



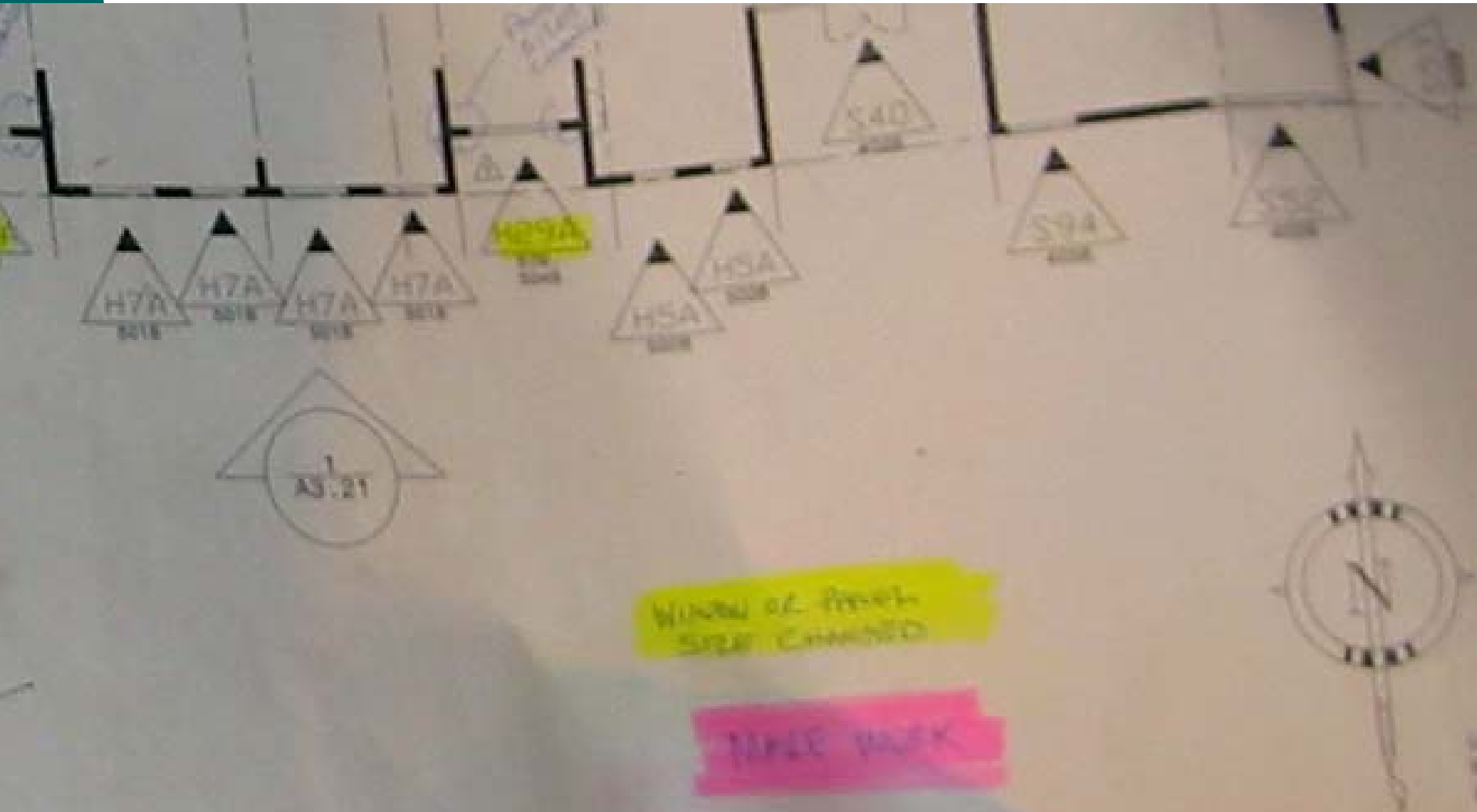
# Tolerance Analysis and Work-Structuring

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Colin Milberg and Iris Tommelein  
University of California at Berkeley

IGLC-12

# Concrete and Window Interface



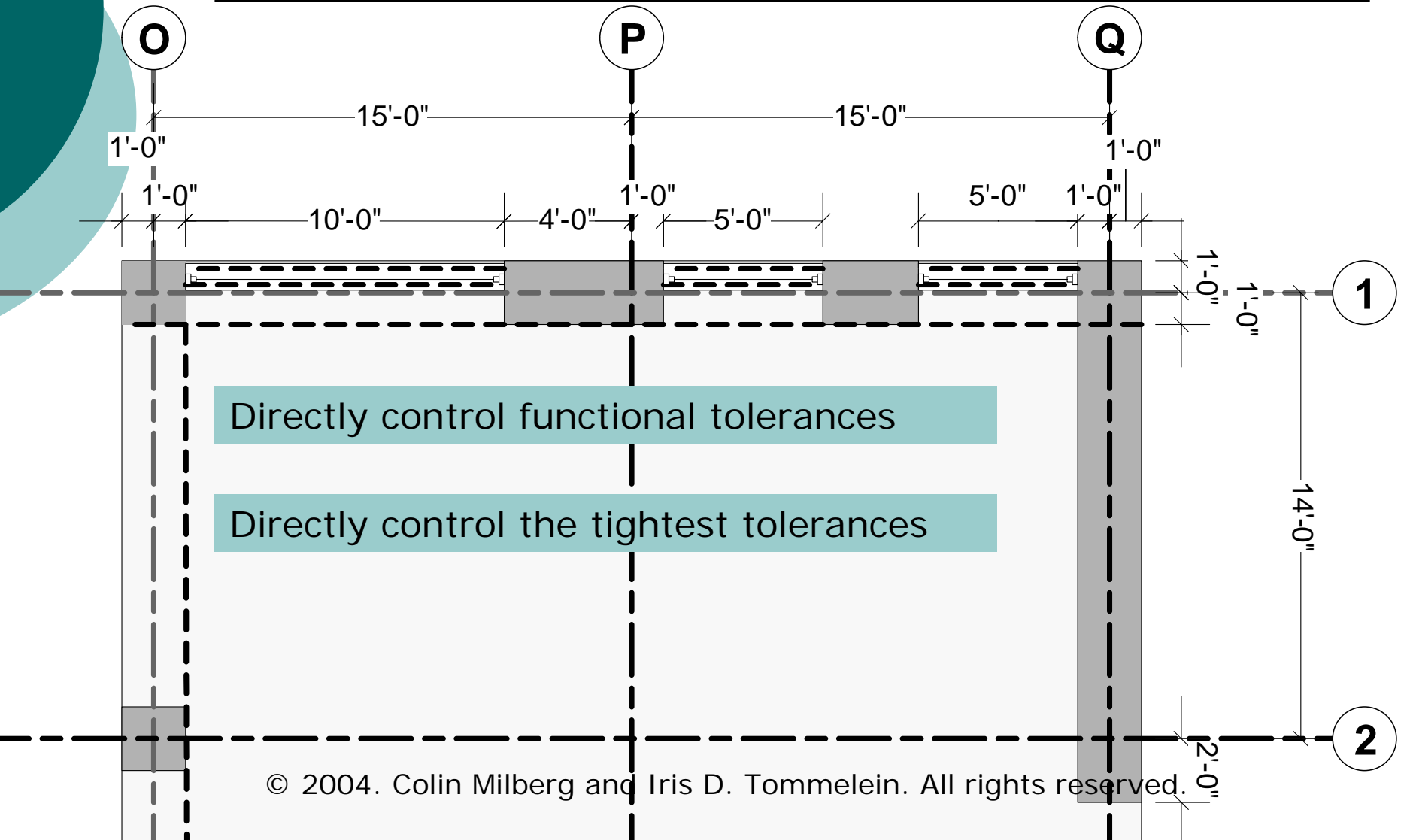


# Problems

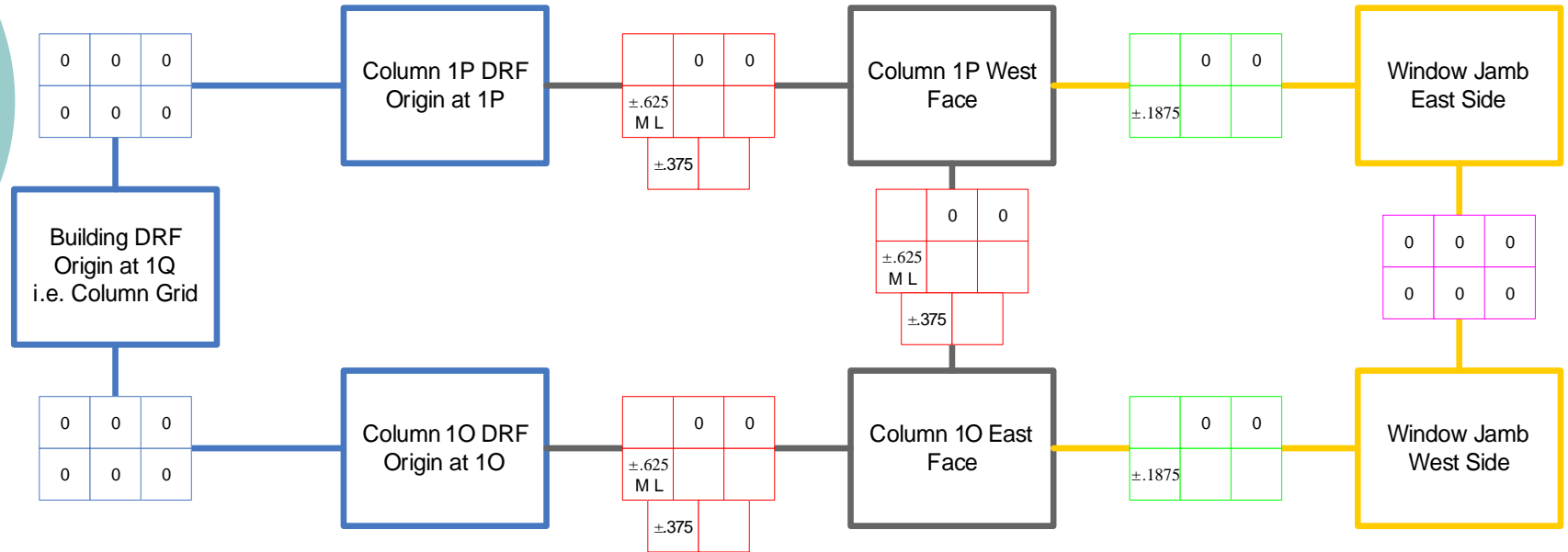
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- Inadequate tolerance standards
- Tolerances are not explicitly managed
- Management techniques employed are not evaluated
- Tolerance management tools from manufacturing are not familiar
- Designs are over-constrained

# Tolerance Loop / Over-constraint



# Tolerance Map





# Mapping Benefits

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- Identifies inconsistency during detailed design
- Provides a communication tool between design and construction
- Identifies alternatives to eliminate inconsistency
- Provides data to evaluate among alternatives

# Tolerances and Lean

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- Tolerancing (specifying tolerances)
  - Language for describing variability
  - Describes project constraints, design intent, connections among components (transparent)
  - Identifies over-constraint, loops
- Tolerance analysis
  - Quantifies accumulation of variability
  - Quantifies buffer size
  - Identifies inconsistent loops
- Tolerance allocation
  - Locates and sizes buffers
  - Identifies work-structuring trade-offs



# Current Topics, Questions, Issues

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- How practical is it to implement tolerance maps?
- How large is the benefit?
- Who should implement tolerance maps?
- Who is in a position to change the standards?
- How can we apply what is learned from managing geometric variability to other forms of variability such as time and capacity?