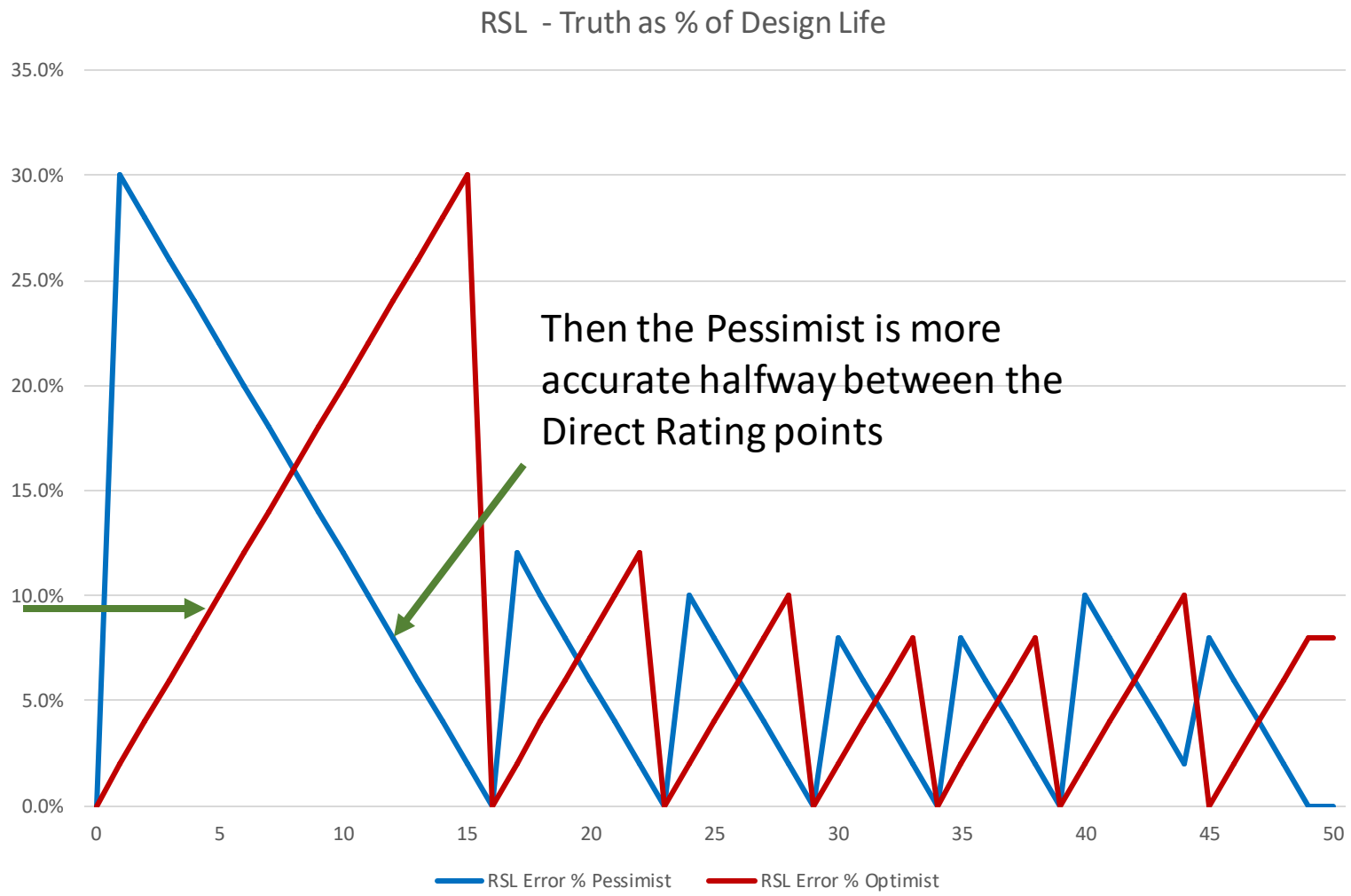
Experiment - Remaining Service Life

What happens if one assessor always chose the higher rating, and another chose the lower rating



Experiment - Remaining Service Life Error

What happens if one assessor always chose the higher rating, and another chose the lower rating (Pessimist Error shortens life, Optimist Error lengthens life)

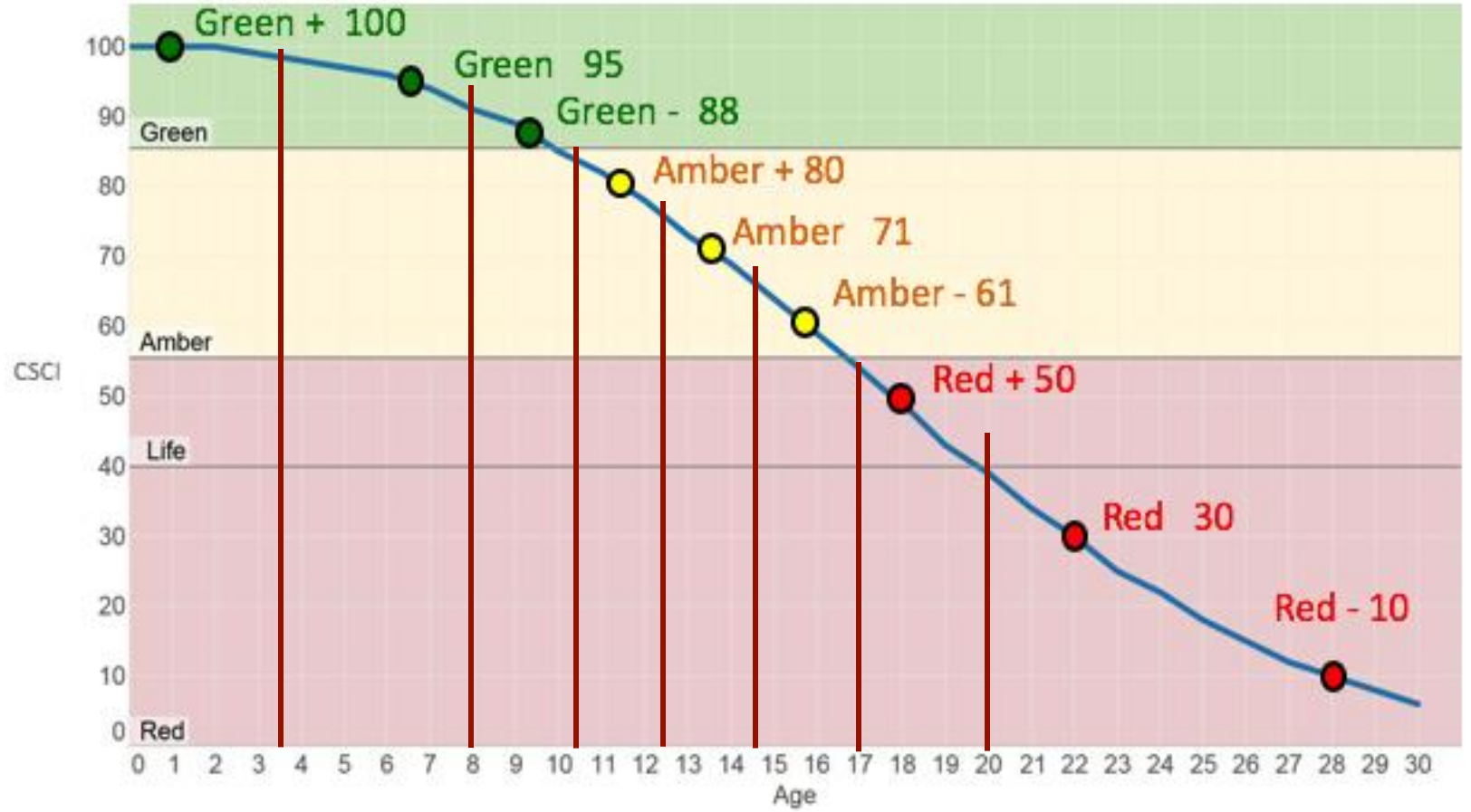


Then the Pessimist is more accurate halfway between the Direct Rating points

Optimist is more accurate at the start

Experiment - Remaining Service Life Error

What happens if an Assessor choose the rating that will minimize the error

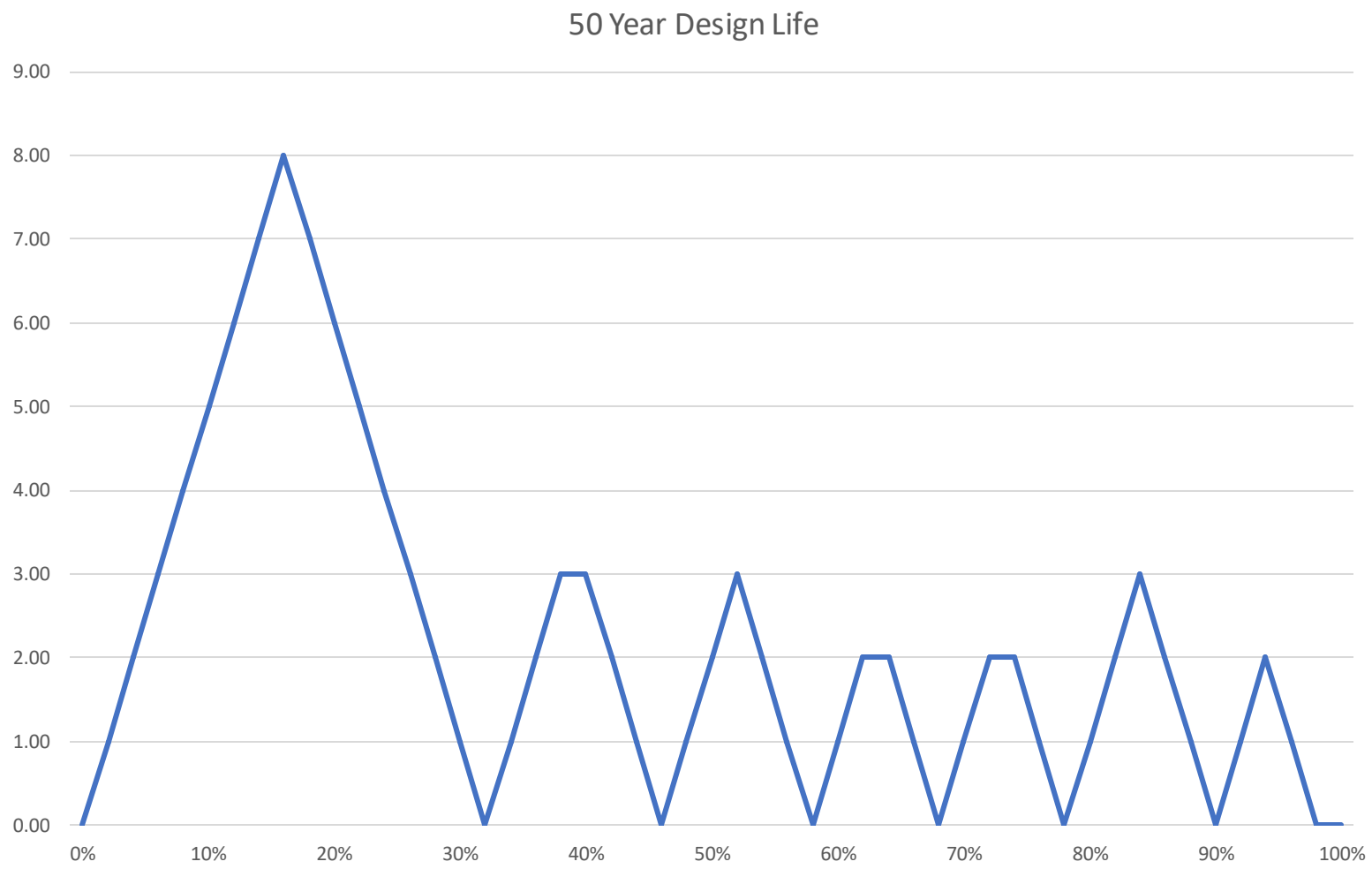


Experiment - Remaining Service Life Error

Curve below is the error (as a % of Design Life) in RSL due to the Direct Rating Method

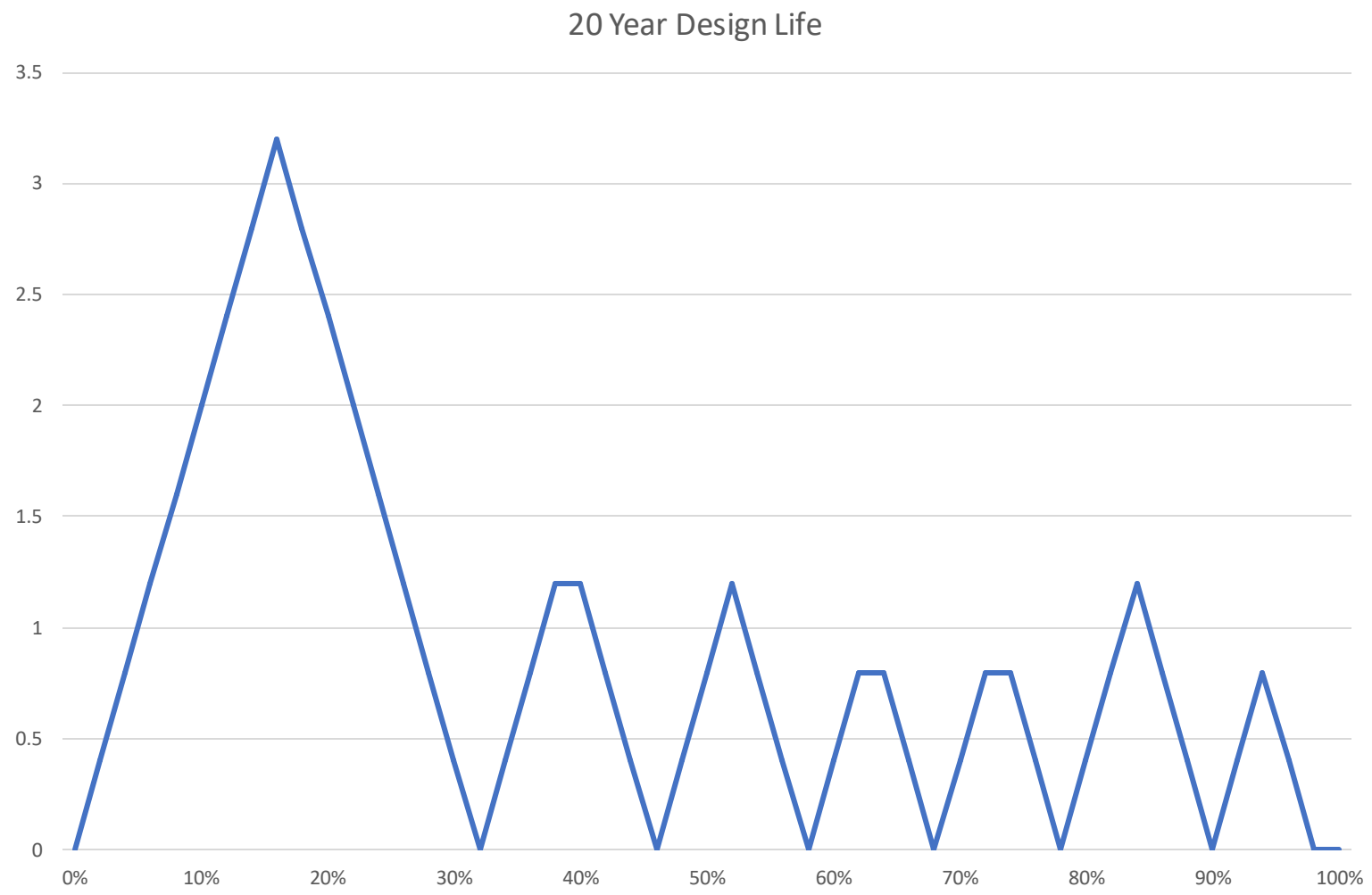
Experiment - Remaining Service Life Error

Curve below is the error (in Years) in RSL due to the Direct Rating Method for a Design Life of 50 Years



Experiment - Remaining Service Life Error

Curve below is the error (in Years) in RSL due to the Direct Rating Method for a Design Life of 20 Years



Observations

RSL calculation is Limited in the first 25% of Design Life

- **Bad News**
  - **Up to 16% of Design Life**

- **Good News**
  - **BUILDER only forecasts for 10 years**
  - **Design Life sections in this state will probably not show up in the forecast work plan**

RSL calculation is Pretty Good after the first 25% of Design Life

- **Good News**
  - **Max of 6% error due to the Direct Rate method**

Conclusions

Direct Rating Method is still Great

- **Be aware for longer forecasts that there is some error in the RSL**
- **Especially true if you want to forecast beyond 10 years**
- **Don’t know how much error is introduced by**
  - **Error in the installation year**
  - **Interrater reliability**
- **This experiment only had one inspection per section**
  - **The more inspections, the more accurate the forecast**

Advice

When building a 5 Year Plan

- **Identity everything that needs to be replace in the next 8 years**
- **Look at these sections to see if their forecast is accurate**
- **Remove items**
  - **Don’t need to be replaced**
- **Add items**
  - **That need to be replaced sooner**
  - **That will be impacted, like ceiling finishes if they will be damaged when replacing the light fixtures**

Presented by:
Stephen Desrosiers
CTO
ALPHA Facilities Solutions, LLC

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Facilities Solutions
Building perspective.