

| 'Ls' TENSION LAP SPLICE LENGTH - CLASS B (GRADE 60 UNCOATED BARS NORMAL WEIGHT CONCRETE) |                          |        |                          |        |                          |        |                          |        |                          |        |
|--|--------------------------|--------|--------------------------|--------|--------------------------|--------|--------------------------|--------|--------------------------|--------|
| BAR SIZE   | f <sub>c</sub> =3000 psi |        | f <sub>c</sub> =4000 psi |        | f <sub>c</sub> =5000 psi |        | f <sub>c</sub> =6000 psi |        | f <sub>c</sub> =8000 psi |        |
|  | TOP                      | OTHER  | TOP                      | OTHER  | TOP                      | OTHER  | TOP                      | OTHER  | TOP                      | OTHER  |
| # 3  | 2'-4"                    | 1'-10" | 2'-1"                    | 1'-7"  | 1'-10"                   | 1'-5"  | 1'-8"                    | 1'-4"  | 1'-6"                    | 1'-2"  |
| # 4  | 3'-2"                    | 2'-5"  | 2'-9"                    | 2'-1"  | 2'-5"                    | 1'-11" | 2'-3"                    | 1'-9"  | 1'-11"                   | 1'-6"  |
| # 5  | 3'-11"                   | 3'-0"  | 3'-5"                    | 2'-7"  | 3'-0"                    | 2'-4"  | 2'-9"                    | 2'-2"  | 2'-5"                    | 1'-10" |
| # 6  | 4'-8"                    | 3'-7"  | 4'-1"                    | 3'-1"  | 3'-8"                    | 2'-10" | 3'-4"                    | 2'-7"  | 2'-11"                   | 2'-3"  |
| # 7  | 6'-9"                    | 5'-3"  | 5'-11"                   | 4'-6"  | 5'-3"                    | 4'-1"  | 4'-10"                   | 3'-9"  | 4'-2"                    | 3'-3"  |
| # 8  | 7'-9"                    | 6'-0"  | 6'-9"                    | 5'-2"  | 6'-0"                    | 4'-8"  | 5'-6"                    | 4'-3"  | 4'-9"                    | 3'-8"  |
| # 9  | 8'-9"                    | 6'-9"  | 7'-7"                    | 5'-10" | 6'-9"                    | 5'-3"  | 6'-2"                    | 4'-9"  | 5'-4"                    | 4'-2"  |
| # 10   | 9'-10"                   | 7'-7"  | 8'-6"                    | 6'-7"  | 7'-8"                    | 5'-11" | 7'-0"                    | 5'-4"  | 6'-0"                    | 4'-8"  |
| # 11   | 10'-11"                  | 8'-5"  | 9'-6"                    | 7'-3"  | 8'-6"                    | 6'-6"  | 7'-9"                    | 5'-11" | 6'-8"                    | 5'-2"  |

- NOTES:
- FOR CLASS 'A' SPLICE (PERMITTED ONLY WHEN NOT MORE THAN HALF THE BARS SPLICED AND SPLICES STAGGERED BY THE DISTANCE OF SPLICE LENGTH), USE SAME AS L<sub>d</sub> = TENSION DEVELOPMENT LENGTH TABLE.
  - WHEN REINFORCING BAR SPACING IS LESS THAN 2 d<sub>b</sub> FOR BEAMS AND COLUMNS OR 3 d<sub>b</sub> FOR ALL OTHER CONCRETE ELEMENTS, LENGTHS SHALL BE MULTIPLIED BY A FACTOR OF 1.5 (d<sub>b</sub> = REINFORCING BAR DIAMETER).
  - FOR WIDELY SPACED BARS IN FOOTINGS, WALLS, AND SLABS, THE BAR SPLICE LENGTHS CAN BE REDUCED BASED ON ACI 318-14 EQUATION 25.4.2.3a OR ACI 318-19 EQUATION 25.4.2.4a.

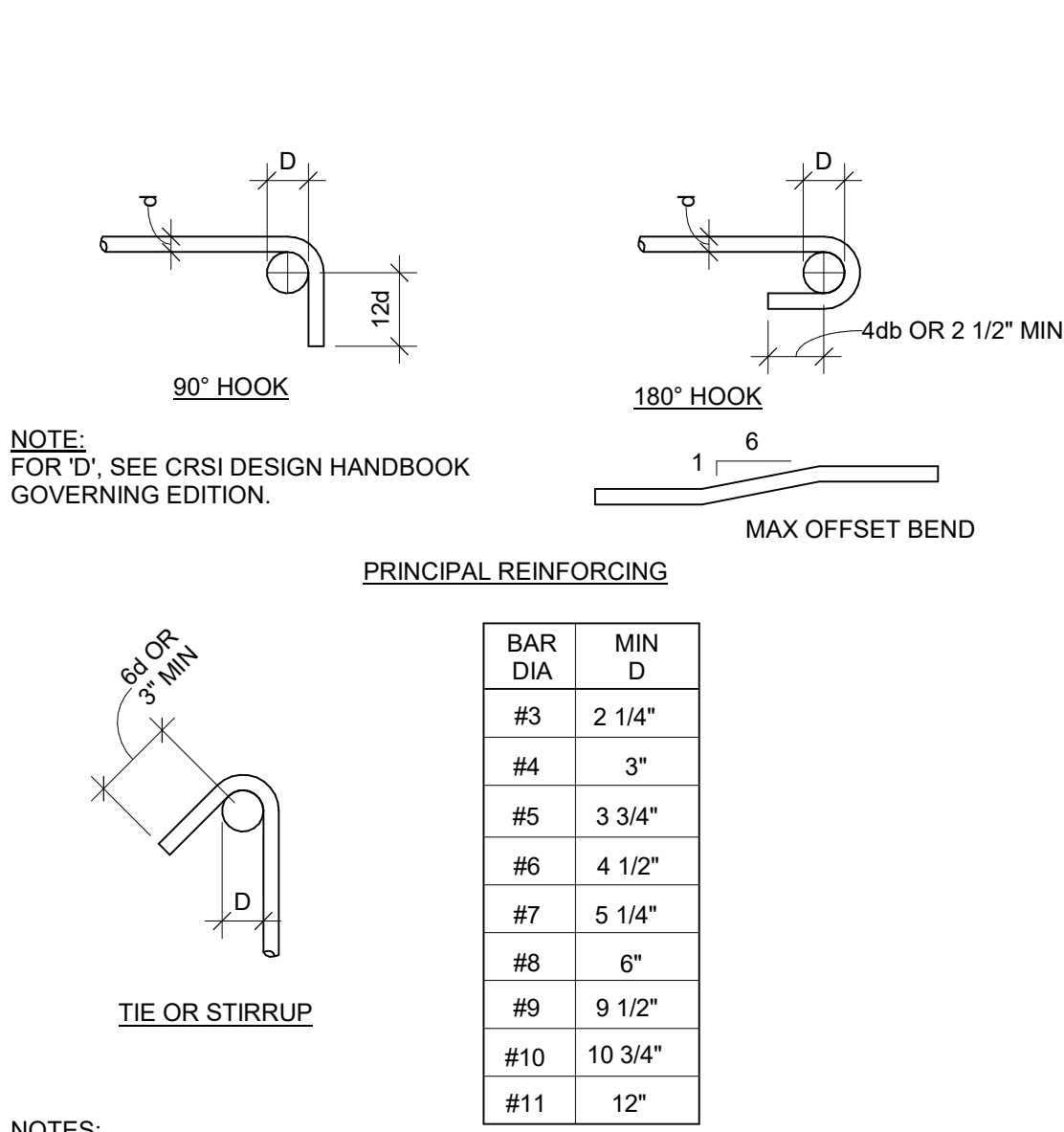
| 'L <sub>d</sub> ' TENSION DEVELOPMENT LENGTH (GRADE 60 UNCOATED BARS - NORMAL WEIGHT CONCRETE) |                          |        |                          |       |                          |        |                          |        |                          |        |
|--|--------------------------|--------|--------------------------|-------|--------------------------|--------|--------------------------|--------|--------------------------|--------|
| BAR SIZE   | f <sub>c</sub> =3000 psi |        | f <sub>c</sub> =4000 psi |       | f <sub>c</sub> =5000 psi |        | f <sub>c</sub> =6000 psi |        | f <sub>c</sub> =8000 psi |        |
|  | TOP                      | OTHER  | TOP                      | OTHER | TOP                      | OTHER  | TOP                      | OTHER  | TOP                      | OTHER  |
| # 3  | 1'-10"                   | 1'-5"  | 1'-7"                    | 1'-3" | 1'-5"                    | 1'-1"  | 1'-4"                    | 1'-0"  | 1'-2"                    | 1'-0"  |
| # 4  | 2'-5"                    | 1'-10" | 2'-1"                    | 1'-7" | 1'-11"                   | 1'-5"  | 1'-9"                    | 1'-4"  | 1'-6"                    | 1'-2"  |
| # 5  | 3'-0"                    | 2'-4"  | 2'-7"                    | 2'-0" | 2'-4"                    | 1'-10" | 2'-2"                    | 1'-8"  | 1'-10"                   | 1'-5"  |
| # 6  | 3'-7"                    | 2'-9"  | 3'-1"                    | 2'-5" | 2'-10"                   | 2'-2"  | 2'-7"                    | 2'-0"  | 2'-3"                    | 1'-9"  |
| # 7  | 5'-3"                    | 4'-0"  | 4'-6"                    | 3'-6" | 4'-1"                    | 3'-2"  | 3'-9"                    | 2'-10" | 3'-3"                    | 2'-6"  |
| # 8  | 6'-0"                    | 4'-7"  | 5'-2"                    | 4'-0" | 4'-8"                    | 3'-7"  | 4'-3"                    | 3'-3"  | 3'-8"                    | 2'-10" |
| # 9  | 6'-9"                    | 5'-2"  | 5'-10"                   | 4'-6" | 5'-3"                    | 4'-0"  | 4'-9"                    | 3'-8"  | 4'-2"                    | 3'-2"  |
| # 10   | 7'-7"                    | 5'-10" | 6'-7"                    | 5'-1" | 5'-11"                   | 4'-6"  | 5'-4"                    | 4'-2"  | 4'-8"                    | 3'-7"  |
| # 11   | 8'-5"                    | 6'-6"  | 7'-3"                    | 5'-7" | 6'-6"                    | 5'-0"  | 5'-11"                   | 4'-7"  | 5'-2"                    | 4'-0"  |

- NOTES:
- 'TOP' BARS ARE HORIZONTAL BARS WITH MORE THAN 12 INCHES OF FRESH CONCRETE CAST BELOW THE BARS AT THE DEVELOPMENT LENGTH.
  - WHEN REINFORCING BAR SPACING IS LESS THAN 2 d<sub>b</sub> FOR BEAMS AND COLUMNS OR 3 d<sub>b</sub> FOR ALL OTHER CONCRETE ELEMENTS, LENGTHS SHALL BE MULTIPLIED BY A FACTOR OF 1.5 (d<sub>b</sub> = REINFORCING BAR DIAMETER).
  - FOR WIDELY SPACED BARS IN FOOTINGS, WALLS, AND SLABS, THE BAR DEVELOPMENT LENGTHS CAN BE REDUCED BASED ON ACI 318-14 EQUATION 25.4.2.3a OR ACI 318-19 EQUATION 25.4.2.4a.

| 'L <sub>dh</sub> ' TENSION DEVELOPMENT (EMBEDMENT) LENGTH FOR STANDARD END HOOKS (GRADE 60 BARS - NORMAL WEIGHT CONCRETE)  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| <div><div><div>L<sub>dh</sub></div><div>2" MIN COVER</div></div><div><div>L<sub>dh</sub></div><div>2" MIN COVER</div></div><div>STANDARD 90 HOOK<br/>SIDE COVER &gt; 2 1/2"</div><div>STANDARD 180 HOOK<br/>SIDE COVER &gt; 2 1/2"</div></div> |                          |                          |                          |                          |
| BAR SIZE   | f <sub>c</sub> =3000 psi | f <sub>c</sub> =4000 psi | f <sub>c</sub> =5000 psi | f <sub>c</sub> =6000 psi |
|  | L <sub>dh</sub>          | L <sub>dh</sub>          | L <sub>dh</sub>          | L <sub>dh</sub>          |
| # 3  | 6"                       | 6"                       | 6"                       | 6"                       |
| # 4  | 6"                       | 6"                       | 6"                       | 6"                       |
| # 5  | 8"                       | 8"                       | 8"                       | 7"                       |
| # 6  | 11"                      | 10"                      | 10"                      | 10"                      |
| # 7  | 1'-2"                    | 1'-1"                    | 1'-0"                    | 1'-0"                    |
| # 8  | 1'-4"                    | 1'-3"                    | 1'-3"                    | 1'-3"                    |
| # 9  | 1'-8"                    | 1'-6"                    | 1'-6"                    | 1'-5"                    |
| # 10   | 1'-11"                   | 1'-10"                   | 1'-9"                    | 1'-9"                    |
| # 11   | 2'-3"                    | 2'-2"                    | 2'-1"                    | 2'-0"                    |

## C1 TENSION LAP SPLICES

SCALE 3/4" = 1'-0"

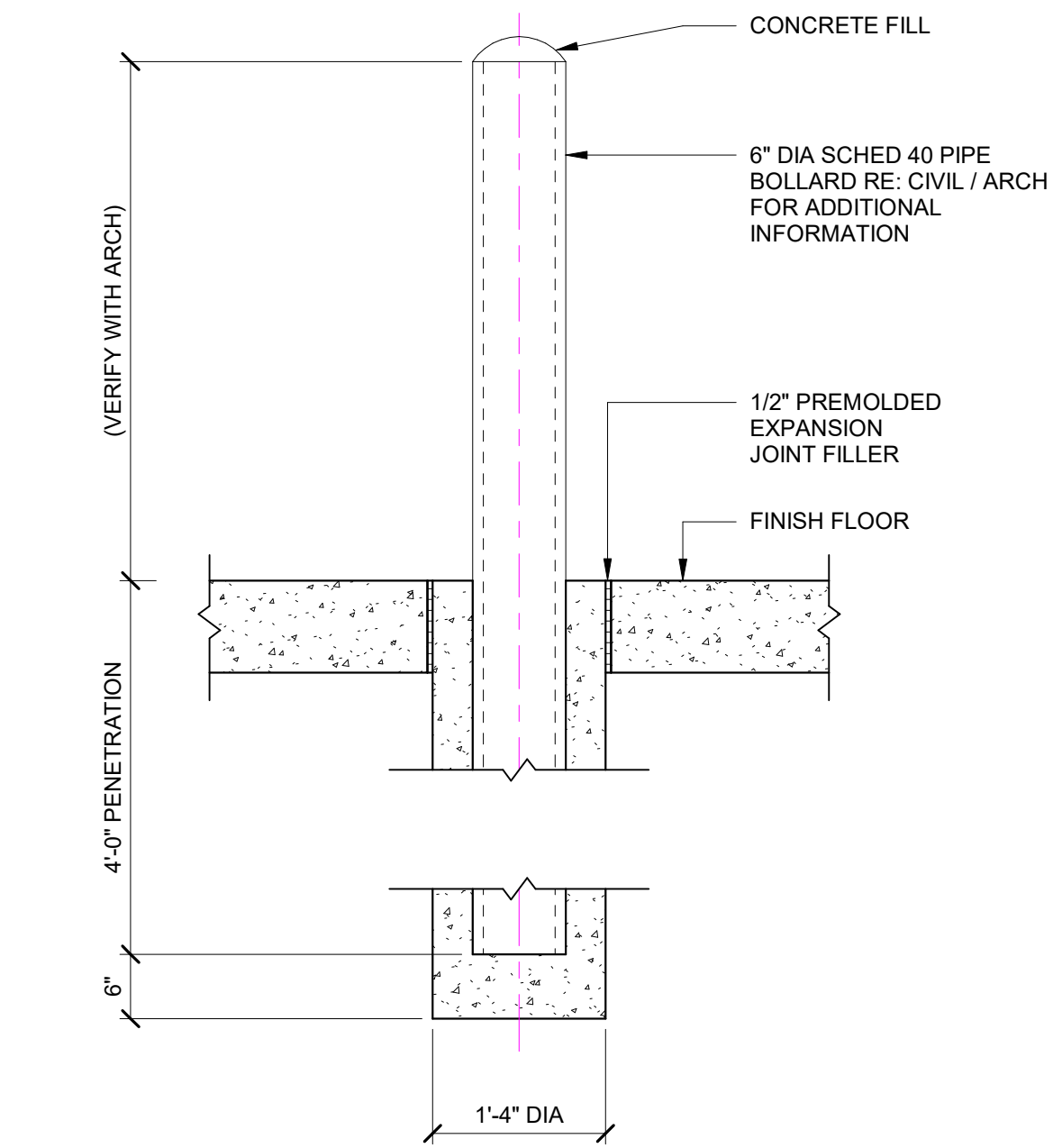


## D1 BAR BENDS

SCALE 1" = 1'-0"

## C2 TENSION DEVELOPMENT LENGTH

SCALE 3/4" = 1'-0"

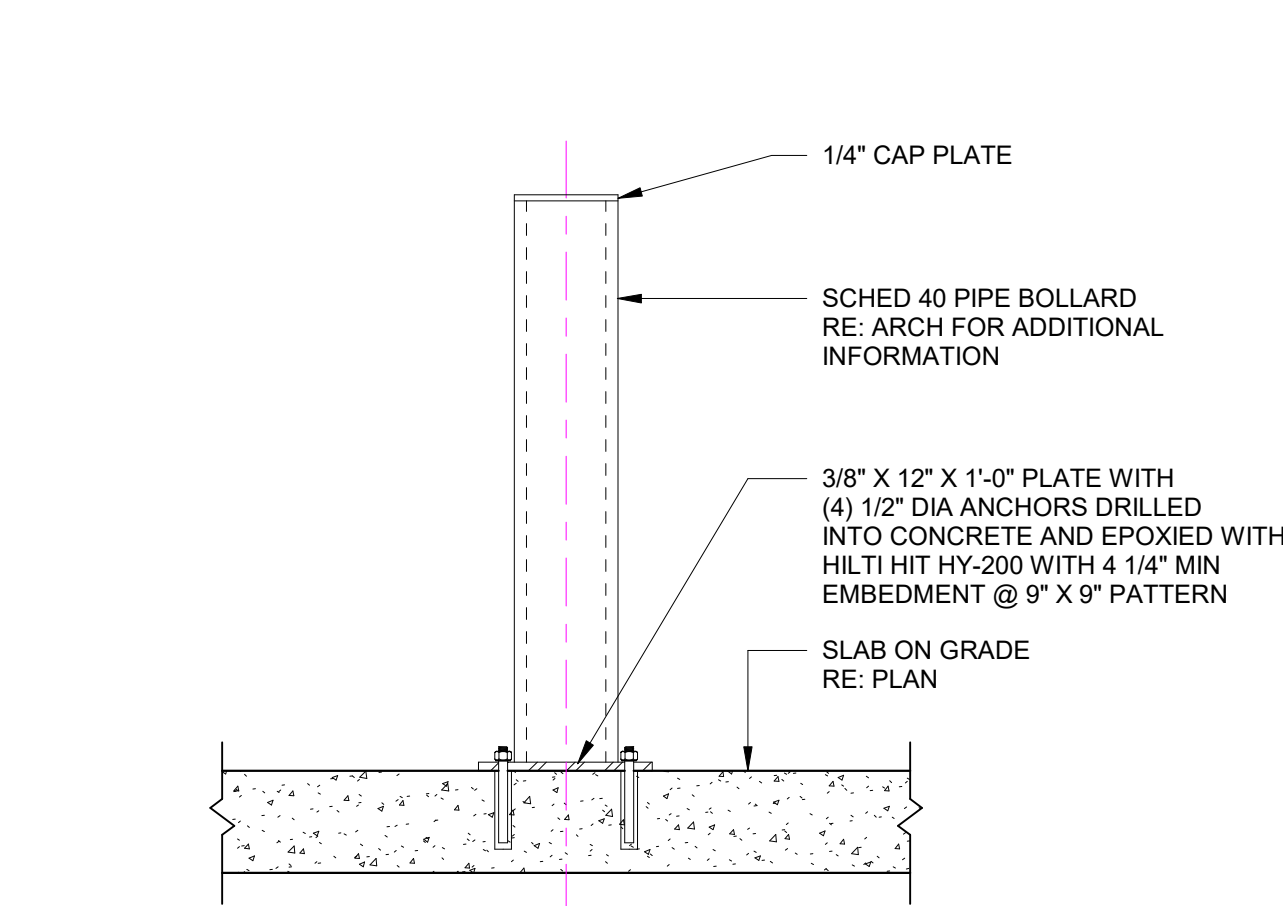


## D2 TYPICAL BOLLARD DETAIL

SCALE 3/4" = 1'-0"

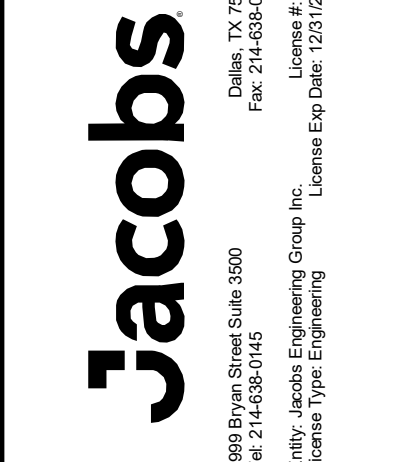
## C4 TENSION DEVELOPMENT (EMBEDMENT) LENGTH FOR STANDARD END HOOKS

SCALE 3/4" = 1'-0"



## D4 TYPICAL BOLLARD DETAIL

SCALE NTS



| NO. | DATE       | DESIGN | DR | CHK | APPROVED | BY | DATE | REVISION | 100% ISSUED FOR CONSTRUCTION | DATE | APPROVED | BY | DATE | REVISION | 100% ISSUED FOR CONSTRUCTION |
|-----|------------|--------|----|-----|----------|----|------|----------|------------------------------|------|----------|----|------|----------|------------------------------|
| 0   | 09/18/2024 |        |    |     |          |    |      |          |                              |      |          |    |      |          |                              |

Structural Standard Details  
Camden OSD  
Calhoun County, Arkansas  
Aerojet Rocketdyne

STRUCTURAL  
TYPICAL DETAILS

SHEET NO  
S-815

SCALE As indicated  
DATE 09/18/2024  
PROJ D37545N0  
DWG