

PROJECT REFERENCE NO.  
U-6005

SHEET NO.  
UC-3L

DESIGNED BY: ELM  
DRAWN BY: ELM  
CHECKED BY: MUP  
APPROVED BY: MUP

REVISED:

NORTH CAROLINA  
DEPARTMENT OF  
TRANSPORTATION

UTILITIES ENGINEERING SEC.  
PHONE: (919) 707-6690  
FAX: (919) 250-4151

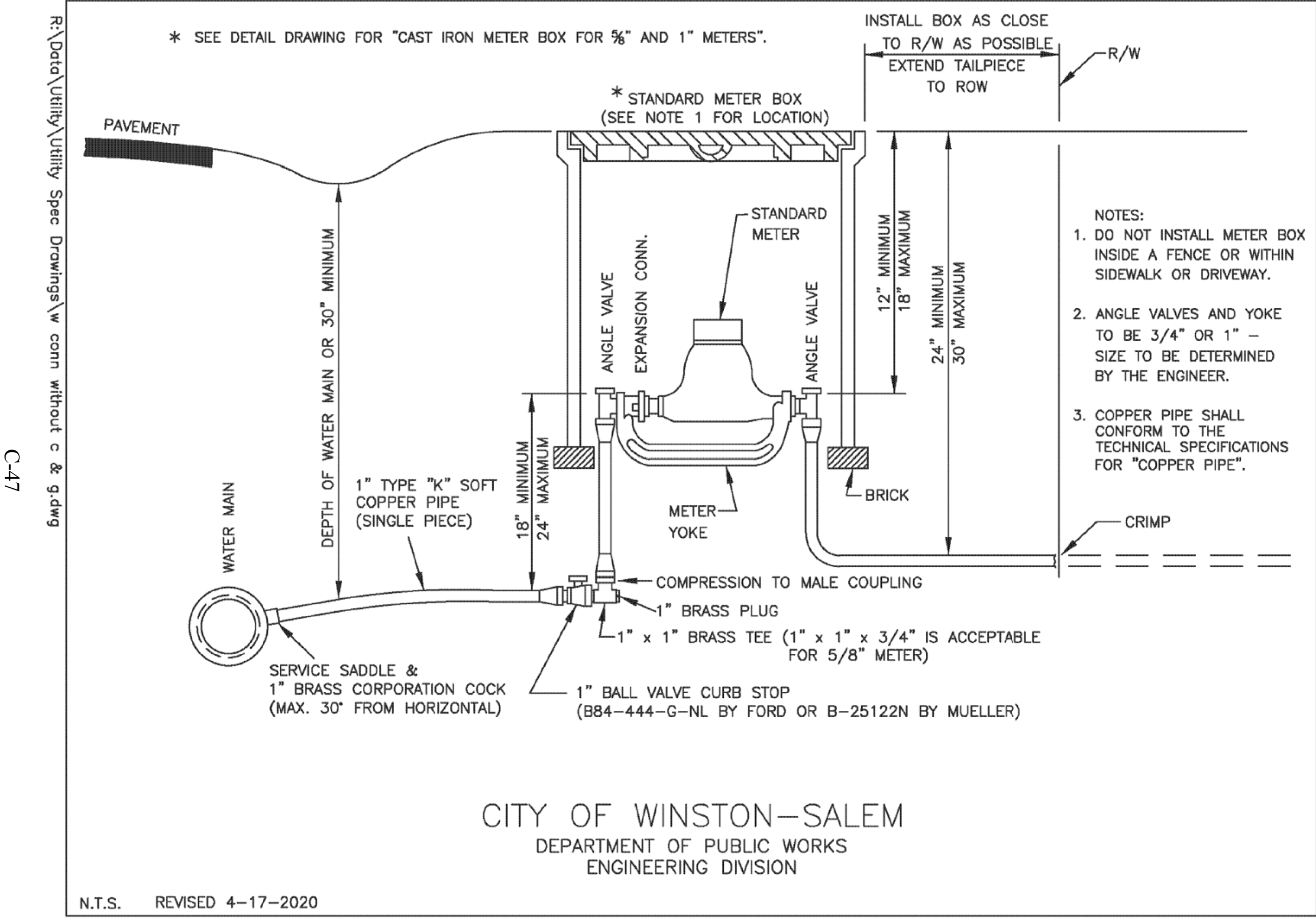
SEAL  
20212

REGISTERED PROFESSIONAL ENGINEER  
MAY 1983  
2/12/2025 11:41:30 AM EST

UTILITY CONSTRUCTION  
PLANS ONLY

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

1" Water Connection (Without Curb & Gutter)



Horizontal & Vertical Up Bends

| Pipe Size (inch) | Bend Angle | Pipeline Restraint Req. Each Side of Fitting (feet) |
|------------------|------------|-----------------------------------------------------|
| 6"               | 11.25      | 8                                                   |
|                  | 22.5       | 15                                                  |
|                  | 45         | 31                                                  |
|                  | 90         | 75                                                  |
| 8"               | 11.25      | 10                                                  |
|                  | 22.5       | 19                                                  |
|                  | 45         | 40                                                  |
|                  | 90         | 97                                                  |
| 10"              | 11.25      | 12                                                  |
|                  | 22.5       | 23                                                  |
|                  | 45         | 48                                                  |
|                  | 90         | 116                                                 |
| 12"              | 11.25      | 13                                                  |
|                  | 22.5       | 27                                                  |
|                  | 45         | 56                                                  |
|                  | 90         | 135                                                 |
| 16"              | 11.25      | 17                                                  |
|                  | 22.5       | 34                                                  |
|                  | 45         | 71                                                  |
|                  | 90         | 171                                                 |

PIPE RESTRAINT CHARTS

Vertical Down Bends

| Pipe Size (inch) | Bend Angle | Pipeline Restraint Req. Each Side of Fitting (feet) |
|------------------|------------|-----------------------------------------------------|
| 6"               | 11.25      | 16                                                  |
|                  | 22.5       | 32                                                  |
|                  | 45         | 66                                                  |
|                  | 90         | 159                                                 |
| 8"               | 11.25      | 20                                                  |
|                  | 22.5       | 41                                                  |
|                  | 45         | 85                                                  |
|                  | 90         | 205                                                 |
| 10"              | 11.25      | 25                                                  |
|                  | 22.5       | 49                                                  |
|                  | 45         | 102                                                 |
|                  | 90         | 247                                                 |
| 12"              | 11.25      | 29                                                  |
|                  | 22.5       | 58                                                  |
|                  | 45         | 120                                                 |
|                  | 90         | 289                                                 |
| 16"              | 11.25      | 37                                                  |
|                  | 22.5       | 74                                                  |
|                  | 45         | 153                                                 |
|                  | 90         | 369                                                 |

Tees, Reducers, Caps

| Fitting | Size  | Pipeline Restraint Req. Each Side of Fitting (feet) |
|---------|-------|-----------------------------------------------------|
| Tee     | 4     | 68                                                  |
|         | 6     | 114                                                 |
|         | 8     | 160                                                 |
|         | 10    | 202                                                 |
|         | 12    | 244                                                 |
| Reducer | 16    | 323                                                 |
|         | 6x4   | 120                                                 |
|         | 8x6   | 115                                                 |
|         | 10x4  | 488                                                 |
|         | 10x6  | 252                                                 |
|         | 10x8  | 104                                                 |
|         | 12x4  | 736                                                 |
|         | 12x6  | 422                                                 |
| Cap     | 12x10 | 102                                                 |
|         | 16x8  | 553                                                 |
|         | 16x10 | 360                                                 |
|         | 16x12 | 213                                                 |
|         | 4     | 112                                                 |
|         | 6     | 159                                                 |
|         | 8     | 205                                                 |
|         | 10    | 247                                                 |
|         | 12    | 289                                                 |
|         | 16    | 369                                                 |