


Panel Discussion: Benefits and Risks of Various Project and Contract Structures in Construction

# *Performance-Based Design:*

# *Why aren't we leveraging it to its full potential?*

# Panel Discussion: Benefits and Risks of Various Project and Contract Structures in Construction



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# Performance-Based Design: Why aren’t we leveraging it to its full potential?

# Introduction

Karl Terzahi (1948):

*Base the design on whatever information can be secured. Make a detailed inventory of all the possible differences between reality and assumptions. Then compute, on the basis of the original assumptions various quantities that can be measured in the field…On the basis of such measurements , gradually close the gaps in knowledge and, if necessary, modify the design during construction.*

# Introduction

Ralph Peck (1969):

*Although the Observational Method often offers the best way out of difficulties that have already developed, its intended use from the inception of a project offers even more opportunity for imaginative planning and may lead to the best design from the point of view of safety, economy, and time.*

*...the potential for savings of time and money without sacrifice of safety is so great that every engineer who deals with applied soil mechanics needs to be informed.*

# Introduction

- What is your experience with the Observational Method (OM)?
- What does it mean to say a design is ‘prescriptive’ or ‘performance-based’?
- What is a ‘collaborative contract’ model?
- How can the OM be ‘leveraged’?
- What factors have changed since 1969???

# The Risk of Prescriptive Designs

- Prescriptive criteria, alone:
  - Does not make a design safe
  - Can lead to unnecessary work being performed…adding cost and increasing construction safety exposure
- Prescriptive criteria does not do a good job of accounting for uncertainty.

# The Risk of Prescriptive Designs

- Overly conservative designs can lead to the construction team taking risks and cutting corners
- Examples:
  - Overstressing of supported soils leading to
    - Creep which can lead to destressing of tiebacks
    - Heave of nearby structures
  - Over-excavation past support levels
  - Less attention paid to monitoring results

# Case History: Cedarvale Subway Station

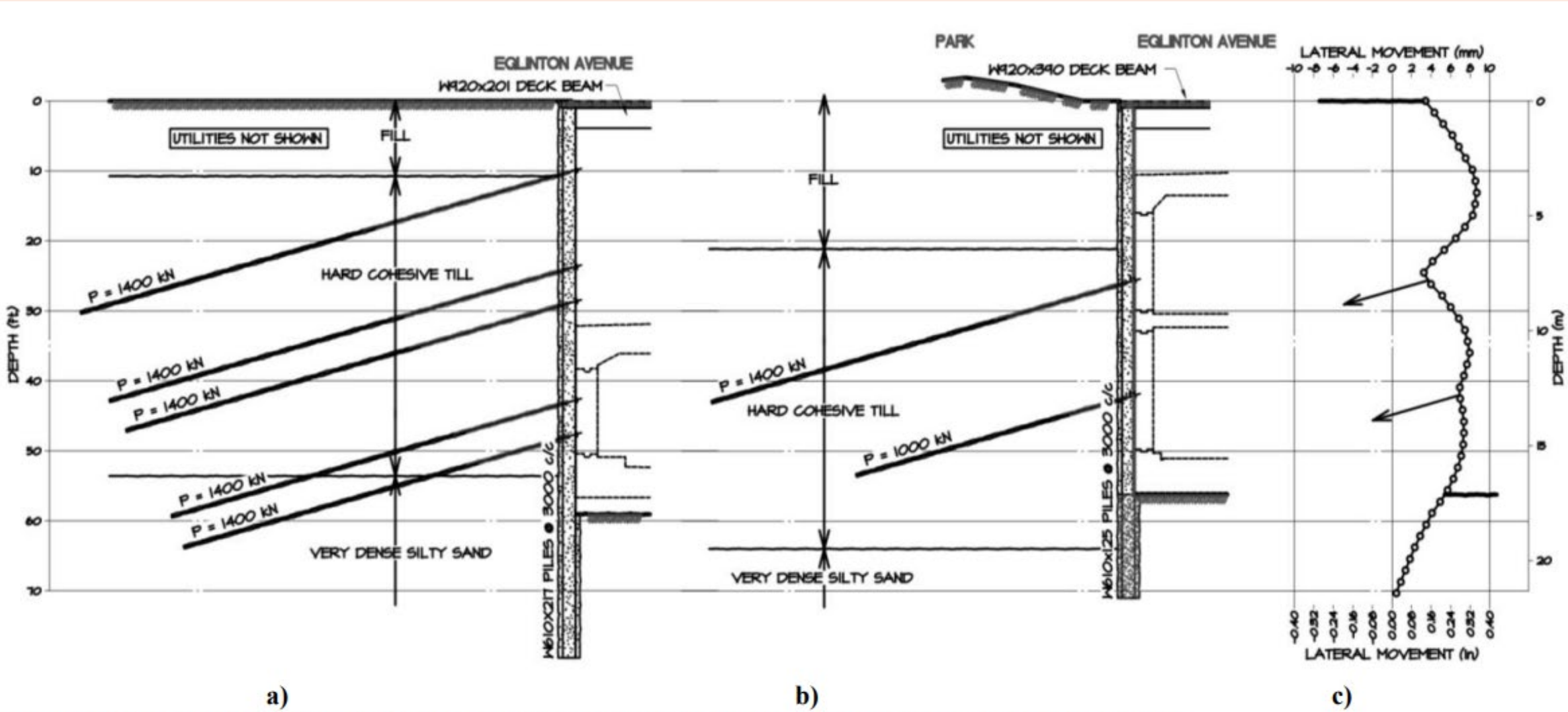



**Figure 4: a) LS2 cross section, b) Cedarvale station cross section, c) Cedarvale station inclinometer plot**

# Case History

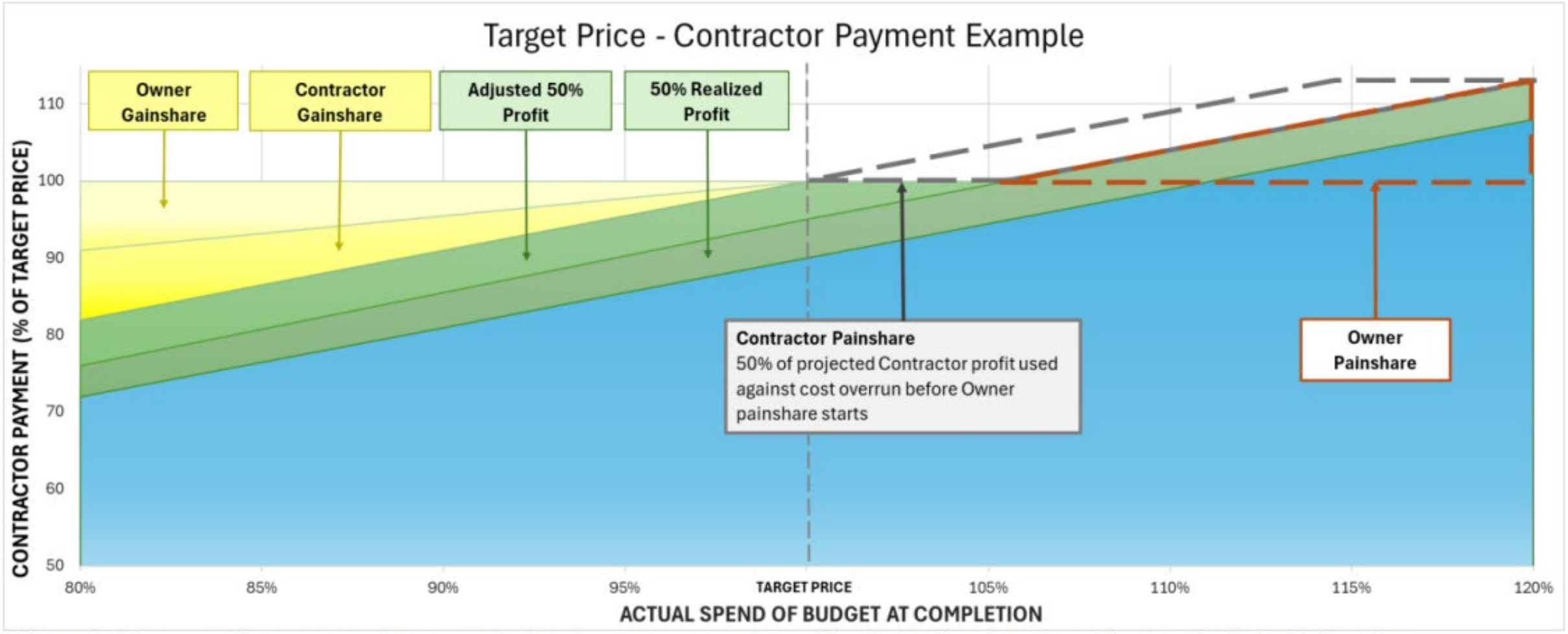



**Figure 5: Target price contract framework showing contractor incentive (gainshare) and profit claw back (painshare)**

# Observational Method & Contracts

- Collaborative contract models:
  - Progressive Design-Build (PDB)
  - Construction Manager/General Contractor (CMGC)
  - Construction Manager at Risk (CMAR)
- Do these models allow for the use of ***observation driven***, performance-based designs?
- Do the contracts incentivize risk sharing?

# Observational Method & Contracts

Collaborative contract models cover a spectrum of risk-sharing methods.

- Simpler:
  - One or two parameters of variability
  - Contract “levers” to trigger additional work based on performance levels.
- More complex – risk borne by multiple parties:
  - Target pricing
  - Open book – progressive design methods
  - Owner/contractor alliances

# Contract Implementation

- What are indicators that OM-based contract terms would make sense?
  - OM base cost should be lower than alternative.
- Private procurement:
  - Owner has more flexibility
  - If there is a trusting relationship, ideas can be shared informally, and terms can be reached without infringing on intellectual property rights and without an owner being taken advantage of via a contractor's superior knowledge/experience/expertise
- Public procurement:
  - Reference Concept Design (RCD)
  - Geotechnical Baseline Report (GBR)
  - Performance criteria
  - Qualifications-based procurement

# Observational Method – Additional Notes

1. Perform geo investigation
2. Create GBR to convey and agree upon:
    a. what is known
    b. a range of conditions…including the most unfavorable
3. Create base design based on most probable conditions
4. Determine performance indicators to be observed
5. Create contingency designs…or establish contingency design steps
6. Outline “triggers” for contingency measures during construction and action plans for swift implementation

# Conclusions

Ralph Peck (1969):

*...if done correctly, the Observational Method is the safest method of design, and an opportunity to get the design exactly right by confirming the assumptions along the way. A conservative design without the same level of validation is not de facto safer...*

*The lowest price is rarely the lowest overall risk-adjusted project cost.*

*Setting appropriate incentives for all parties to bring ideas to the table and share in the potential risks and opportunities is key to the success of this approach.*

*The goal of collaborative contracting is support the development of trust...as it is impossible to contractually enforce it.*

# Reframing *Adversarial* Contracts

- *Is it possible to shift away from our long-standing culture of adversarial contracts?*
- *How can we persuade owners that early de-risking – through transparent discussions around contingencies – can actually reduce  project uncertainty?*
- *In what ways does perceived contractual risk obscure the management of real construction risk?*

# Identifying Collaborative Project Candidates

- *What indicators suggest a project is well-suited for a collaborative contracting model?*
- *In non-competitive processes, how can public agencies still demonstrate due diligence and value for money to stakeholders?*

# Owner Accountability & Key Individuals

- *Collaboration hinges on commitment at all levels – including continuity of key personnel. Contractors are often required to commit to key individuals on a project. Should owners be held to the same standards?*
- *How can we address the imbalance of resource commitments between owners and contractors when it comes to key personnel?*

# Flow Down Contracts

- *How can collaborative contract principles be effectively flowed down to subcontractors and consultants?*

# Role of Geotechnical Baseline Reports (GBRs)

- *What role do Geotechnical Baseline Reports play in collaborative contracts, and how is baseline data differently compared to traditional models?*

# Building Trust

- *Trust is the backbone of collaboration. What have you found to be the most effective strategies to build and maintain trust across diverse project teams?*
- *Are tools like project kickoffs or dedicated key individuals proving successful?*
- *Are there other, newer techniques worth exploring?*



# *Next Steps???*