



# Constructability Panel

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# Constructability

- What is Constructability?
  - The Ability to Construct Something
- System-Wide – Designs are very good
  - Most designs are very constructible
  - However, we have cases where we may be able to improve constructability

# Intent of Discussion

- How to Improve Constructability
  - Review Some Constructability Challenges
  - Discuss Contractor Recommendations
  - Won't discuss all potential design constraints
    - Know that there could be other design considerations
    - Hopefully the contractor's perspective will be considered, if possible

# Today's Constructability Discussion

- Describe the Subject Work
- Review Constructability Issue
- Discuss Contractor's Suggested Changes to Improve Constructability
- Feel Free to Question or Comment at any Point

# Contractor Panel

- Felipe Jaramillo, P.E. – Ajax Paving
- Geoff Scales – Cardno, Inc.
- Rich Hewitt, P.E. – FDOT Construction
- Rick Baldocchi, P.E. – AVCON, Inc.

# Why Improve Constructability?

- Typically, as constructability increases...
  - Construction Time & Labor Decreases
  - Project Costs Decrease
  - Delays, Claims & Conflicts Decrease
  - Construction Quality & Profits Increase

# Why Improve Constructability?

- When Your Designs:
  - Are easier to construct
  - Have fewer problems during construction
- Your Company:
  - More likely to be selected for projects
    - Design-Bid-Build: FDOT
    - Design-Build: Contractor

# Maximizing Constructability

- Best Design:
  - Provides an easily constructed project
  - Meets design intent
  - Achieves desired quality
  - Maximizes use of resources
    - Equipment
    - Labor
    - Materials
    - Time
    - Money

# Design/Estimating Challenge

- Sometimes a more constructible design appears more expensive
- Likely it isn't more expensive, if it is easier to construct

# Design/Estimating Challenge

- If,  $\text{Project Cost} = \text{Average Cost} * \text{Quantity}$
- You might assume Lower Quantity = Lower Project Cost
  - Not always true
- Average cost based on data with a range of constructability (and range of unit prices)
- Projects with Constructability Challenges
  - Cost is typically higher than:
    - Average Cost
    - Cost of more Constructible Design

# How do we Improve Constructability?

- Increase Communication between Construction & Design about:
  - Standard Construction Practices & Equipment capabilities
  - Project Challenges as they are encountered
  - Project Challenges solved in field
- Visit Projects & Observe Construction Operations
- Construction videos online

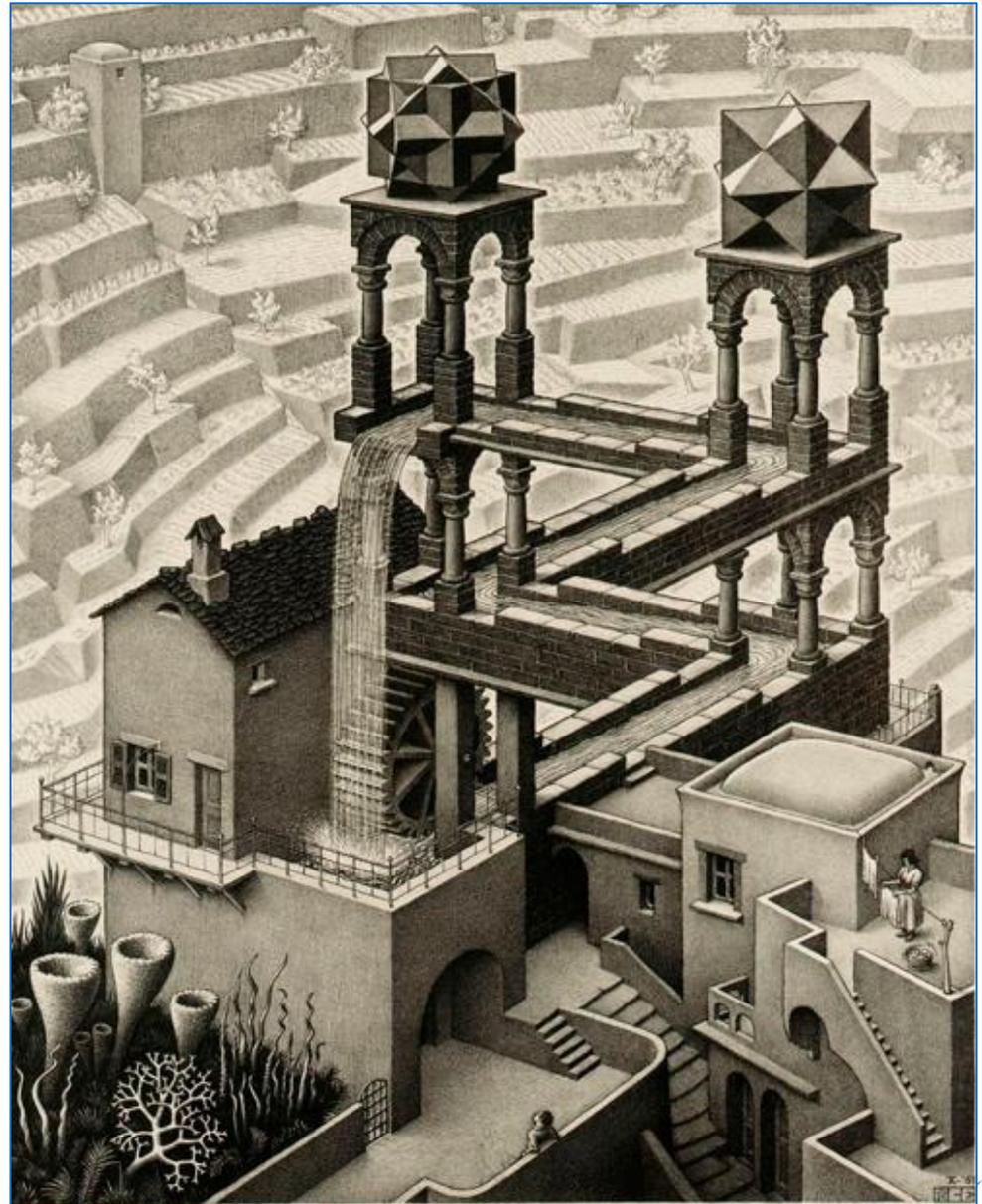
# 3D Models & Automated Machine Guidance (AMG)

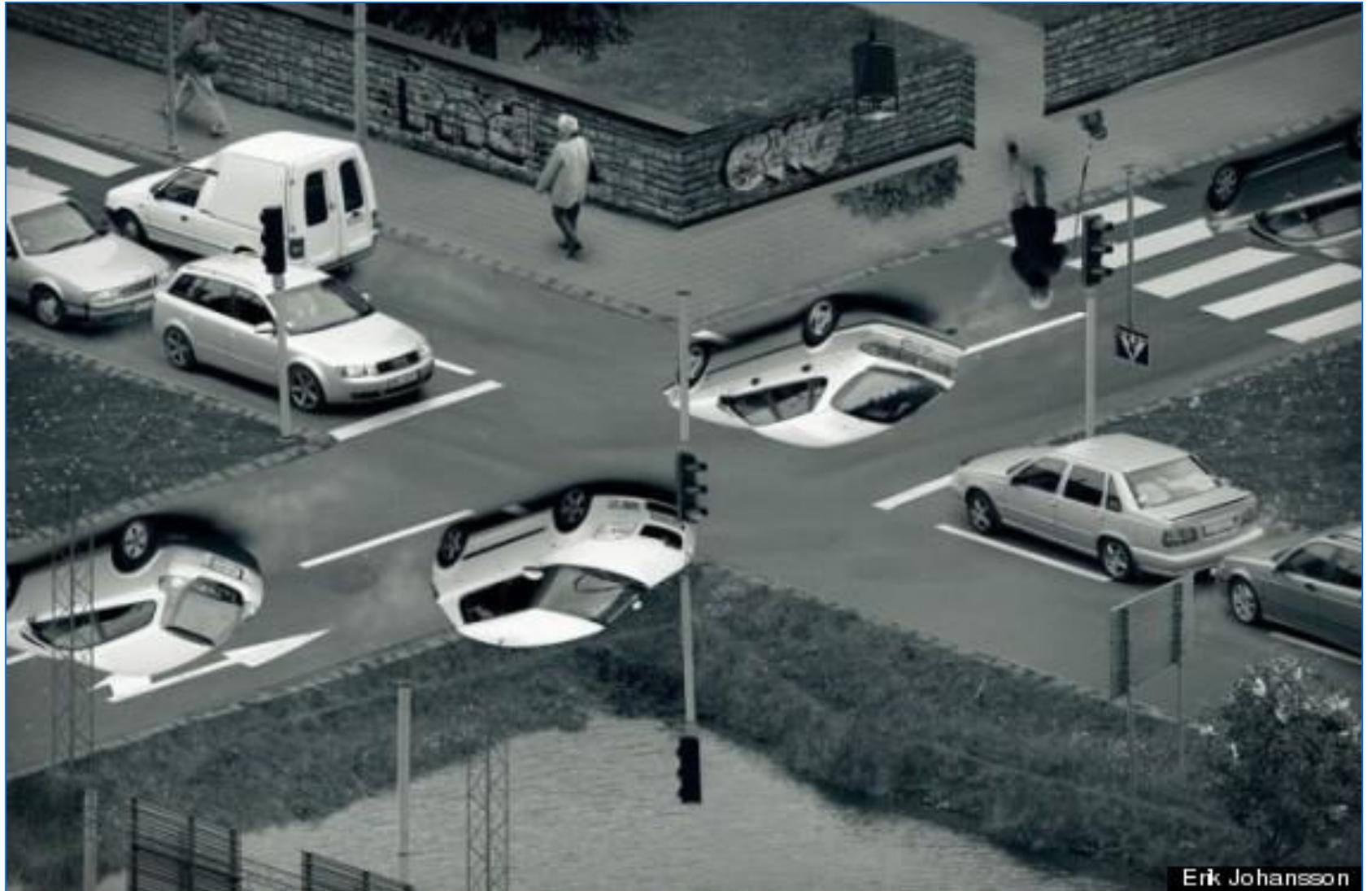


# 3D Models & AMG



It can be drawn, but is it constructable?





Erk Johansson

Challenge is  
to provide  
plans that  
represent  
what we  
want built,  
that is  
constructable



# Constructability Issues

# Cardno – Issue #1

- Utility conflicts with storm drain!
  - Allow more space for deep drainage close to shallower Water Main/Communication/Gas Main etc.
  - Consider the size or ATT manholes (more like vaults!) when designing drainage alignment or (dis)approving utility relocations.

# Ajax – Issue #1

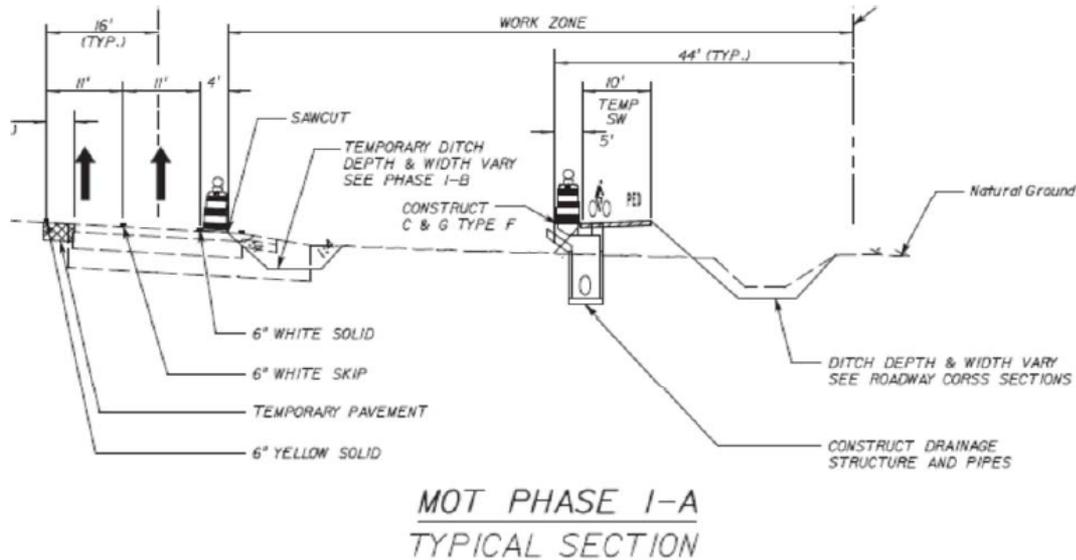
- Utility Work by Highway Contractor (UWHC) MOT Plans
  - Description: UWHC work that is not being considered in MOT plan phasing or contract durations
  - Constructability Issue: RFI's and plan revisions are being made to account for missed work. Time extension requests and claims are being filed recoup time.
  - Proposed Solution: MOT plans and phasing notes should include UWHC crossings and time calculations should account for pressure and BacT testing.



# Cardno – Issue #2

- MOT Plans
  - Make a workable pedestrian plan, or write some realistic constructible notes for pedestrians in urban areas. Don't just say maintain continuous pedestrian sidewalk traffic & crossing at all times.

# Cardno – Issue #2



- CONSTRUCT CURB, PERMANENT DITCH, STORM DRAIN SYSTEM AND TEMPORARY SIDEWALK IN EASTBOUND DIRECTION. CONSTRUCT TEMPORARY SIDEWALK IN WESTBOUND DIRECTION. RELOCATE UTILITIES AS REQUIRED. CONSTRUCT TEM

## TCP GENERAL NOTES:

THE CONTRACTOR SHALL STAGE CONSTRUCTION TO MAINTAIN PEDESTRIAN TRAFFIC ON TEMPORARY PAVED SIDEWALKS IN ACCORDANCE WITH FDOT INDEX 660.

THE CONTRACTOR SHALL MAINTAIN..... 10' WIDE SIDEWALK ON SOUTH SIDE, UNLESS DIRECTED OTHERWISE BY THE ENGINEER...

COST OF TEMPORARY SIDEWALKS AND CROSSWALKS ARE CONSIDERED INCIDENTAL TO SPECIAL DETOUR PAY ITEMS (102-2-XX)

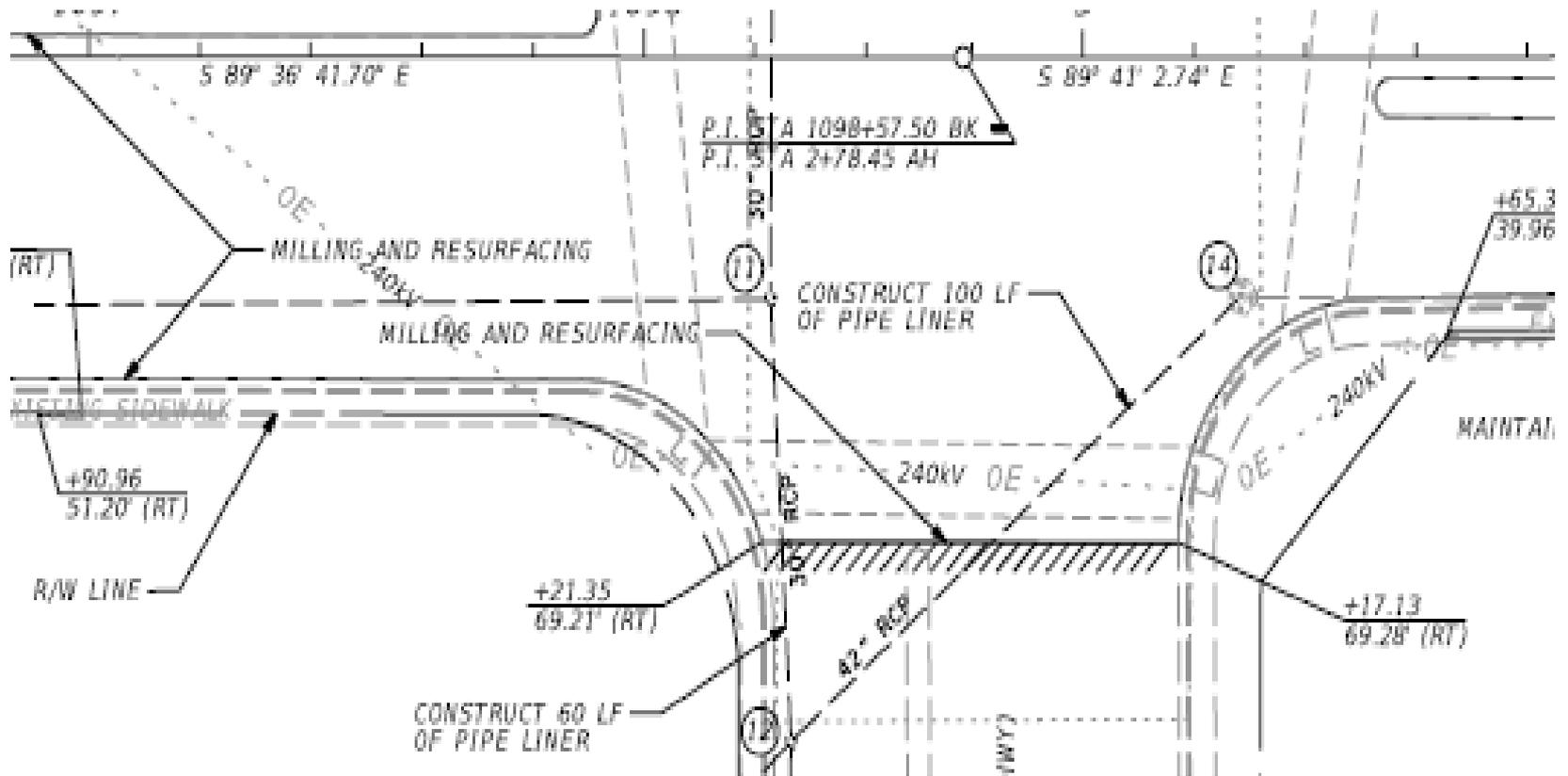
# Cardno - Issue #2

- If existing signal timing is coordinated (i.e. various schemes for different times of the day) make sure to note requirements for maintaining this.
- Make sure to consider significant utility work by others (or by JPA) when designing TCP, and when calculating contract time. Remember that water main and force main tapping operations cannot be done in one night, unlike storm pipe.
- If in doubt, add conservative noise level or time restrictions near residential areas. In many cases, noise ordinances are exempt for road construction, and this leads to many disgruntled neighbors!

# Ajax – Issue #2

- Inadequate work area for Pipe Lining Operations
  - Description: Pipe lining operations requiring partial demo of existing structure done under a lane closure
  - Constructability Issue: Inadequate work area and duration are leading to disputes and safety concerns.
  - Proposed Solution: 10 hour lane closures and double lane closures are needed to safely execute the work.

# Ajax – Issue #2



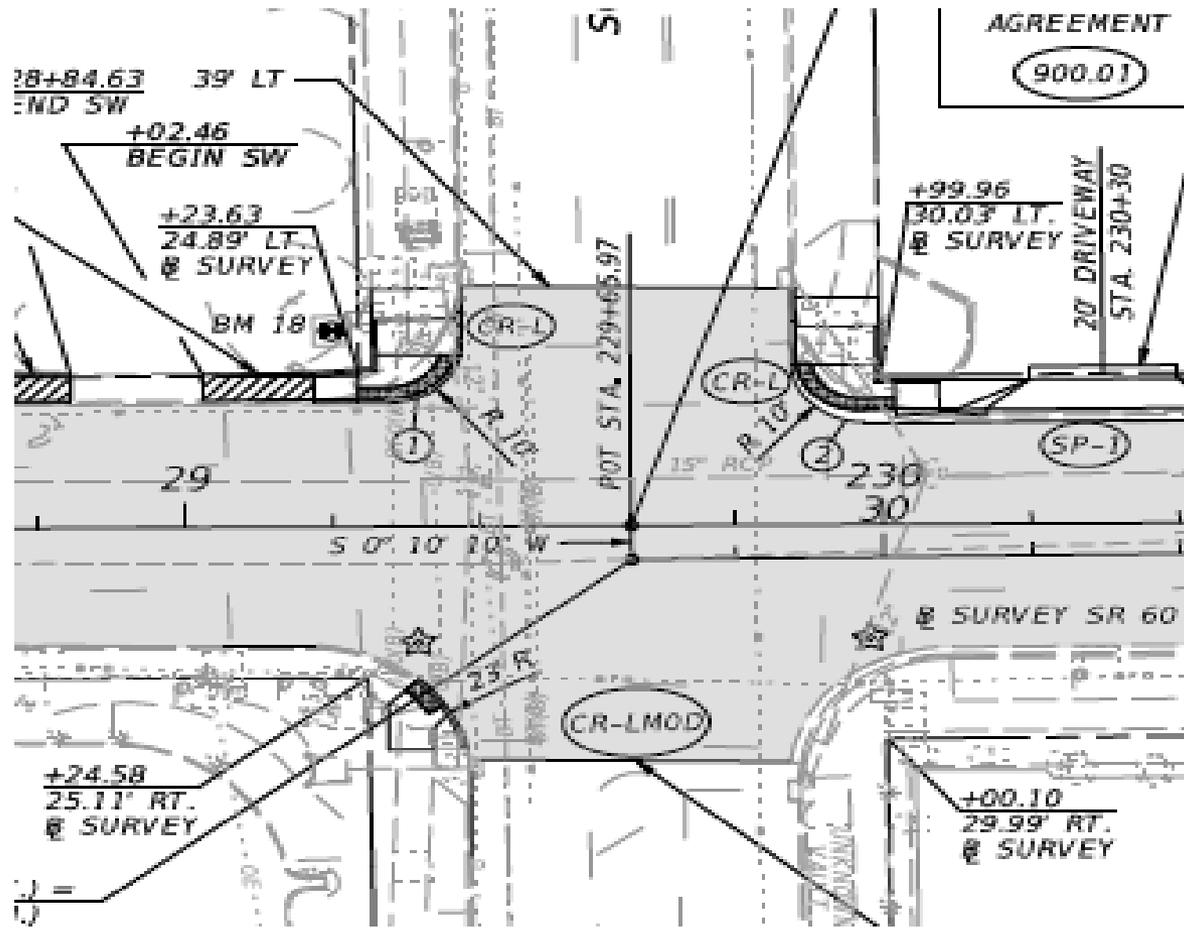
# Cardno – Issue #3

- Erosion Control Plan
  - Implementation (LS) by Contractor is a disaster waiting to happen... unless project is high and dry with no creeks, crossing etc.

# Ajax – Issue #3

- ADA Curb Ramp Compliance on Mill & Resurface Projects
  - Description: Inadequate details are shown in plans and standard indices to correctly construct an ADA compliant corner. ***Recent direction is “make it fit”.***
  - Constructability Issue: RFI’s and plan revisions are being developed to account for unclear scope.
  - Proposed Solution: Plan details need to be prepared showing existing elevations and placement of pedestrian poles, buttons, pull boxes, ramps, cabinets, etc...

# Ajax- Issue #3



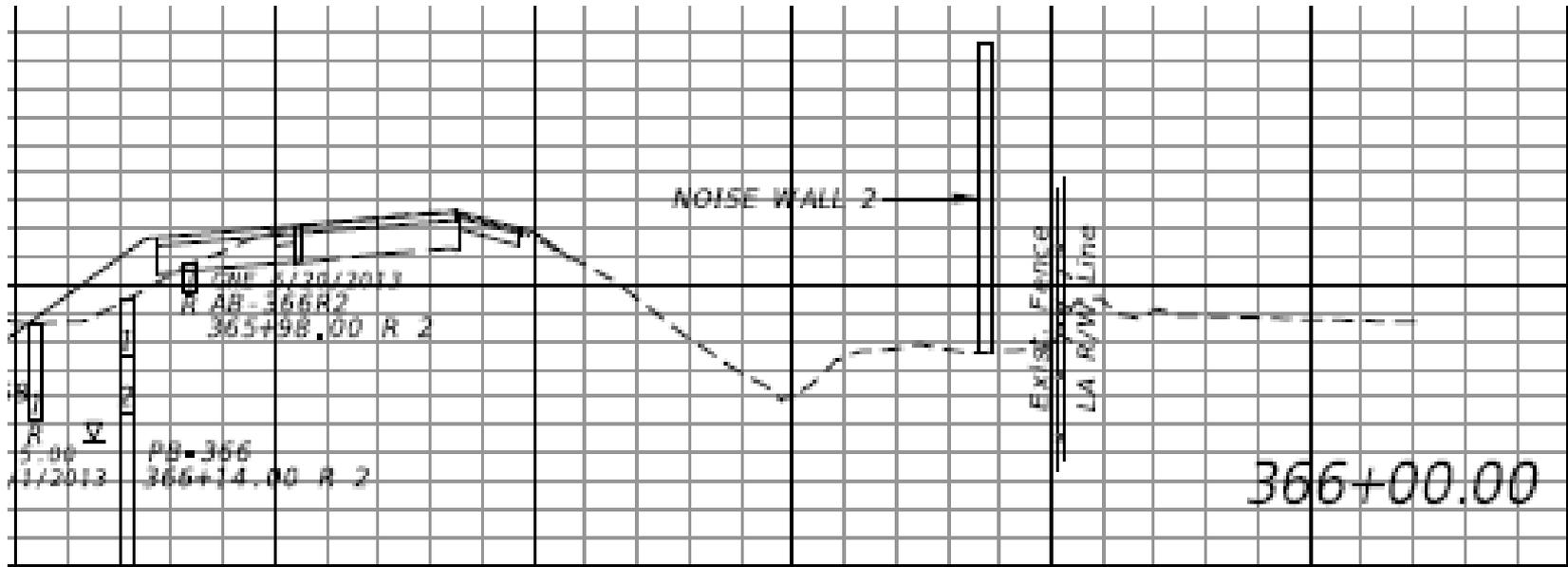
# Cardno – Issue #4

- Concrete (Walls, bridges etc.)
  - Realize that the absolute volume of concrete in an element is not always the driver of price. A simpler formed shape may be cheaper even if there are more CY involved.
  - Increases in production can bring prices down.

# Ajax – Issue #4

- Incidental Work Associated with Noise Wall Construction
  - Description: Work pad, staging area, backside work is not being accounted for in Pay Item quantities.
  - Constructability Issue: Overrun on pay item quantities: Clear & Grub, Embankment, Excavation, Sod are leading to disputes at the end of the construction.
  - Proposed Solution: Account for a 40' work pad which needs to be clear & grubbed, and sodded. Bottom elevation needs to be verified in design to make sure embankment and excavation figures are correct.

# Ajax – Issue #4



# Cardno – Issue #5

- Jacking Storm Pipe
  - If jacking is indicated use steel casing as carrier.
  - Don't specify RCP (or other) inserted into a big casing.

# Cardno – Issue #6

- Reduce the number of pavement typical designs where possible
  - When designing adjacent lanes it is important to remember that phasing may not allow an entire lane to be built at one time.
  - On interstate widening projects, don't try to create a new PGL. Specify any cross-slope correction followed by widening to match existing.

# Cardno – Issue #7

- Drainage swales in lieu of side drain is often a false economy!
  - Increased maintenance long term.
  - Steep slopes lead to erosion and possible safety problems.

# Cardno – Issue #8

- Storm Pipe Detail – Provide longitudinal drawings in lieu of or in conjunction with cross sections.
  - More info in less plan sheets! Much easier to read.
  - The rest of the world does it this way.