



# Proper Preparation for Graphic Presentations using BIM and 4D Scheduling

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# DISCUSSION OVERVIEW

- **Graphic Presentations are now widely used and effective.**
- **Historically, very expensive to prepare – tens of thousands of dollars, usually done after-the-fact. Often challenged, sometimes court would refuse to allow.**
- **With BIM, CPM and 4-D contemporaneous presentations can now be made at much lower cost.**
- **But if not properly prepared and vetted, there is considerable risk of the graphics effort backfiring, either during the project or in dispute resolution.**



**Proper Preparation to  
Make Your Graphic  
Presentation Bullet  
Proof.**



## **Making your graphic presentation bullet proof.**

**Developing a 4D graphic presentation that brings your position to life is only half the battle.**

**Your opposition will try to discredit your data and your documentation, and make your model look like an impressive lie.**



**Everything you need  
to know about the law  
in 60 seconds or less.**

- Unlike many area of the law, the law concerning expert testimony and graphic representations is actually somewhat intuitive and logical.
- Your presentation schedule and BIM, and indeed all the entire graphic presentation and supporting expert testimony can be stricken if it is not sufficiently *reliable, accurate and fair.*

# Inadmissible or just plain useless?

- **The law of admissibility is not your only problem. It may be the least of your problems.**
- **Judges and especially arbitrators will allow models and testimony into evidence with full knowledge that they have been rendered useless by the opposition.**
- **You need to protect not just the admissibility of your presentation but its integrity and persuasiveness, both during the project as well as in post-construction dispute resolution.**

# **1 Golden Rule, 3 Threats to Avoid & 1 Strategy for Success**

**Rule: Start Early**

**Threats: Friendly Squirrels**

**Death by 1000 Cuts**

**The Dog with a Bone**

**Strategy: Verify, Identify, Prepare**

**Start Early...**  
**Do not be**  
**penny wise**  
**and pound**  
**foolish**



# The Successful Ingredients for a Useable and Reliable 4D Schedule

A “GOOD” BIM



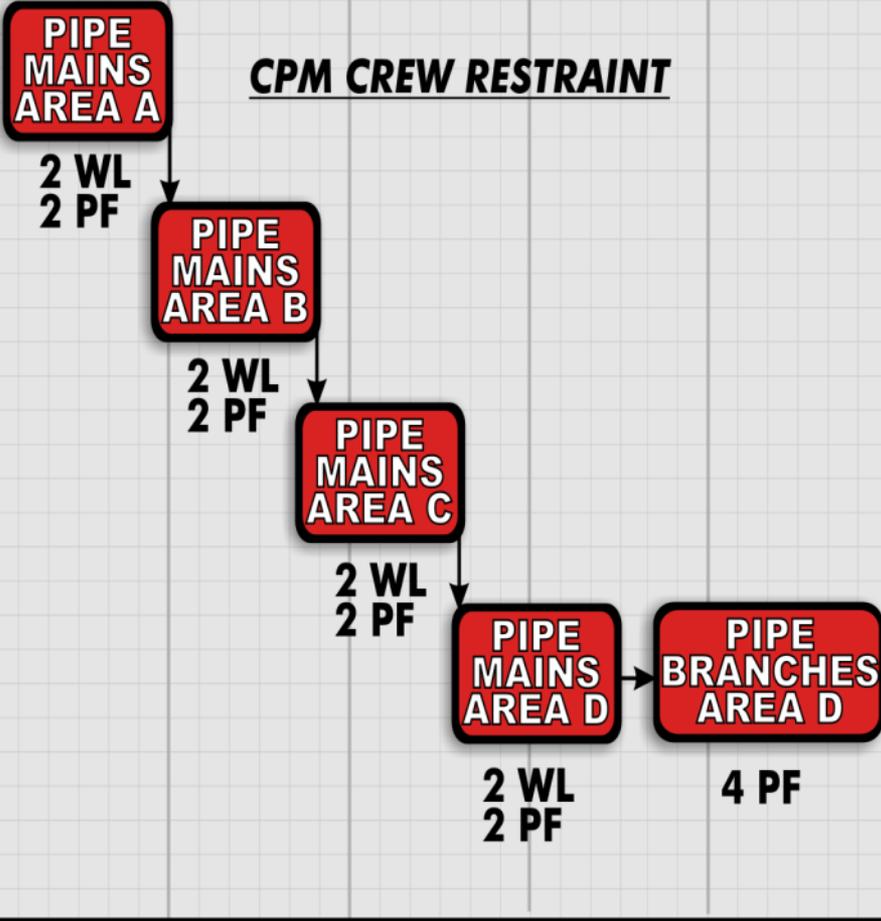
A “GOOD” CPM  
SCHEDULE

# Starting Early – Schedule Protocols

- **Get all team members involved in planning and schedule preparation.**
- **Assign a dedicated project scheduler.**
- **Implement LEAN programs to improve collaboration and communication. (Last Planner, PDCA, Target Value Design)**
- **Understand technical scheduling requirements in the Contract Documents. Be aware of safety, laydown, site access restraints**
- **Proper activity development – one trade per activity, resource loaded, sufficient detail so scope is understood**
- **Subcontractor activity development, logic and manpower.**
- **Look for dangles, stacking of trades, mechanical crew overloading, false float and imposed constraints (i.e., HVAC Systems on line”)**
- **Schedule should produce a realistic critical path.**
- **Use an approved baseline schedule and/or update where possible for the 4D presentation.**
- **Use half-step schedules in the updating process – very useful to establish or rebut alleged concurrent delay.**

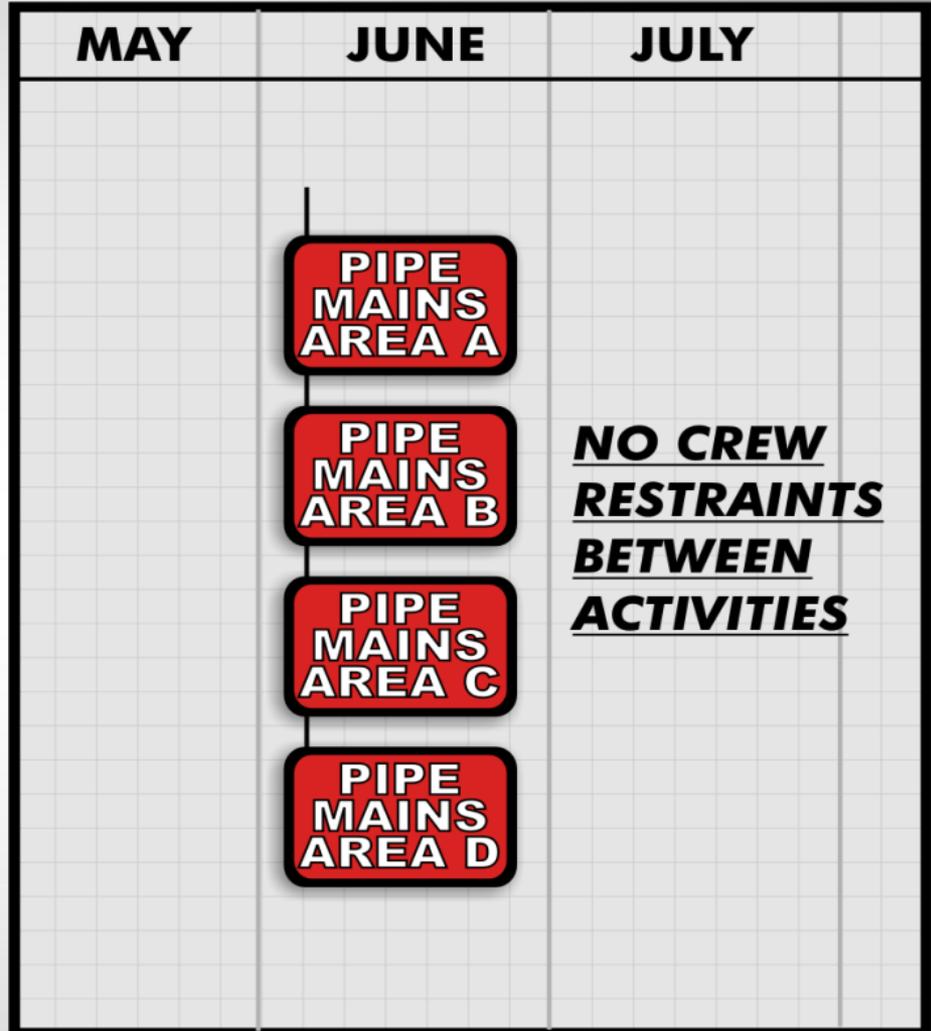
APRIL      MAY      JUNE      JULY      AUGUST

**CPM CREW RESTRAINT**



MAY      JUNE      JULY

**NO CREW RESTRAINTS BETWEEN ACTIVITIES**

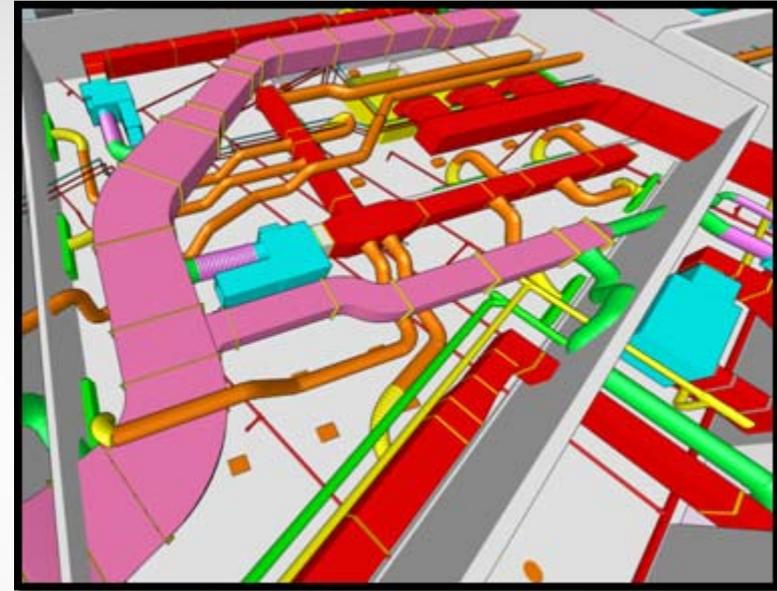


# A “GOOD” CPM SCHEDULE – A FEW DEFINING CHARACTERISTICS

- Logical interdependencies among activities are included
- Activities and Overall Schedule Must Contain A Sufficient Level of Detail Appropriate for the project under construction
- Updated at least Monthly
- Typically include administrative activities such as procurement, submittals, inspections, etc.
- Ability to distinguish critical tasks from non-critical ones
- Sequence of Activities is planned and developed before the data is entered into the computer
- Resource loaded for purposes of review of progress payments

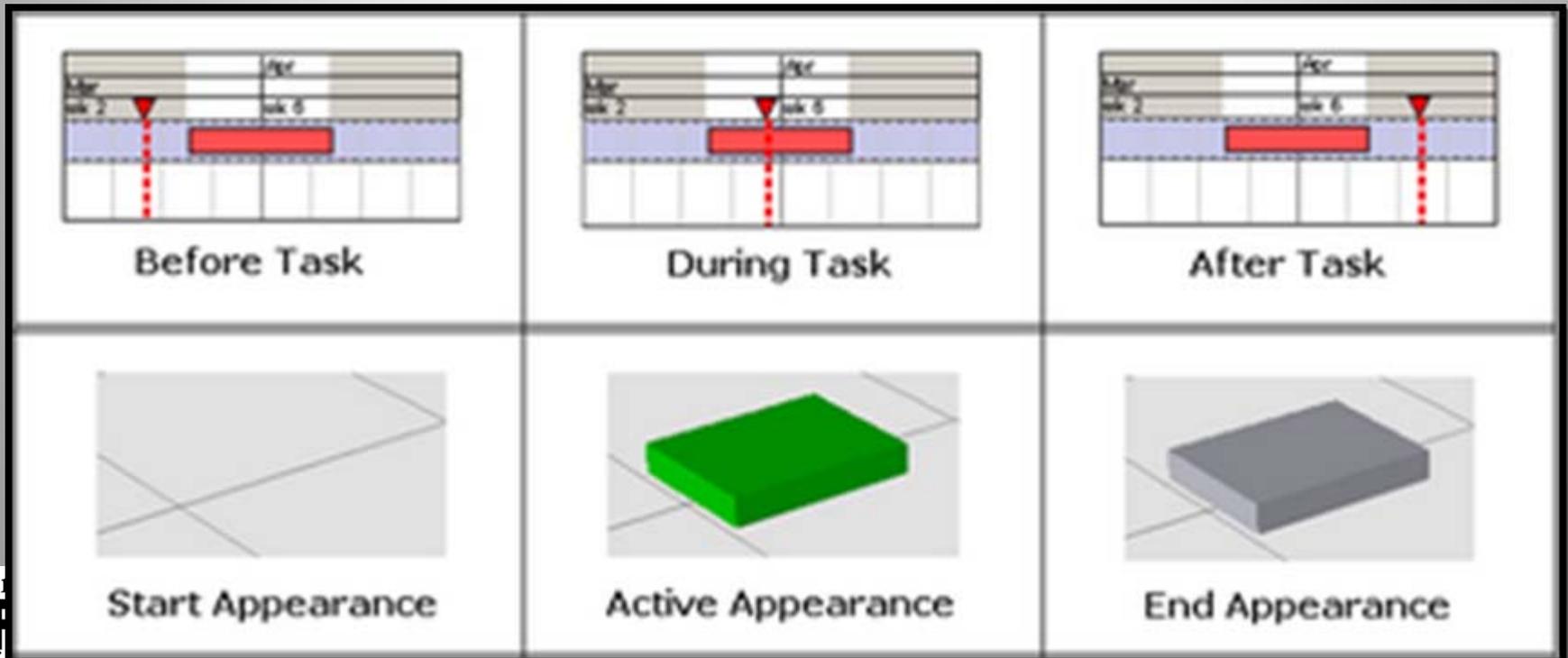
# Starting Early - BIM

- BIM contains a lot of information beyond the spatial qualities of the elements of the project
- BIM Advantages:
  - Easily Understood, all trades can be viewed
  - Can be used for MEP coordination
  - Facilitate Constructability Review
- BIM Disadvantages
  - Models can grow so large they become useless
  - Perceived technical boundaries to reviewing 3D information effectively (worker); real boundary of software interoperability
  - Transition from the site trailer to the work area



# Starting Early – BIM Protocols

- Elements of Work are animated according to the start and finish dates of their associated tasks in the CPM schedule
- The user can define how elements are displayed when active; color, growth, transparency, temporary, demolition, etc.
- In general, most elements of work to be installed are controlled as follows:

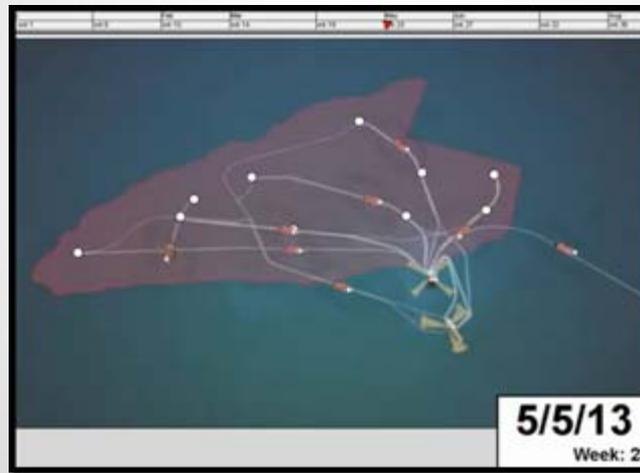


# Starting Early – BIM Protocols

- Make sure that the model selected for use in the 4D presentation reflects the latest model.
- Determine the level of detail that you want to present. Using schematic models can present challenges and difficulties.
- The BIM should match the schedule's level of detail.
- Maintain control over the model – don't ask others to edit the model for your convenience.
- Stakeholders collaborate as early as possible in the preparation of a BIM Project Execution Plan, including:
  - File Naming Convention
  - File Format and Interoperability
  - Level of Detail
  - Common Origin Point

# Starting Early – BIM Protocols

- Model critical elements in the manner by which they will be installed.
- Utilize the model authoring program for situations where exacting precision is required.



- If possible, relate model elements to their CPM schedule activity in the BIM authoring program to facilitate auto-matching through field user metadata.

# Starting Early – 4D Tool Selection : Hardware/Software

- 
- **Minimum computer spec:**
    - Operating System – Windows
    - RAM – 8GB
    - Processor – Quad Core
    - Hard Drive – Minimum 1TB w/reasonable Cache
    - Graphics Card – Standard, modeling specific, at least 2GB
    - Screen resolution – 1920x1080
    - Price – \$2,500 - \$3,500
  - **Powerful computer spec:**
    - Operating System – Windows
    - RAM – 32GB
    - Processor – Quad Core w/ Hyper-Threading (8 cores)
    - Hard Drive – Minimum 1TB w/reasonable Cache or SSD
    - Graphics Card – Standalone, modeling specific, at least 4GB
    - Screen resolution – 2560x1440
    - Price – \$4,500 - \$5,500

# Starting Early – Get the Right 4D Personnel

- **Ideal candidate to appoint as 4D Maven:**
  - **Familiar with animation and video editing**
  - **Familiar with BIM and or 3D Modeling**
  - **Understands CPM Scheduling**
  - **Understands construction means, methods, and best practices**
  - **Detail oriented**
- **Alternatively; anyone willing to take a swing!**

# Starting Early – the 4D Process

## Steps Before Starting the 4D Schedule Process

(assuming you've got a BIM and a CPM schedule)

- **Step 1 – Meeting between the Project Stakeholders to define goals for implementation of the 4D schedule; determine desired granularity**
- **Step 2 – Review CPM Schedules and 3D/BIM information to suggest any revisions to the model or schedule to facilitate a smooth process; it is more efficient to adjust the documents in their native authoring programs prior to importing into 4D.**
- **Fix it: Once you have imported and made all the assignments you will always see something that needs to be corrected, be willing to adjust it and get it right.**

# Starting Early Best Practices : 4D Schedule Preparation

- Generally better to import the BIM into the 4D program first.
- Create a backup of your schedule prior to importing the schedule into 4D Scheduling program
- Only import data you intend to utilize in 4D Scheduling program.
- Determine what layers will be visible in the 4D program to conserve system resources.
- Use the “Use profiles” to show things installing in a reasonable and understandable way.
- Set aside time for schedule import
- Check the schedule data after import is complete
  - Calendar issues
  - Milestone date calculation
  - Float values



# Beware of Squirrels

**A squirrel is a diligent opposition person, including, but not limited to, legal counsel or outside expert who starts collecting acorns of doubt early in the project life cycle and later dispute resolution life cycle and will use those acorns to bury your presentation at any step in the construction life cycle.**



# Beware of Squirrels

- Long before a formal claim is filed, while everyone is still on the project trying to “work together” there is significant risk.
- Opposition attorneys, consultants and managers are identifying key issues and trying to find ways to build a paper trail and a time line to support their position.
- Through emails, formal project meetings and informal discussions, they are looking to shape the narrative.
- This is always a concern when a dispute is brewing, but there are unique concerns when you are developing a graphic 4D presentation.



# Beware of Squirrels

- **Small or seemingly meaningless discrepancies can completely undermine your presentation and your expert testimony.**
  
- **It is essential that you control the flow of information by:**
  - **Limiting points of contact with the “opposition” where possible;**
  - **Making certain that your team knows not to speak out of school;**
  - **Ensuring that your points of contact are aware of issues and/or have access to counsel or experts who can guide them;**
  - **Stressing the importance of the seemingly unimportant and mundane;**
  - **Locking down the email – external AND internal**



# Death by 1000 Cuts

- Experts are always subject to attack for minor inconsistencies or conflicts in their opinions.
- With an animated model, any inconsistency, no matter how small, means that what we are seeing is a “lie.”
- There are only so many times your expert can admit that what we are seeing may be “inaccurate” before the model's integrity is fatally compromised.



# Death by 1000 Cuts – Examples

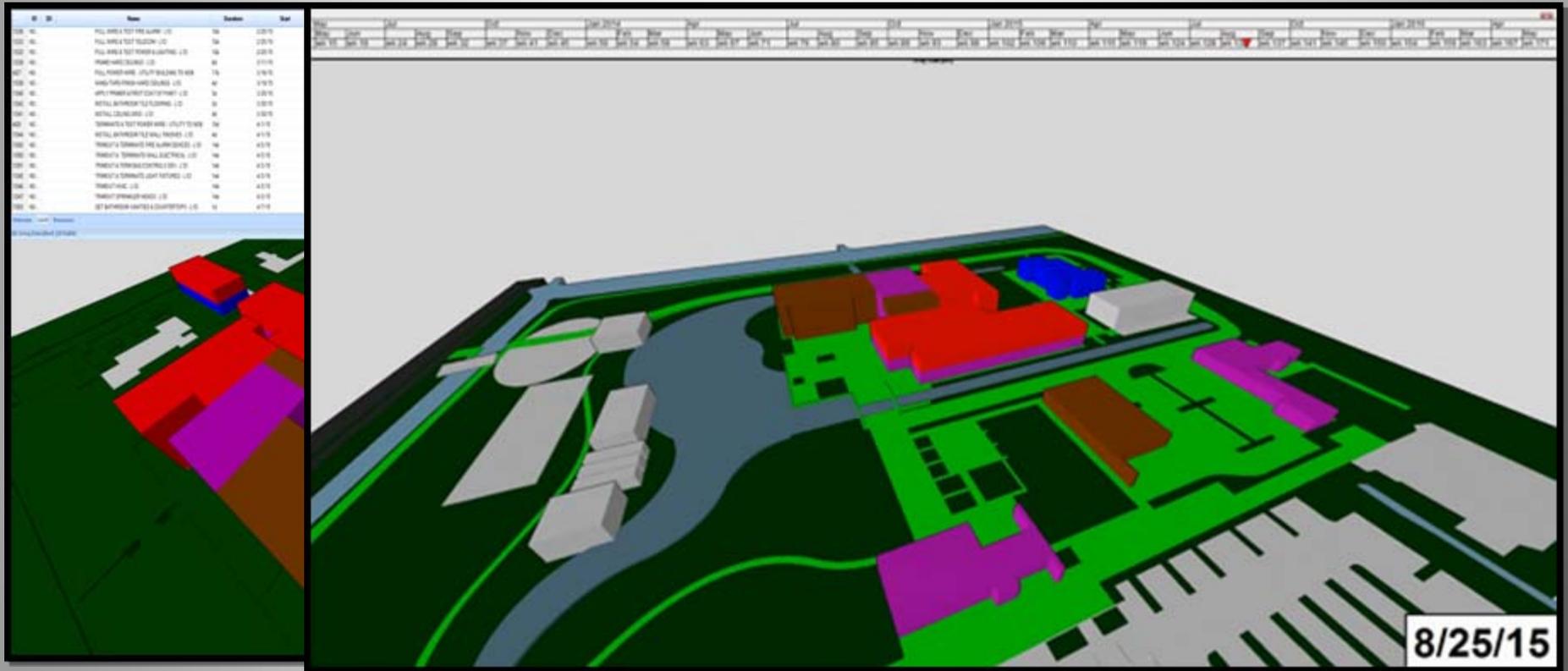
- **Open Ends.**
- **Start Dangles.**
- **Wrong Actual Dates.**
- **Software setting – retained logic vs progress override**
- **Not using the right schedule or BIM.**
- **Unrealistic logic/erroneous critical path.**
- **Lack of buy-in by project team – schedule not used in field**
- **Missing elements and details**
- **Using schematic BIM when more detailed BIM available**
- **Duration assumptions when activities are stacked – poor resource planning**
- **After-the-fact modifications to the CPM and/or the BIM in lieu of the contemporaneous data.**

# The Dog With A Bone



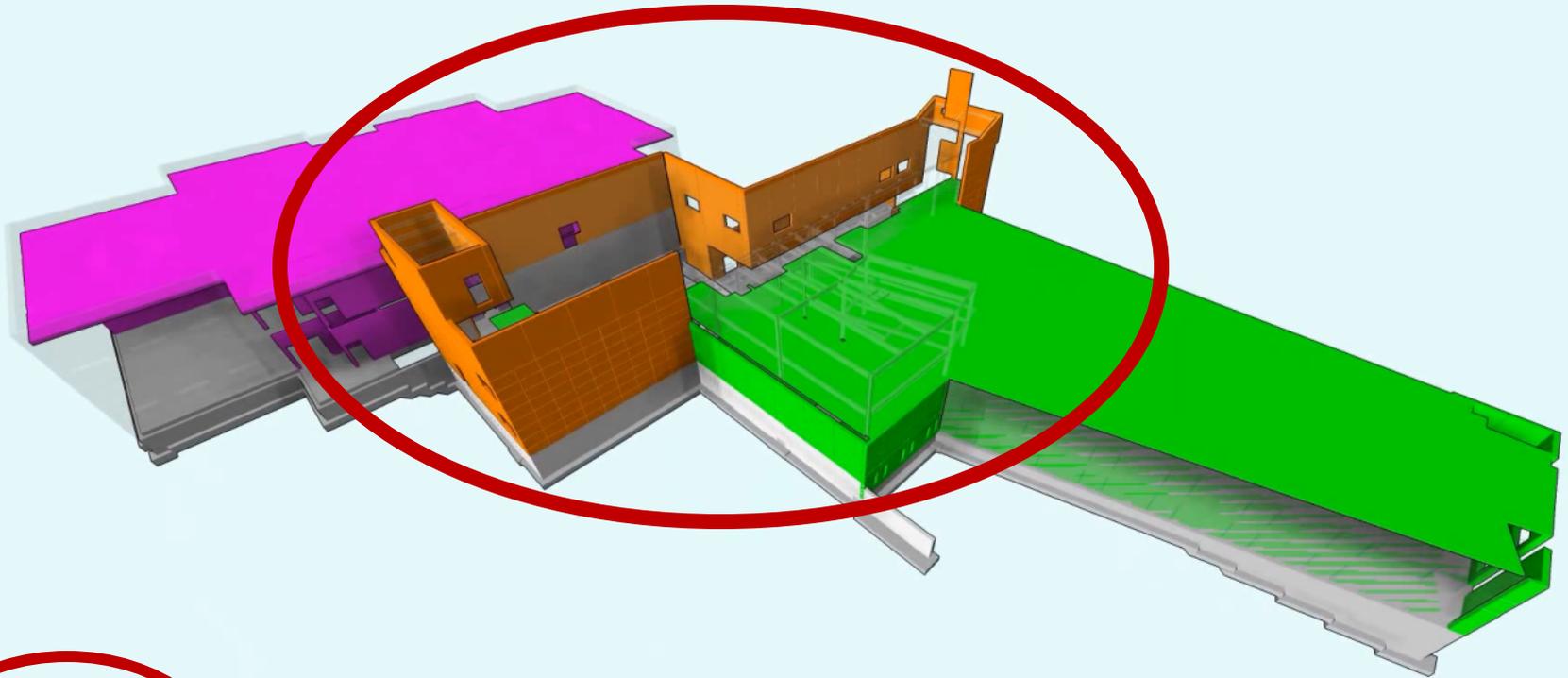
- **Even more painful than defending 1000 small mistakes is trying to explain a huge problem with your model.**
- **It may be a mistake on a relatively inconsequential aspect of your presentation.**
- **Your opposition may latch onto that mistake like a dog with a bone - biting you over and over again, until your credibility is in pieces.**

# Missing Scope



# Unrealistic Masonry Duration

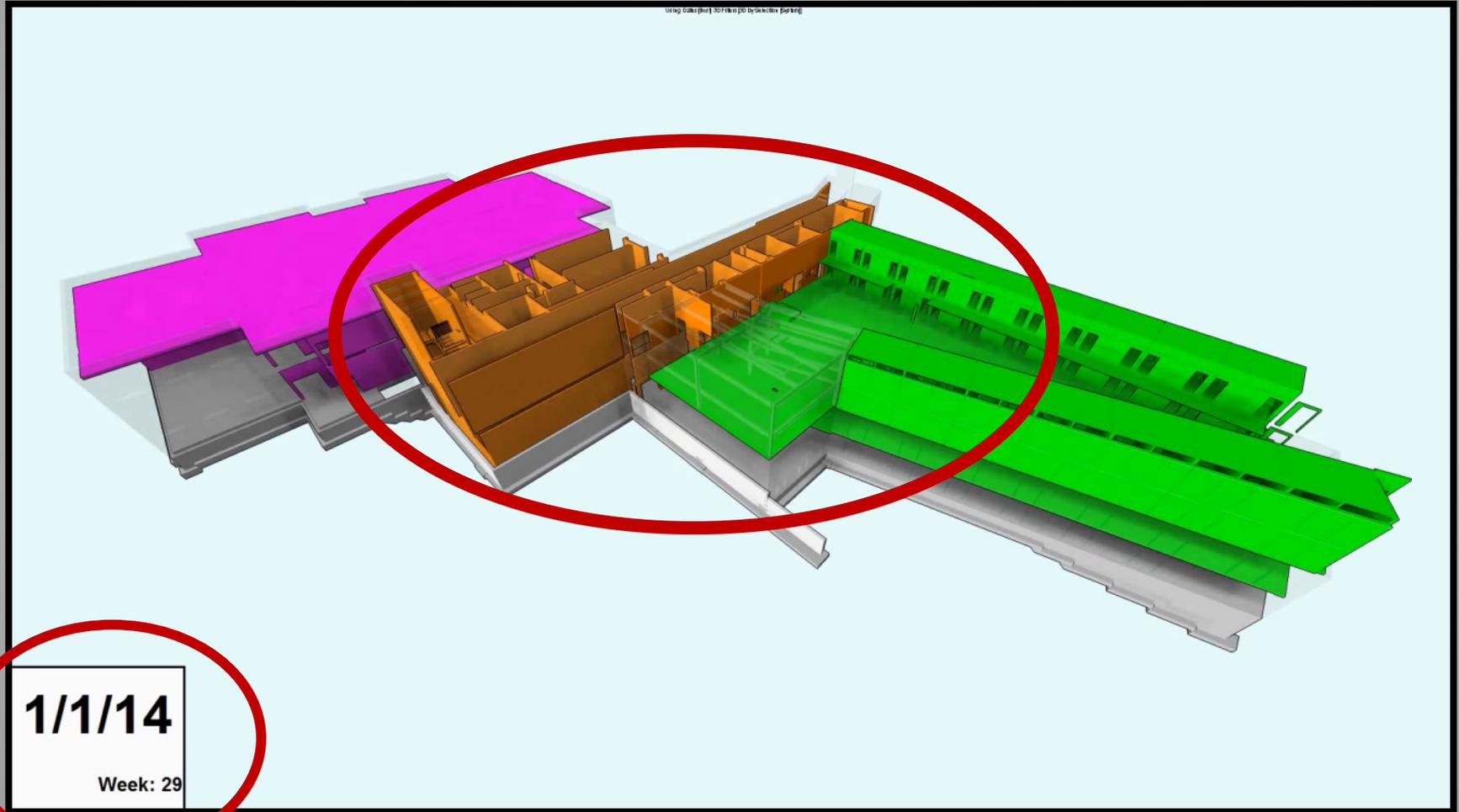
Using ColorMap 3D Filter (D) by Selectra (P) 1/1/13



12/28/13

Week: 28

# Three Week Delay to Masonry



# Incorrect Depiction of Release of Inlet Duct

2/1/13

2/1/13

NON-FIRST  
FIRE PIPE  
RELEASES :  
12/10/12 -  
3/25/13

FIRST FIRE  
PIPE  
RELEASES :  
11/12/12 -  
4/8/13

NO DUCTWORK  
RELEASED FOR 8  
WEEKS - SMALL  
"SLIVER" OF DUCT  
RELEASED ON 1/30/13

PARTIAL/PIECEMEAL  
RELEASE OF THE  
BAGHOUSE

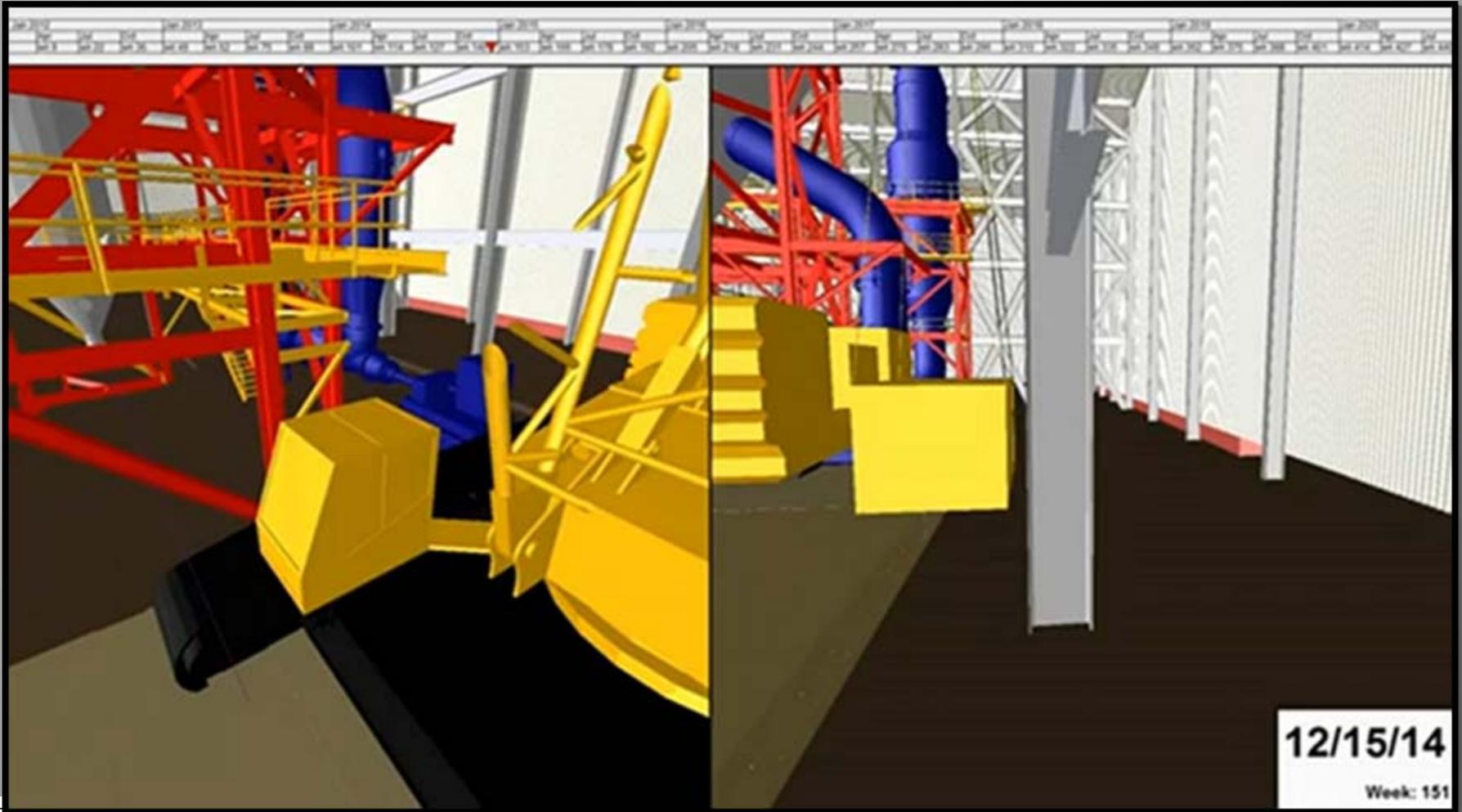


Appearance Profiles	
□	00 - NOV RELEASE
■	01 - DEC RELEASE
■	02 - JAN RELEASE
■	03 - FEB RELEASE
■	04 - MAR RELEASE
■	05 - APR RELEASE
■	06 - MAY RELEASE
■	07 - JUN RELEASE
■	08 - JUL RELEASE
■	09 - AUG RELEASE
■	FIRST FIRE PIPE FINAL
■	NON-FIRST FIRE PIPE FINAL
■	PARTIAL PIPE FIRST FIRE
■	PARTIAL PIPE NON-FIRST FIRE
■	UNIVERSAL

AS-PLANNED

AS-BUILT

# Failing to Incorporate Schedule into Crane Plan



# **VIP - Verify, Identify & Prepare**

- **VERIFY** your facts and documents to absolutely minimize any mistakes or conflicts.
  - locate all available information
  - cross reference your data
  - do not forget the dreaded email
- **IDENTIFY** any conflicts or inconsistencies that cannot be resolved with 100% certainty.
- **PREPARE** a compelling explanation for your choices where conflicts cannot be resolved.

# In summary ...

- **It's all about reliability and accuracy**
- **If you are aiming for mere admissibility, you are setting your sights far too low.**
- **Start early!!! Plan the critical path of your claim.**
- **Get everything you need – give them nothing.**
- **Avoid errors and inconsistencies, even the small and seemingly inconsequential can be devastating.**
- **Check, verify and check again.**
- **Know your weakness and have answers ready.**