

## Rural Underground Improvements Checklist

1. Upon receipt of plans and proposal.
  - A. Examine the Plans and make notes of any questions that you have. If there is a conflict Plans will govern over Standard Specifications or Supplemental Specifications.
    - i. Notes.
    - ii. Read the General Notes to determine details that are project specific and not included in the specifications that apply to underground improvements. Plan notes supersede specifications if there is a conflict.
  - b. Estimate of Quantities
    - i. Find out what quantities are for the underground improvements.
  - c. Detail Sheets
    - i. Go through detail sheets and find detail sheets that pertain to underground improvements such as pipe erosion control measures or inlets.
    - ii. Find pipe backfill details for pipes and learn what type of pipe requires what type of backfill.
      1. Type of material used for backfill.
      2. Excavation limits.
      3. Dimensions of backfill around pipe.
      4. Compaction requirements for pipe backfill.
    - iii. Check to see if any of the pipes require special erosion control features.
      1. Fiber rolls
      2. Erosion control mats
      3. RR Fabric with Riprap
      4. Straw Mat
  - d. Removal section
    - i. See what pipes need to be removed.
  - e. Plan and Profile Storm Sewer.
    - i. Check flow line elevations insure they match up with the slope staking report and the cross sections.
    - ii. Note locations and sizes, of pipe and inlets being installed.
    - iii. Make sure there is enough pipe length from inlets to end-sections.
    - iv. Do riser heights of inlets match up with the proposed ditch elevations?
    - v. Are inlets in proper locations (low point in sag curves so there is proper drainage)?
    - vi. Note if it crosses utilities or other underground improvements and is there enough room to set storm drain improvements in these locations.
    - vii. Is erosion control required on any of the inlets or end sections?
    - viii. Make sure each pay item is on sheet and that it matches the cross sections.
      1. For each type of inlet
      2. Each size of riser, or pipe
      3. Aggregate Base Course
      4. The correct quantity is called out for each item (LF, EA, CY or TONS)
  - f. Standard Details
    - i. Review all standard details required with underground improvements.

1. Erosion control measures, and concrete pipe sizes and thicknesses for steel or concrete pipes.
- B. Standard Specifications.
- a. Review Section 700 of the Standard Specifications to refresh knowledge of requirements for the work.
    - i. Section 708 covers the Description, Materials, Construction Requirements, Method of Measurement, and Basis of Payment for Erosion Control Measures.
    - ii. Section 709 covers Description, Materials, Construction Requirements, Method of Measurement, and Basis of Payment for Geotextile Fabrics.
    - iii. Section 714 covers Description, Materials, Construction Requirements, Method of Measurement, and Basis of Payment for Culverts, Storm Drains, Edge Drains, and Underdrains.
    - iv. Section 722 covers Description, Materials, Construction Requirements, Method of Measurement, and Basis of Payment for Manholes, Catch Basins, and Inlets.
    - v. Review all specifications referenced within Section 700. Often another specification will be referenced within a specification to save duplication. The reference specification becomes part of the specification referencing it. Materials specifications pertaining to the work will be referenced.
- C. Proposal.
- a. Look at Supplemental Specifications to be aware if any specification updates from the Standard Specifications have been made. Supplemental Specifications will govern over the Standard Specifications.
  - b. Examine the proposal to find Special Provisions regarding underground improvements. Special Provisions are specific to the project and cover items and conditions that are not included in the Standard Specifications. Special Provisions govern over Plans, Supplemental Specifications and Standard Specifications.
- D. Check the quantities of the bid items involved in the work. Plans are generally accurate but errors do happen and it is much better to find them early to avoid problems.
- a. Organize calculations to identify where materials are placed.
  - b. Inlets
  - c. Pipe lengths
  - d. Riser lengths
  - e. Pipe bedding materials
- E. Prepare any necessary field books to document the work.
- a. Include:
    - i. Location
    - ii. Date installed
    - iii. Date stamped
    - iv. Pay item
    - v. Quantity
    - vi. Date paid
    - vii. Calculations (if needed)
  - b. Each main pay item should have a field book

- i. Can include incidental items such as end sections, pipe bedding for each location under main pay item.
      - ii. Can set up each location for CL pipe. Use Sta of pipe and include pipe, end sections, fabric and base all on same location sheet.
    - c. Ask for prior year's field books and ask for past inspectors input on what to improve to make field book more complete.
  - F. Organize the documentation required for materials acceptance.
    - a. Determine what materials are accepted by certification and which need sampling or testing.
    - b. Prepare a list of materials that are accepted by certification and a testing and sampling frequency for materials that require them.
2. Prior to the start of installation of underground improvements.
- A. Job site
    - a. Get survey done for exact locations of end of barrel for all pipe improvements on job.
      - i. Find Sta, offset, elevations and size of each pipe to insure they match the plans.
        - 1. Get elevations for all flow lines at end sections, and inlets.
      - ii. If they are different than the plans make necessary changes to the plans to insure elevations are correct for end sections and inlets.
      - iii. Insure the pipe has enough cover over the top of each pipe.
      - iv. Let contractor know of any changes to plan quantities that are needed for riser heights, pipe lengths, or pipe sizes to insure proper drainage.
      - v. Check elevations of cross sections with the slope staking reports to see if changes are needed.
      - vi. Insure all end sections; median drains, etc. are in the clear zone.
      - vii. Don't assume plans are correct!
    - b. Check stockpiles.
      - i. Identify type of material and location of materials needed for improvements.
      - ii. Check pipes, end sections, risers, etc. for cracks or deformities.
      - iii. Check that stockpiles to make sure the correct pipe sizes and lengths are there. Inform contractor if more or less pipe is needed.
      - iv. Is the correct bedding material on location? Do you need to take a sample of the material used for the base?
      - v. Insure the proper end sections are on hand (male or female ends)
  - B. Supplier
    - a. Do you need materials samples from the supplier?
    - b. Do you have the required spec sheets from the supplier for materials used in the underground improvements?
    - c. Has the bedding material passed your prior gradation tests?
  - C. Have surveyor install all hubs needed for underground improvements.
    - a. Get together with contractor and surveyor to find out what way to have surveyor stake the required improvements so the contractor can construct improvements correctly and accurately.(offsets and markings)

- b. Check elevations and locations of hubs to make sure they match the plans.
- c. Make sure contractor and yourself can double check at least one hub after installing materials. (They can construct without destroying all staked hubs)

### 3. Underground Construction

#### A. Storm Sewer

- a. Learn standard details, notes, and plan detail sheets!
- b. Excavation
  - i. Correct location
  - ii. Are limits of excavation correct and adequate for installation?
  - iii. Are there any utilities in the way or could be exposed with excavation for the pipe? Ensure contractor asked for locates.
- c. Reinforcement fabric (if required)
  - i. Install fabric correctly.
  - ii. Make sure adequate dimensions are used.
  - iii. Make sure fabric is pinned taut with the correct overlap.
- d. Aggregate Base
  - i. Install base course in correct lift sizes.
  - ii. Is there adequate moisture in the base course to achieve compaction?
  - iii. Compact each lift correctly and adequately.
  - iv. Grade the base course correctly after installation and compaction.
- e. Pipe installation
  - i. Install pipe at correct flow line elevation.
  - ii. Is camber of the pipe required? (If it is, inform contractor of amount)
  - iii. Install gasket and or lube if required.
  - iv. Insure pipe is laid proper direction (bell ends upgrade)
  - v. Tie pipes together if required.
    - 1. Make sure correct tie bar sizes are used.
  - vi. Make sure pipes fit together tight on inside and outside.
  - vii. Ensure pipe is set straight in line with final hub location.
  - viii. Ensure no damage to pipe occurs during installation. (replace if necessary)
- f. Inlets
  - i. Insure inlet gets installed at proper location, elevation, and rotation.
  - ii. Backfill around inlet with proper materials and compaction equipment.
- g. Pipe Backfill
  - i. Make sure correct material is used for backfill.
  - ii. Ensure proper lift sizes are used for entire process of backfilling the pipe.
  - iii. Make sure proper compaction equipment is used and that the hunches of the pipe receive proper compaction.
  - iv. Ensure contractor backfills pipe to the final requirements of the pipe backfill detailed drawing.

### 4. Post construction

#### A. Fill out daily diary

- a. Equipment used for the work
- b. Labor force to complete the work
- c. What contractor completed during the day
  - i. Include all locations of where work was completed.
  - ii. Include pay items installed, with their respective quantities.

- iii. Note any problems or delays that happened during day.
  - iv. Note any changes to plans that were required during construction.
- B. Fill out field books
- a. Fill out each field book with dates to show what pay items were completed for the day.
  - b. Note any specs required per pay item. (date stamped, grade, ASTM #, etc.)
  - c. Note any changes in location, grade, or elevations.
- C. Fill out pay quantity report
- a. Include location, pay item, quantity, and calculations if needed.
  - b. Note what field book is needed to find the information on the pay item.