SECTION 02400

GENERAL UTILITY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY:

A. Section Includes:
   1. Submittals
   2. Inspections
   3. Procedures

B. Related Sections:
   1. 02111 – Tree and Plant Protection
   2. 02200 – Earthwork
   3. 02221 – Trenching, Backfilling, & Compaction
   4. 02300 – Utility Tunnels
   5. 02665 – Water Systems
   6. 02667 – Chilled Water Systems
   7. 02685 – Gas Distribution Systems
   8. 02695 – Steam Distribution Systems
   9. 02711 – Foundation Drainage
   10. 02722 – Drainage Structures & Piping
   11. 02730 – Sanitary Sewer Systems
   12. 02785 – Electric Power Transmissions
   13. 02795 – Compressed Air Systems

1.2 INTENT:
A. The intent of this standard to state the general utility requirements that apply to all utilities on the UCB campus.

1.3 CODES & STANDARDS:

A. The most recent City of Boulder Design & Construction Standards are incorporated by reference into the University’s Standards. When there is a conflict between standards, the more stringent requirement shall apply. The University’s Civil Engineer must approve in writing any deviation from these standards prior to construction.

B. The most recent International Plumbing Code

C. The most recent International Building Code

1.4 PERMITS:

A. Each project which disturbs or modifies an underground utility is required to obtain a Utility Permit from the University’s Facilities Management Department prior to commencing construction.

B. The project is responsible for paying any permit fees associated with the Utility Permit.

C. Authorization to Proceed (ATP) with construction

1. The contractor shall not break ground or start any construction activities before an ATP is signed by the University

2. The ATP will not be signed until the following, at a minimum, are complete:

a. Drainage report

b. LEEDs 6.1, 6.2 and 7.1 documentation/design

c. Finalized and approved drawings (100% CD)

1.5 TAP FEES

A. The project is responsible for paying any tap fee (also commonly referred to as an impact fee or a plant investment fee (PIF)) as determined by the University’s Facility Management – Civil Division. Please reference the utility fee schedule.

1.6 SUBMITTALS

A. During Schematic Design, the design engineer shall provide a preliminary utilities plan
which:

1. Illustrates proposed methods and alternatives for providing utility service for the project.

2. Include site topography at 2-foot interval contours

3. Illustrate existing utilities, including manholes, within 400 feet of the proposed development.

4. Identify features, such as creeks, drainage facilities, wetlands, floodplain, utility tunnel, and irrigation ditches, that might influence the location of underground utilities.

5. Illustrate the general layout of the proposed utilities including mains and manhole locations.

6. Illustrate a demolition plan which clearly identifies which utility lines are to be abandoned.

B. During Design Development, the design engineer shall submit a Utility Report to the University’s Civil Engineer. This report shall conform to the requirements outlined in the City of Boulder’s Design & Construction Standards for the utility report. The engineer shall submit a utility system analysis showing the impacts of the project on the utility services. In addition, the following items shall be included for review:

1. Demolition plans,

2. Utility plans showing new and existing utilities,

3. Existing trees,

4. Utility details, and

5. An outline specification

C. Construction Document Phase, the design engineer shall submit complete plans and specifications for review which include:

1. Pipe sizes,

2. Points of connection,

3. Valve details,
4. Thrust blocks (including area),
5. Thrust (restraint) rods (including diameter),
6. Supports,
7. Trenching and bedding details,
8. Hydrant details,
9. Connection and joint details,
10. Vault plans and sections,
11. All existing tunnels and utilities,
12. A demolition plan indicating which lines are to be abandoned,
13. Building penetration details, and

D. Prior to construction:

1. A copy of the manufacturer’s installation recommendations for each kind of pipe must be provided to each foreman and the inspector prior to construction and must be followed during construction unless otherwise instructed.
   b. Manufacturer’s description of admixtures used.
   c. Manufacturer’s report of visual inspection.

2. Submit a copy of the project’s Stormwater Management Plan (SWMP) for review and approval. Use Best Management Practices (BMP’s). Sediment, debris or other pollutants from construction operations must be managed to prevent flow to the storm drainage system(s). Erosion and sediment management practices must be applied during construction.

3. Submit a copy of the project’s dewatering permit, if applicable.

4. Submit proposed modifications to any existing pre-engineered concrete structure (i.e., manhole, catch basin, or vault). Submittal shall show
dimension of any holes and method for preventing excessive damage.

5. Shop drawings

6. Prior to delivery of pipe from each manufacturing lot or run, submit:
   a. Test results for external load crushing strength test per Section 11 of ASTM C76 or Section 10 of ASTM C655.

E. At project closeout:

    Record Drawings: The Contractor shall safely maintain in good working order at the project site, one copy of all approved plans, specifications, addenda, written amendments, change orders, work change directives, field orders, and written interpretations and clarifications, clearly annotated to describe all changes made during construction. These documents, together with all final samples and Shop Drawings, shall be available for reference at the request of the University. Upon completion of the work, any deviations from the approved design and any pertinent notes and comments regarding construction conflicts shall be transferred to the approved plans and electronic drawing files and subsequently submitted to the University as the “Record Documents” for the project.

    1. Submit record drawings of installed utility system piping and products, in accordance with requirements of Section 01720.
    2. Submit shop drawings in accordance with the Section 01300.

1.7 NOTIFICATIONS:

A. Notify the CU Project Manager:
   1. Not less than 48 hours before performing locates.
   2. Not less than 48 hours before commencing work.
   3. Not less than 24 hours before laying pipe.
   4. Not less than 48 hours before any testing required by these standards.
   5. At substantial completion
   6. Not less than 48 hours before final inspection.

1.8 INSPECTIONS:

A. Notify the Owner’s Representative not less than 48 hours before inspection time.
B. Inspections are required prior to the following installation activities.
1. **Stockpiled Materials** – Verify that materials meet construction drawings and approved submittals, including but not limited to: bedding material, pipe, fittings, valves, valve boxes, and fire hydrants.

2. **Excavation** – Verify proper trench depths, shoring, spoil pile location, dewatering, and location and protection of existing utilities.

3. **Installation** – Verify proper bedding depth, alignment and grade, clean pipe and lubricants. Inspect piping to determine whether line displacement or other damage has occurred. If inspection indicated poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and re-inspect. Inspection of rebar for cast-in-place manhole bases.

4. **Backfill and Compaction** – Verify proper methods of backfill and compaction, depths of lifts, moisture control, backfill material free of large rock and organic or frozen material, and proper compaction effort and passing tests. Verify that warning tape has been installed. Verify that tracer wire has been installed and that it has a passing continuity test.

5. **Testing** – Verify that testing methods comply with UCB Design and Construction Standards. Verify that the Utility Inspector has witnessed all pressure tests of pipe, vacuum testing of manholes, televising of storm and sanitary sewers, and any other testing requirements such as deflection testing the may be required in the project specifications.

6. At any other time required by the contract documents.

C. Final inspection will be performed at completion at final stabilization of grade.

D. If work to be inspected is covered up prior to inspection, and if the University considers it necessary or advisable that covered work be observed, inspected, or tested, the Contractor, at the University’s request, shall uncover, expose, or otherwise make available for observation, inspection, or testing by the University, that portion of the work in question, furnishing all necessary labor, material, and equipment at no cost to the University.

E. If directed, the Contractor shall promptly correct all defective work, whether or not fabricated, installed, or completed, or, if the work has been rejected, remove it from the site and replace it with work that is not defective. The Contractor shall pay all claims, costs, losses, and damages caused by or resulting from such correction or removal (including, but not limited to, all costs of repair or replacement of work by others).

1.9 QUALITY ASSURANCE:

A. Manufacturer's Qualifications:
1. The manufacturer(s) shall be a firm regularly engaged in manufacture of water system materials and products, and whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications:

1. The installation firm(s) must submit documents of qualification and have a minimum of 3 years of successful installation experience on projects with work similar to that required for project.

1.10 SEPARATION OF UTILITIES:

A. Parallel (Horizontal) Separation: Parallel separations between utility mains and services to provide for adequate trench excavations and maintenance operations shall be as follows. All distances are measured from outside of pipe to outside of pipe:

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<thead>
<tr>
<th></th>
<th>Water</th>
<th>Sewer</th>
<th>Storm</th>
<th>Electric, Telecommunication s, and/or Gas</th>
<th>Chilled Water, Steam and/or Condensate</th>
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<tbody>
<tr>
<td>Water</td>
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<td>Sewer</td>
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<td>Storm</td>
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1. If the minimum horizontal separation between wastewater pipe and other utility cannot be achieved, then either the wastewater pipe or the other utility pipe should be upgraded to a pressure class pipe for the distance where the minimum separation cannot be achieved.

2. The Utility Engineer may approve any deviation from the minimum separation distances on a case-by-case basis.

B. Pipe Crossings (Vertical) Separation

1. The minimum vertical separation between water and wastewater line crossings, as measured outside of pipe to outside of pipe, shall be 18 inches. The water line shall be constructed above the wastewater line.
a. If the 18 inches of vertical separation cannot be obtained, and the water line is constructed above the wastewater line, reinforced concrete encasement shall be installed around the sewer pipe per City of Boulder standard drawing 4.06 and extending a distance of 10 feet either side of the center of the water main. OR One length of PVC pressure pipe at least 20 feet long shall be constructed in the sewer and centered under the water main. Joints between the sewer pipe and the special pipe should be encased in a reinforced concrete collar at least 6 inches thick and extending at least 6 inches either side of the joint. This shall be in addition to the use of a premanufactured adapter coupling such as a Mission, Fernco, or Caulder coupling with stainless steel tightening bands.

b. If the water line cannot be constructed above the wastewater line, then vertical separation between the water line and the wastewater line must be at least 18” and sewer joints shall be grouted or encased in concrete a minimum of 10 feet on either side of the crossing, measured from the outside diameter of the water pipe OR sewer pipe shall be replaced with PVC pressure pipe or cased in steel/ductile iron casing pipe for a minimum of 10 feet on either side of the crossing measured from the outside diameter of the water pipe.

2. The minimum vertical separation between water and storm drainage line crossings shall be 18 inches, measured from outside of pipe to outside of pipe.

a. If the 18 inches of vertical separation cannot be obtained, and the water line is constructed above the storm drainage line, reinforced concrete encasement shall be installed around the storm sewer pipe per City of Boulder standard drawing 4.06 and extending a distance of 10 feet either side of the center of the water main. OR One length of PVC pressure pipe at least 20 feet long shall be constructed in the storm sewer and centered under the water main. Joints between the sewer pipe and the special pipe should be encased in a reinforced concrete collar at least 6 inches thick and extending at least 6 inches either side of the joint. This shall be in addition to the use of a premanufactured adapter coupling such as a Mission, Fernco, or Caulder coupling with stainless steel tightening bands.

b. If the water line cannot be constructed above the storm drainage line, then vertical separation between the water line and the storm drainage line must be at least 18” and sewer joints shall be grouted or encased in concrete a minimum of 10 feet on either side of the crossing, measured from the outside diameter of the water pipe OR the storm drainage pipe shall be replaced with PVC pressure pipe or cased in steel/ductile iron casing pipe.
casing pipe for a minimum of 10 feet on either side of the crossing measured from the outside diameter of the water pipe.

3. The minimum vertical separation between wastewater and storm drainage line crossings, as measured outside of pipe to outside of pipe, shall be 6 inches, including the following:

   a. If the storm drainage line is constructed below the wastewater line, then pressure class pipe will be required for ONE of the utility lines to prevent wastewater contamination of storm drainage.

4. When excavating under an existing utility, flowfill shall be used for backfilling under the utility pipe.

5. For any dry utilities not mentioned above the minimum vertical separation shall be 6”, subject to the UCB Civil Engineer’s written approval.

C. Additional scenarios related to utility separation:

<table>
<thead>
<tr>
<th>Description</th>
<th>Solution</th>
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<tbody>
<tr>
<td>Proposed wet utility crossing under existing wet utility with a separation of 18&quot; or greater</td>
<td>Flowfill shall be used for anything above the proposed utility up to 12&quot; above the existing utility.</td>
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<tr>
<td>Proposed utility under roadway (designated roadway or sidewalk ≥ 6' wide)</td>
<td>Standard backfill plus 3' flowfill cap along entire trench length.</td>
</tr>
<tr>
<td>Proposed utility trench breaches the side of adjacent existing trench causing bedding material to dislodge</td>
<td>Contractor to pothole existing utility to determine separation distances. New CWR/S, steam, or condensate lines shall meet horizontal separation distance in Item #10 of this matrix. Flowfill shall be used in the proposed trench and shall extend to the existing utility to ensure the existing utility is properly supported. Contractor to coordinate with CU Inspector on the flowfill requirements.</td>
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<tr>
<td>Xcel gas line crossing</td>
<td>Gas lines could potentially be within the 3' flowfill cap. Xcel Energy does not allow their gas lines to be encased in flowfill. Sand slurry, flash fill, or anything that can be dug by hand shall be used in place of flowfill for any gas lines within the 3' flowfill cap.</td>
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<tr>
<td>Proposed utility trench disturbs existing utility thrust block</td>
<td>Flow fill must be placed around the disturbed thrust block in order to stabilize the thrust block.</td>
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<tr>
<td><strong>Horizontal Separation</strong></td>
<td>The contractor shall maintain a minimum of 5' clear separation between the proposed and existing utility pipes (edge to edge). If the horizontal separation distance is between 3-5', then the contractor shall flowfill the trench to 12&quot; above the shallowest utility. Under no circumstance shall the horizontal distance be less than 3 feet.</td>
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<tr>
<td><strong>Future Utility</strong></td>
<td>Whenever the proposed utility crosses a future utility line that has not been installed (as in the case of the storm lines near Kitt Central), the contractor shall survey/locate the exact location of the future utility and meet separation requirements. Also, the contractor shall flowfill between the two utilities to a height of 6&quot; below the future utility.</td>
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<td></td>
<td><em>Note: &quot;Wet utilities&quot; include domestic water, chilled water return/supply, steam, condensate, storm and sewer lines when determining separation requirements.</em></td>
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1.11 **EROSION AND DUST CONTROL:**

A. Refer to Section 02230 for specific erosion control requirements.

B. The Contractor shall prevent erosion of soil on the site and adjacent property resulting from utility construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operation that will disturb the natural protection. Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practical. Stormwater inlets shall be protected to prevent sediment from excavated areas from entering. All BMPs shall be designed as to not restrict the inlets during large storm events which have the potential to cause flooding and damage to campus buildings.

C. If the Contractor is told that off-project area transport of dust is occurring during construction. The Contractor shall immediately increase the level of dust control to their construction activities.

D. It shall be the responsibility of the Contractor to investigate and verify in the field, the existence and location of utilities whether shown on the approved plans or not. The Contractor shall be solely responsible for the protection of all structures or utilities, including pipes, cables, fences or similar items. Permission for the adjustment of existing utilities or other items or structures shall be obtained from the appropriate owners or agents.

1.12 **UTILITY LOCATES FOR OUTSIDE CONTRACTORS/PROJECTS:**
A. Underground Utility locates must be requested through the Utility Notification Center of Colorado (UNCC) at 1(800) 922-1987 or 811. The contractor may contact the University of Colorado representative in charge of locating for general site information at (303) 961-0875.

B. The contractor must wait 2 business days (not to include the call day) from the time the locate request was made before excavation can commence per Colorado State Law. Under no circumstance other than an emergency is it allowable to commence excavation before this stated time frame.

C. Emergency utility locates must be requested through the Utility Notification Center of Colorado (UNCC) at 1(800) 922-1987 or 811. The contractor may also contact the utility locator directly at (303) 961-0875 during regular business hours. The contractor must give the utility locator 2 hours to respond in person or by telephone. Under no circumstance should excavation commence unless the contractor has spoken with the utility locator and contacted the UNCC. If for some reason the utility locator cannot be reached, the contractor could contact the Facilities Management Service Center at (303) 492-5522 for assistance.

D. Non-University entities that have utilities on the University property are responsible for their own utility locates. The contractor must make sure that these entities have been notified and have shown up before any digging starts.

E. The dig area(s) must be pre marked with white paint. The only exception to this rule is if the contractor meets with the utility locator to point out the specific dig area(s). The contractor must also make every attempt to adequately describe the area when the utility locate is called into the UNCC. Building names and landmarks are extremely helpful when describing campus locations. Each building on campus does have a physical address that can be obtained from Facilities Management web site.

F. All projects shall pothole existing utility lines in the construction area whenever regrading is required or when a new utility is expected to cross an existing utility.

1.13 DAMAGE NOTIFICATION. IF A FACILITY IS DAMAGED, THE FOLLOWING DAMAGE NOTIFICATION PROCEDURE SHALL BE FOLLOWED:

A. Immediately evacuate the area and call 911 if a dangerous or potentially dangerous situation exists.

B. Cease excavation and immediately notify the CU representative to report damage or exposed facility. Assist CU representative in completing a damage report.

C. Immediately call UNCC (1-800-922-1987 or 811) and process a Damage Ticket.

D. Contact facility owner(s) and report the damage.
E. Excavators and owners/operators who fail to use reasonable care will be “presumed liable” for the cost of the damage, including expenses of suit and reasonable attorney fees and any third party injuries or damages. Reasonable care should include all of the guidelines identified under excavator and facility owner/operator responsibilities.

F. Continue excavation only after a facility representative has arrived and given permission to proceed.

1.14 UTILITY TRACE WIRE

A. General Requirements:

1. Every trace wire system installed should have been designed to match the life of the utility it accompanies.

2. The trace wire needs to be continuous, insulated from the earth and grounded on its ends. NO below ground connections accepted.

3. The trace wire should have a minimum 12 AWG size or use NEPTCO RT Series Detectable MuleTape, constructed of solid copper and have a minimum 30 mil polyethylene jacket designed for buried use. The use of solid copper wire type THHN or THWN VW-1 600V, gasoline and oil resistant insulated is the minimum requirement for trace wire.

4. Trace wires must be installed on all underground utility lines that cannot be located between manholes.

5. Both trace wire ends must be accessible from the surface and protected in a flush-mounted trace wire box (Snake Pit Magnetized Box). Trace wire boxes must be installed along the utility line every 250 feet. Trace wire boxes must also be installed adjacent to outside walls where utilities enter the building. The trace wire box must be identified as a trace wire box on the outside. The trace wire must be 12 AWG or larger and must be marked to reflect the UNCC color code of the utility being installed. The test points must also be identified to reflect the UNCC color code of the utility being installed.

B. Installation in the Trench

1. The trace wire should not float “somewhere in the trench.” The trace wire will not be wrapped around the pipe in a spiral as this is a source of signal degradation and adds physical stress to the wire. The trace wire will be placed on top of the utility pipe and will be fastened in place at approximately every 8 to 12 feet to secure it in place when the trench is backfilled. Metallic Fasteners are not to be used. The trace wire on fuel pipelines and on gas lines will not be fastened to the top of the
pipe. Instead, the wire will be fastened to the pipe with the use of a spacer to keep the wire at a set distance from the pipe.

2. The wire will be allowed some slack to allow for bends in laying and for future installation of joints, splices, tapping saddles, etc. The slack should also be sufficient to allow small earth movements occurring in compacting trench fill or through natural subsidence.

3. If it is necessary to join the trace wire below ground, the wire should be joined in a permanent bond (braising, cad welding or equivalent) and the joined area insulated and rendered watertight in order to prevent corrosion.

C. Installation of Trace Wire Access Points

1. Any trace wire system will be accessible at a minimum of 2 points, the beginning and the end of the wire. The general design of access points to tracer wire is that the wire will be brought to ground level and a connection point provided for a locator to clip equipment onto the wire. If the contractor laying the new utility needs to join sections of tracer wire, these access points are considered an above ground join and do not need to be extensively insulated. Split bolts (preferred) and wire nuts are options. The join can be taped also.

2. Trace wire in valve boxes are vulnerable to being twisted around valve keys and snapped, or pushed to the bottom of the valve box where they are out of reach and inaccessible to the locator. The problem can be mitigated by correctly installing the trace wire so it enters the valve box near the top where it can be coiled just under the valve cap. This way the utility worker can easily pull the loop out of the way before using the valve.

D. Distance Between Access Points

1. Access to trace wire will in general be at every point the utility has another physical access point. On water, gas and fuel lines all valves below ground are considered access points and trace wire should be accessible at these points. Access points’ distance from each other will thus vary from a few feet up to hundreds of feet depending on the utility and the project. Concentrations of multiple valves on one utility within 10 feet of each other may be simplified to one access point if this is made explicit in the trace wire submission drawings.

2. There normally should be an access point at least every 500 feet. On long utility runs that exceed 500 feet there should be an intermediate access point provided by bringing the trace wire to the ground level and installing an above ground accessible junction box. Where this is a problem the trace wire system may be initially designed with cable that can be demonstrated to carry an adequate signal over longer distances.
E. Termination of Trace Wire

1. The beginning and end of a tracer wire are equally logical places to be brought to the surface. Above ground trace wire termination points will be clearly tagged or labeled as end points. An as-built point-to-point wiring diagram will be provided and mounted next to the termination point. The end points of any trace wire system are also suitable points to place anodes. Anodes have the dual function of providing cathodic protection for the trace wire (thus increasing its life expectancy) and for providing high quality grounds points.

2. Where a new non-metallic utility line taps into an existing metal utility line, the tracer wire should be either terminated at an anode next to the metallic utility or be permanently attached to the metallic line. A tracer wire will not be terminated to or on another tracer wire or metallic utility line unless the two systems are demonstrably compatible. This is to reduce the potential for rapid corrosion of one system due to a ‘reverse’ cathodic effect.

3. Lateral connections will be designed to be compatible with the trace wire on the main line. If the termination of the lateral at the main line tracer wire is underground, the join will meet all requirements for underground joins applicable to the main line tracer wire. If the join is ‘above ground’, e.g. at a valve for the lateral line, the joint will be a permanent one (split bolt or better) to the main line tracer wire and will be accessible.

4. Where the lateral line effectively terminates/interfaces with a building, the lateral tracer wire line section will be terminated in an appropriate manner for the utility. Where the utility enters a meter, junction box or similar point outside the building, the trace wire should be brought to the surface and terminated by attaching it to the appropriate utility with a suitable fastener/clamp so that it is clearly visible as part of the utility installation (no dangling wires). When the utility access is only available inside the building, the tracer wire will be terminated in a neat manner inside the building and clearly labeled or tagged. It will also need to be grounded.

F. Testing of Trace Wire Systems

1. All trace wire for new utility installations will be tested before acceptance. The test will take the following form:

   a. A standard 5 watt generator will be used to provide an AC current on the wire.

   b. The frequency of the signal from the generator will be initially restricted to 33 kHz or less.

   c. A standard hand held detector will be used to trace the signal.
2. The installed trace wire will be deemed to pass the test if using this set up:
   a. The trace wire is accessible at all access points.
   b. The trace wire can be traced from access point to access point.
   c. Widely-spaced access points can be traced out in the worst case from each ‘end’ to a common meeting point between them.
   d. Depth readings are consistent and accurate to within a 15 to 1 depth to diameter ratio.

1.15 CAPPING OF UTILITIES

A. Any time a backflow preventer is removed from any utility line, the line must be capped at the main to prevent backflow from dead lines into main lines.

1.16 UTILITIES UNDER BUILDINGS

A. All utility line crossings under buildings or other structures, or any other situation as determined by the UCB civil engineer, shall be encased in a casing pipe in accordance with UCB standard detail C.24.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION 02400