NAVIGATING COMMON CONSTRUCTION PITFALLS

Greg Loscher, P.E.

Bowen Collins & Associates

Presentation Outline

1. Preparing Native Subgrades
2. Survey and Site Layout
3. When to Reject New Concrete
4. Concrete Shoring and Form Removal
5. Quality Control and Quality Insurance
6. Pipe Pressure Testing
7. Concrete Curing (why it matters)
8. Considering Constructability

Preparing Native Subgrades

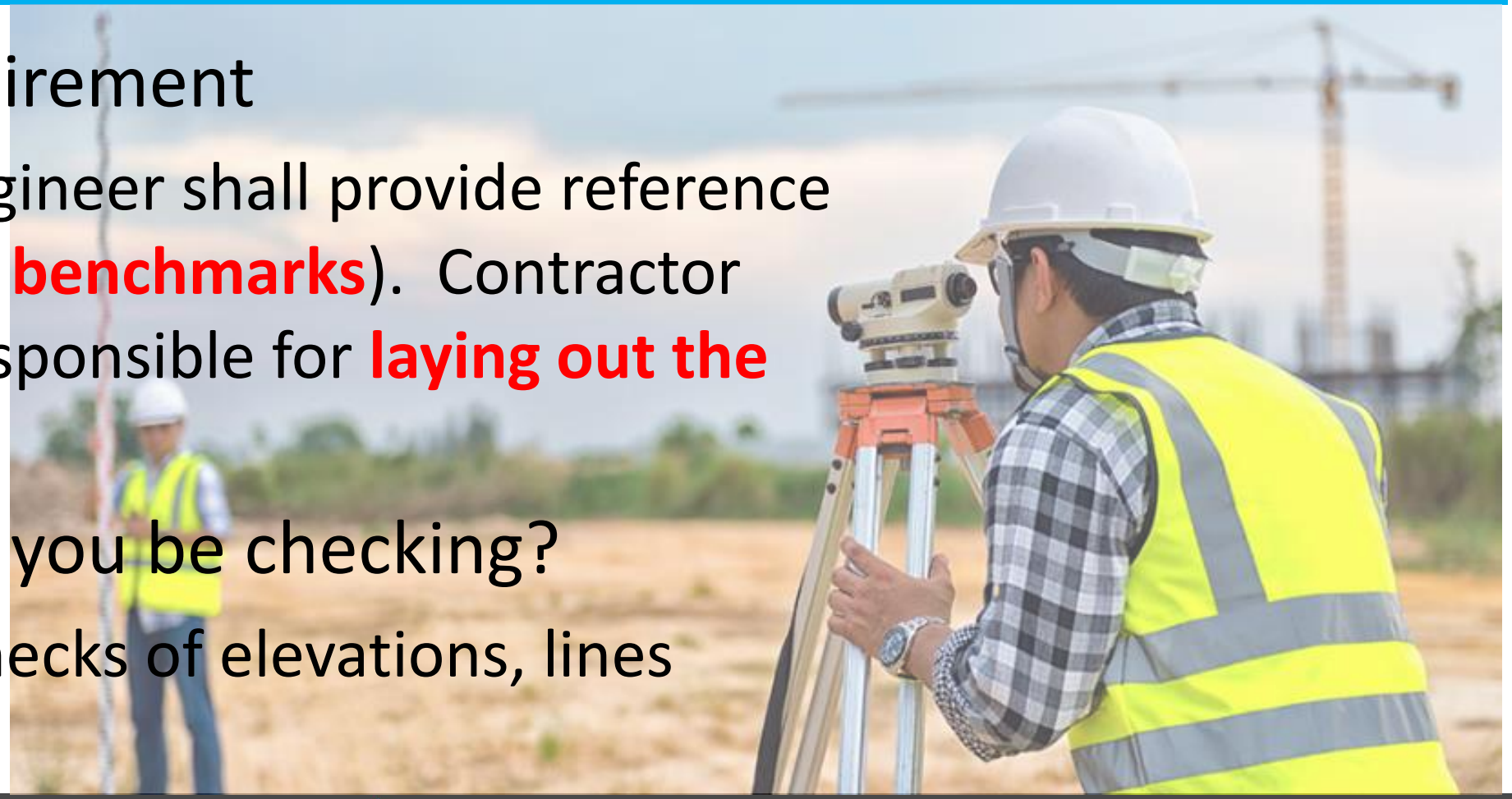
- Sample Specification
  - A. Within Influence Area of pavements, structures, foundations, concrete slabs, earth fills: Scarify upper **12** inches of subgrade and compact to a minimum of **100** percent relative compaction as determined in accordance with **ASTM D698**
  - B. All Other Areas: Proof-roll with complete coverage. If rutting or pumping of subgrade is observed, remove and replace affected area in accordance with correction requirements.

Preparing Native Subgrades

- **Inspection by the (not a) geotechnical engineer.**
- **What to do when it isn't that simple**
  1. ASTM D698 (Standard Proctor) vs. ASTM D1557 (Modified Proctor)
  2. How many Proctors are needed?
  3. Bedrock – Leveling course
  4. Wet soils – Dewatering to 2 feet below bottom of excavation
  5. Soft soils – Stabilization
  6. Other test methods – Sand cone
  7. Lift thickness matters
- **Objective – Maximize bearing capacity, minimize settlement**

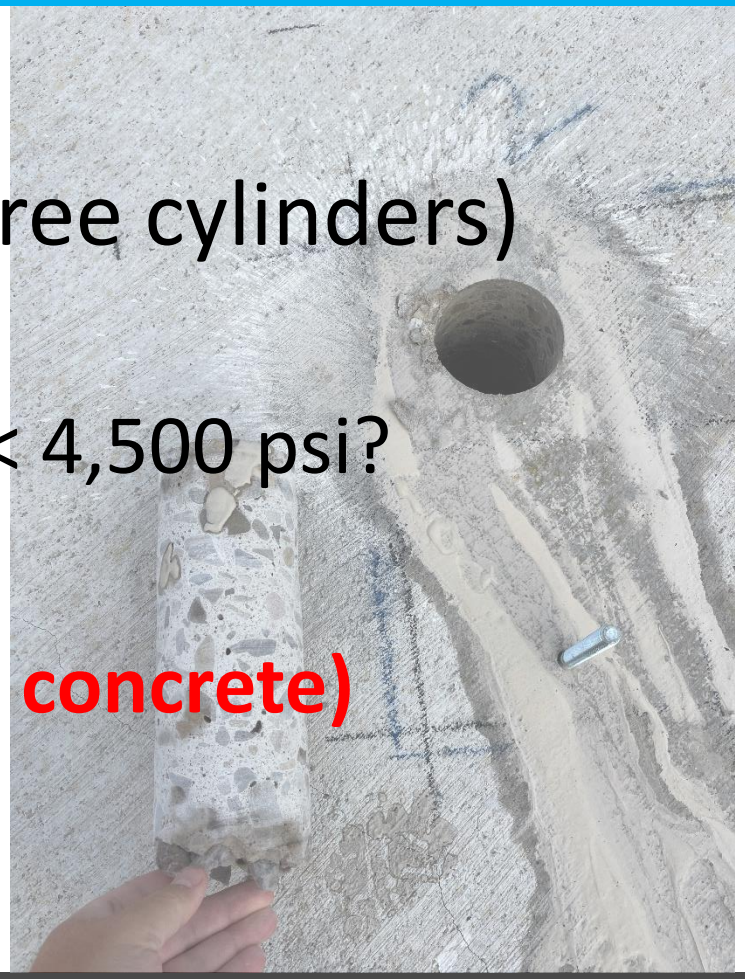
Survey and Site Layout

- Sample Requirement
  A. Owner/Engineer shall provide reference points (i.e. **benchmarks**). Contractor shall be responsible for **laying out the work**.
- What should you be checking?
  A. Periodic checks of elevations, lines



When to Reject New Concrete

- Example: Design Strength (f'c) = 4,500 psi
- 28-day break result = 4,400 psi (two or three cylinders)
  1. Is result < f'c – 500 psi?
  2. Is average of 3 consecutive 28-day results < 4,500 psi?
- Early indicators
  1. Slump, air, **unit weight (esp. for plasticized concrete)**
  2. 7-day breaks



When to Reject New Concrete

- Concrete removal and replacement
- Earlier is always better
- Consider collateral damage
- Repair vs. replacement
- Missing rebar
- Shrinkage requirements for hydraulic structures

Shoring and Form Removal For Structural Concrete

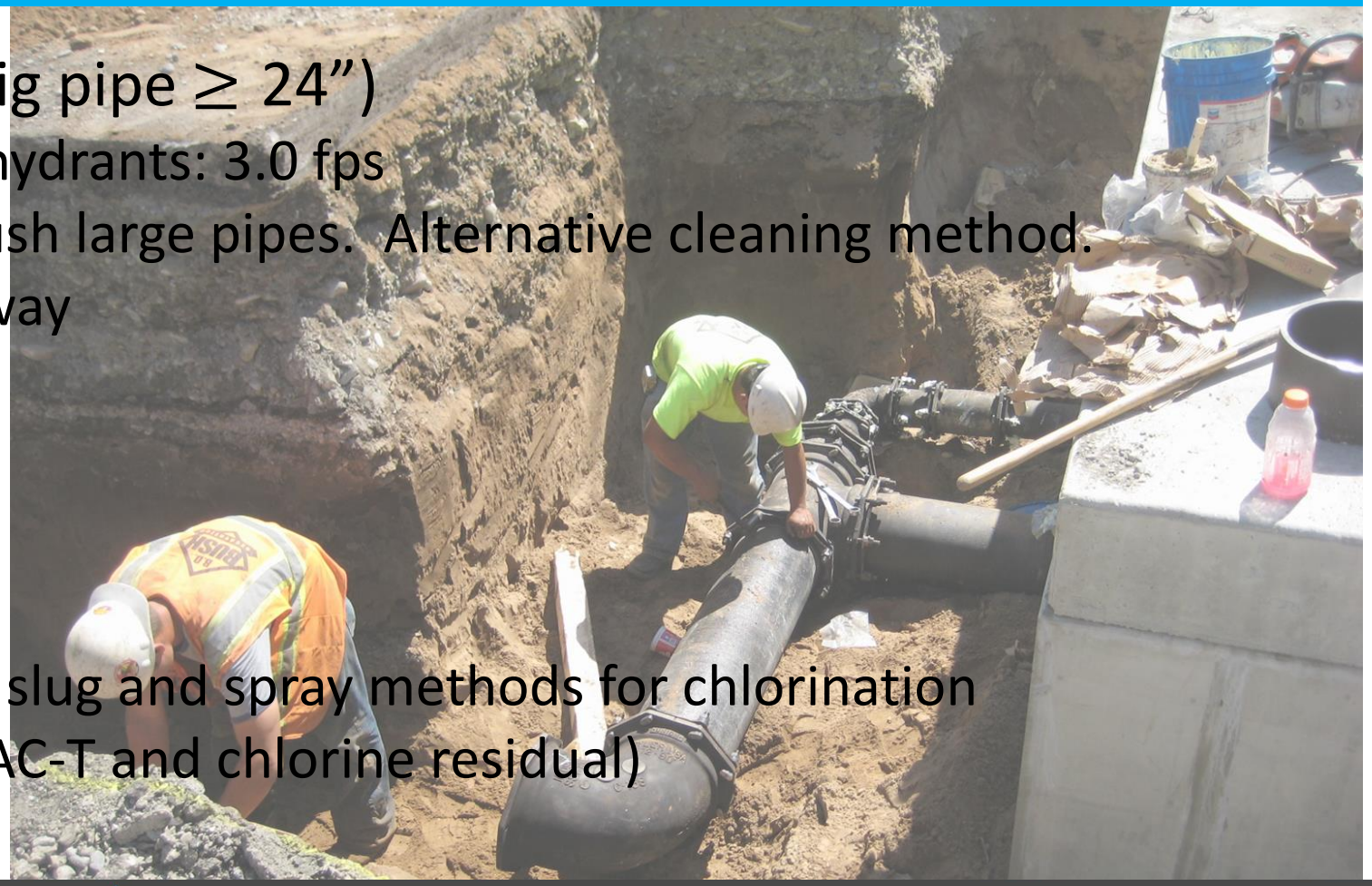
- Typical Requirement – Walls and Columns
  1. **2 days minimum**
- Typical Requirement – Roof Decks/Suspended Slabs
  1. **7 days minimum <u>and</u>**
  2. **75%** of 28-day strength
- Yes but can't the Contractor just jack up the strength?
- Form removal for slabs

Quality Control vs. Quality Assurance

- Quality Control – Contractor
- Quality Assurance – Owner/Engineer (or third-party)
- Typical Requirement for Testing (Soil, Concrete, Asphalt)
  1. Contractor – Qualifications Testing
  2. Owner/Engineer – Field Acceptance Testing
- Note Special Inspections Requirements

Pipeline Pressure Testing and Disinfection (Small vs. Big Pipe)

- Flushing (small < 24” vs. big pipe ≥ 24”)
  1. Sizing of flushing ports/hydrants: 3.0 fps
  2. Often not practical to flush large pipes. Alternative cleaning method.
  3. Prevention goes a long way
- Pressure testing
  1. Air removal
- Disinfection
  1. AWWA C651
  2. Tablet, continuous feed, slug and spray methods for chlorination
  3. Water quality testing (BAC-T and chlorine residual)



Concrete Curing

- Why it matters
  1. Hydraulic structures
  2. Limiting shrinkage
  3. Controlling cracking
- Types
  1. Water cure
  2. Plastic/burlap
  3. Spray-on cure (NSF 61)
- 14-day measures

Considering Constructability

- Means and Methods
- Representing the Owner
- Teaming with the Contractor


Questions?