

Urban 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 manhole, drain, or inlet details.
 - ii. Check for watermain or sanitary sewer details for pipe fittings, valves, or thrust block details.
 - iii. Check to see if insulation board is required for watermain and where it is required.
 - iv. 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.
 - v. 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, manholes, inlets, or fire hydrants need to be removed.
 - e. Drainage summary sheet
 - i. Look over the manhole and inlet details.
 - ii. Check shop drawings for each manhole or inlet to make sure they are all the same as the drainage summary sheets.
 - iii. Make sure all elevations are correct for each manhole or inlet.
 - f. Plan and Profile Storm Sewer.
 - i. Check flow line elevations insure they match up with the drainage summary sheets.
 - ii. Note locations, sizes, and types of manholes and inlets being installed.
 - iii. Make sure there is enough pipe length in-between the manholes or inlets to connect them together. (note Sta and offset of Manholes or inlets are the center of each one)
 - iv. Do riser heights of manholes match the drainage summary sheets and shop drawings.
 - v. Are inlets in proper locations (low point in sag curves so there are no puddles) ?

- vi. Note where insulation board is needed and mark in your plans if not marked.
- vii. Note if it crosses utilities or other underground improvements and is there enough room to set storm drain improvements in these locations.
- viii. Is erosion control required on any of the inlets or end sections?
- ix. Make sure each pay item is on sheet and that it matches the drainage summary sheet.
 - 1. For each type of inlet
 - 2. Each size of manhole, riser, or pipe
 - 3. Aggregate Base Course
 - 4. The correct quantity is called out for each item (LF, EA, BD FT, CY or TONS)
- g. Plan and Profile Sanitary Sewer.
 - i. Check flow line elevations insure they match up with the drainage summary sheets.
 - ii. Note locations, sizes, and types of manholes being installed.
 - iii. Make sure there is enough pipe length in-between the manholes to connect manholes. (note Sta and offset of Manholes are the center of each one)
 - iv. Do riser heights of manholes match the drainage summary sheets and shop drawings.
 - v. Does sanitary sewer cross the watermain? If it does is there enough clearance or offset between the two pipes for adequate safety? (minimum 18 inches vertical clearance)
 - vi. Make sure each pay item is on sheet and that it matches the drainage summary sheet.
 - 1. Each size of manhole, riser, or pipe
 - 2. The correct quantity is called out for each item (LF, EA)
- h. Plan and Profile Watermain.
 - i. Check depth of watermain below the profile grade.
 - ii. Note locations, sizes, and types of gate valves, fittings, hydrants, curb stops, boxes, connections, and PVC.
 - iii. Make sure there is enough pipe length to connect pipe to hydrants, valves, or services.
 - iv. Note where insulation board is needed and mark in your plans if not marked.
 - v. Does sanitary sewer cross the watermain? If it does is there enough clearance or offset between the two pipes for adequate safety? (minimum 18 inches vertical clearance)
 - vi. Make sure each pay item is on sheet and that it matches the drainage summary sheet.
 - 1. For each type of valve
 - 2. Each size of pipe, hydrant, fittings, service connection, or box.
 - 3. The correct quantity is called out for each item (LF, EA, LBS)
- i. Standard Details
 - i. Review all standard details required with underground improvements.
 - 1. Erosion control, concrete pipe sizes and thicknesses, inlet sizes and types, manhole sizes and types, and reinforcement details around inlets or manholes.

- 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. Section 724 covers Description, Materials, Construction Requirements, Method of Measurement, and Basis of Payment for Water Mains, Water Lines, and Sewer Lines.
 - vi. Section 744 covers Description, Materials, Construction Requirements, Method of Measurement, and Basis of Payment for Insulation Board.
 - vii. 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. Construction Manual.
 - a. Consult the Section 400 of the Construction Manual to review the responsibilities of the inspector for the work being performed.
- E. 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. Manholes
 - c. Inlets
 - d. Pipe lengths
 - e. Riser lengths
 - f. Pipe bedding materials
 - g. Insulation board
 - h. Fittings, valves, boxes, or services.
- F. 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 fittings, end sections, pipe bedding for each location under main pay item.
 - c. Ask for prior year's field books and ask for past inspectors input on what to improve to make field book more complete.
- G. 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. Check stockpiles.
 - i. Identify type of material and location of materials needed for improvements.
 - ii. Check pipes, connections, end sections, etc. for cracks or deformities.
 - iii. Inspect manholes and risers and see if they match the shop drawings. If different make sure they are adequate to match plan heights for the roadway.
 - iv. Check that stockpiles to make sure the correct pipe sizes and lengths are there.
 - v. Is the correct bedding material on location? Do you need to take a sample of the material used for the base?
- 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.
 - 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, use correct amount)
 - iii. Install gasket and or lube if required.
 - iv. Tie pipes together if required.
 - 1. Make sure correct tie bar sizes are used.
 - v. Make sure pipes fit together tight on inside and outside.
 - vi. Ensure pipe is set straight in line with final hub location.
 - vii. Ensure no damage to pipe occurs during installation. (replace if necessary)
 - f. Inlets or Manholes
 - i. Ensure proper base is made with required base course before placing base of manhole or inlet.
 - ii. Insure manhole or inlet gets installed at proper location, elevation, and rotation.
 - iii. Insure concrete flow lines are installed.
 - iv. Insure outside and inside of manhole or inlet is completely grouted around concrete pipes.
 - v. Wrap manhole or inlet with plastic if required.
 - vi. Backfill around manhole or 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.
- B. Sanitary 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 that could be exposed with excavation of 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. Install gasket and or lube if required.
 - iii. Ensure pipe gets pushed all the way home.
 - iv. Make sure pipes fit together tightly.
 - v. Ensure pipe is set straight in line with final hub location.
 - vi. Ensure no damage to pipe occurs during installation. (replace if necessary)
 - f. Sanitary Manholes
 - i. Install base for manhole with proper aggregate base.
 - ii. Insure manhole is place correctly to tie in sanitary sewer pipe. (rotation and elevation)
 - iii. Make sure pipes in the manholes have flow in the correct direction.
 - iv. Insure contractor installs a flow line in the manhole to connect the pipes together. Some manholes have precast flow lines.
 - v. Install any riser sections and make sure they are sealed together properly and the steps into the manhole line up (correct rotation).
 - vi. Insure lid is installed in the correct place (rotation).
 - vii. Insure proper sealant is used in-between the MH and lid.
 - viii. Grout pipes into manhole to seal the outside of manhole.
 - ix. Insure manhole gets wrapped with plastic if required.
 - x. Backfill around sanitary manholes with proper materials and 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.
- C. Water Main
- 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 that could be exposed with excavation of 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. Do any services need to be turned off to construct?
 - ii. Insure the contractor gives adequate notice before shutting off water to anyone.
 - iii. Install pipe at correct flow line elevation.
 - iv. Install gasket and or lube if required.
 - v. Ensure pipe gets pushed all the way home.
 - vi. Make sure pipes fit together tightly.
 - vii. Ensure all ductile iron fittings are tightened to proper torque.
 - viii. Ensure pipe is set straight in line with final hub location.
 - ix. Ensure no damage to pipe occurs during installation. (replace if necessary)
 - x. Install insulation board if water main is within the minimum depth from the finished grade or the storm sewer.
 - f. Hydrants, gate valves, curb & corporation stops
 - i. Insure that hydrants are installed at the correct max spacing.
 - ii. Double check location before setting thrust blocks.
 - iii. Check elevation of trench in respect to hydrant top nut elevation or final grade line elevation to insure adequate height of valves, stops, and hydrants.
 - iv. Insure all fittings are installed properly.
 - v. Adjust elevations of pipe to ensure each final top elevation is correct with respect to the final grade of the road, sidewalk, or ground.
 - g. Testing and disinfecting lines
 - i. Get all requirements from the plan notes or standard specs.
 - ii. After partial or complete backfill, each section of new pipe or valves shall be pressure tested.
 - iii. The requirements of the test should be in the notes and the contractor needs to comply with all requirements of the job.
 - iv. After the final pressure test, the contractor shall disinfect all lines complying with all requirements for the job.
 - v. After flushing the lines from the disinfection materials, a bacteriological test shall be completed to ensure the water is adequate.
 - h. 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. 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.