

## Index 455-400 Precast Concrete Sheet Pile Wall (Conventional)

### Design Criteria

***AASHTO LRFD Bridge Design Specifications; Structures Design Guidelines (SDG)***

### Design Assumptions and Limitations

These piles are typically jettied into place rather than driven like a bearing pile. If shallow rock formations exist within the wall limits, other wall types must be considered.

A cast-in-place reinforced concrete bulkhead cap is required to structurally tie the tops of the concrete sheet piles together and to provide corrosion protection for the reinforcing and prestressing steel that extend from the tops of the piles.

These piles can be used for cantilevered walls or tied-back walls. Project specific designs and details are required for tie-backs. If the length of piles required for a cantilevered wall exceeds the limits shown on the standard drawings, consider using tie-backs.

These piles can be used in all environments with the appropriate concrete admixtures.

The grouted keyway used in combination with geotextile (the limits of both are defined by dimension "X") are assumed to not be watertight. Thus they contain the soil behind the wall while still allowing groundwater behind the wall to weep through. No other separate weep holes are generally required. The bottom of the "X" dimension is required to be 1'-8" below the mud line.

The tip elevation of piles shall be determined by the Geotechnical Engineer.

| WALL THICKNESS | STRAND DIA.<br>(in.) | SECTION<br>MODULUS (in <sup>3</sup> ) | STRESS*<br>(psi) |
|----------------|----------------------|---------------------------------------|------------------|
| T=10 in.       | 0.5                  | 500                                   | 1150             |
| T=10 in.       | 0.6                  | 500                                   | 1160             |
| T=12 in.       | 0.5                  | 720                                   | 1100             |
| T=12 in.       | 0.6                  | 720                                   | 1160             |

\* Unit Prestress after losses

See additional information on the Standard.

### Plan Content Requirements

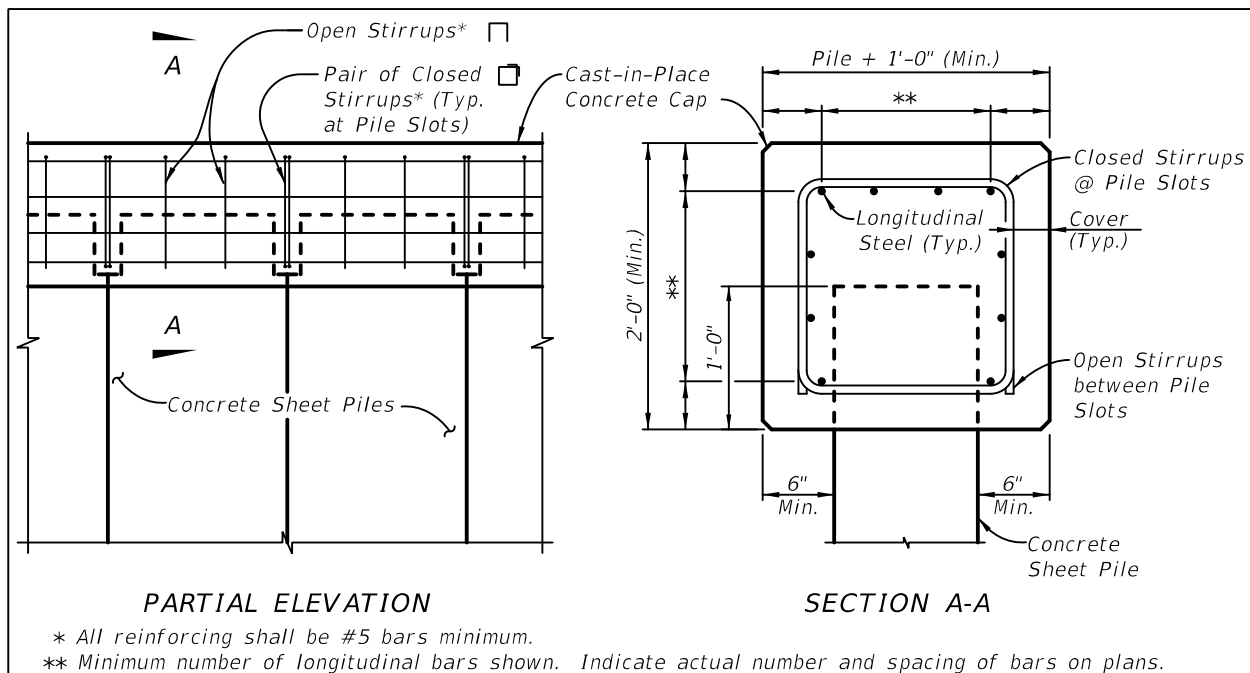
In the Structures or Roadway Plans:

Prepare Wall Control Drawings and related drawings as specified in **SDM** Chapter 19 and **FDM** 262, and include them in the plans. Use combinations of straight and corner piles to accommodate project specific geometric requirements.

Show one Starter Pile location for a given wall. In the Elevation View, show the wall construction sequence proceeding away from the Starter Pile by locating the 11" by 11" corner clip on each Typical Pile on the side farthest away from the Starter Pile. Consider necessary tie-ins with adjacent structures and other boundary restrictions when selecting the Starter Pile location.

Prepare project specific cast-in-place concrete bulkhead cap, tie-back and utility accommodation details and include them in the plans. See Figure 1 for typical cap details. In the Materials Note on the General Notes Sheet, specify the concrete class for the cast-in-place cap in accordance with the retaining wall environment classification. See **SDG** 1.4.

**Figure 1 Typical Cap Details**



Complete the following "Concrete Sheet Pile Wall with Prestressed Soil Anchors Data Table", "Concrete Sheet Pile Wall with Dead Man Anchors Data Table" or "Concrete Sheet Pile Wall, Cantilever Data Table" as applicable and include it on the supplemental sheets. Complete the Notes and add/modify/delete as necessary. See **FDM** 115 for more information regarding use of Data Tables.

| CONCRETE SHEET PILE WALL, CANTILEVER DATA TABLE |             |          |                     |                 |                    |                       |                      |                                 |                                 |                     | Table Date 07-01-12 |                   |                    |                   |                        |
|---|-------------|----------|---------------------|-----------------|--------------------|-----------------------|----------------------|---------------------------------|---------------------------------|---------------------|---------------------|-------------------|--------------------|-------------------|------------------------|
| CONSTRUCTION INFORMATION                        |             |          |                     |                 |                    |                       |                      |                                 |                                 | DESIGN PARAMETERS   |                     |                   |                    |                   |                        |
| WALL LOCATION                                   |             | WALL NO. | TYPE (See Detail A) | NUMBER REQUIRED | PILE LENGTH L (ft) | PILE THICKNESS T (in) | GROOVE LENGTH X (ft) | CORNER ANGLE $\theta$ (degrees) | MINIMUM WALL TIP ELEVATION (ft) | WALL TOP ELEV. (ft) | SOIL ELEVATION      |                   | WATER ELEVATION    |                   | DESIGN LIVE LOAD (psf) |
| STATION (begin to end)                          | OFFSET (ft) |          |                     |                 |                    |                       |                      |                                 |                                 |                     | FRONT OF WALL (ft)  | BACK OF WALL (ft) | FRONT OF WALL (ft) | BACK OF WALL (ft) |                        |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |
| •   | •           | •        | •                   | •               | •                  | •                     | •                    | •                               | •                               | •                   | •                   | •                 | •                  | •                 | •                      |

NOTES: (Notes Date 09-01-19)  
 1. Work the Data Table with Index 455-400.  
 2. Environmental Classification is \_\_\_\_\_  
 3. Concrete for cast-in-place retaining wall cap shall be Class \_\_\_\_\_ (fc = \_\_\_\_\_ psi), \_\_\_\_\_ (with/without) highly reactive pozzolans.

| CONCRETE SHEET PILE WALL WITH DEAD MAN ANCHORS DATA TABLE |              |          |                                 |                 |                     |                       |                       |                                 |                          |                                  |                         |                          |                       |                    | Table Date 07-01-17 |                                      |                    |
|---|--------------|----------|---------------------------------|-----------------|---------------------|-----------------------|-----------------------|---------------------------------|--------------------------|----------------------------------|-------------------------|--------------------------|-----------------------|--------------------|---------------------|--------------------------------------|--------------------|
| CONSTRUCTION INFORMATION                                  |              |          |                                 |                 |                     |                       |                       |                                 |                          |                                  |                         | DESIGN PARAMETERS        |                       |                    |                     |                                      |                    |
| WALL LOCATION   |              | WALL NO. | CONCRETE SHEET PILE FABRICATION |                 |                     |                       |                       | ANCHORS                         |                          | MINIMUM WALL TIP ELEVATION (ft.) | TOP OF WALL ELEV. (ft.) | SOIL ELEVATION           |                       | WATER ELEVATION    |                     | FACTORED DESIGN SURCHARGE LOAD (psf) |                    |
| STATION (begin to end)                                    | OFFSET (ft.) |          | TYPE (See Detail A)             | NUMBER REQUIRED | PILE LENGTH L (ft.) | PILE THICKNESS T (in) | GROOVE LENGTH X (ft.) | CORNER ANGLE $\theta$ (degrees) | ANCHOR BAR SPACING (ft.) |                                  |                         | ANCHOR BAR DIAMETER (in) | + FRONT OF WALL (ft.) | BACK OF WALL (ft.) | FRONT OF WALL (ft.) |                                      | BACK OF WALL (ft.) |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |

\* Minimum of Design Ground Surface or Design Scour Depth.

NOTES: (Notes Date 09-01-19)

1. Work the Data Table with Index 455-400.
2. Environmental Classification is \_\_\_\_\_
3. Concrete for cast-in-place retaining wall caps shall be Class \_\_\_\_\_ ( $f'_c =$  \_\_\_\_\_ psi), \_\_\_\_\_ (with/without) highly reactive pozzolans.

| CONCRETE SHEET PILE WALL WITH DEAD MAN ANCHORS DATA TABLE |              |          |                                 |                 |                     |                       |                       |                                 |                          |                                  |                         |                          |                       |                    |                     | Table Date 07-01-17                  |                    |
|---|--------------|----------|---------------------------------|-----------------|---------------------|-----------------------|-----------------------|---------------------------------|--------------------------|----------------------------------|-------------------------|--------------------------|-----------------------|--------------------|---------------------|--------------------------------------|--------------------|
| CONSTRUCTION INFORMATION                                  |              |          |                                 |                 |                     |                       |                       |                                 |                          |                                  |                         | DESIGN PARAMETERS        |                       |                    |                     |                                      |                    |
| WALL LOCATION   |              | WALL NO. | CONCRETE SHEET PILE FABRICATION |                 |                     |                       |                       | ANCHORS                         |                          | MINIMUM WALL TIP ELEVATION (ft.) | TOP OF WALL ELEV. (ft.) | SOIL ELEVATION           |                       | WATER ELEVATION    |                     | FACTORED DESIGN SURCHARGE LOAD (psf) |                    |
|   |              |          | TYPE (See Detail A)             | NUMBER REQUIRED | PILE LENGTH L (ft.) | PILE THICKNESS T (in) | GROOVE LENGTH X (ft.) | CORNER ANGLE $\theta$ (degrees) | ANCHOR BAR SPACING (ft.) |                                  |                         | ANCHOR BAR DIAMETER (in) | + FRONT OF WALL (ft.) | BACK OF WALL (ft.) | FRONT OF WALL (ft.) |                                      | BACK OF WALL (ft.) |
| STATION (begin to end)                                    | OFFSET (ft.) |          |                                 |                 |                     |                       |                       |                                 |                          |                                  |                         |                          |                       |                    |                     |                                      |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |
| •   | •            | •        | •                               | •               | •                   | •                     | •                     | •                               | •                        | •                                | •                       | •                        | •                     | •                  | •                   | •                                    |                    |

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**NOTES: (Notes Date 09-01-19)**

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2. Environmental Classification is \_\_\_\_\_
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## Payment

| Item number | Item Description                        | Unit Measure |
|-------------|---|--------------|
| 400-2-8     | Concrete Class II, Bulkhead             | CY           |
| 400-3-8     | Concrete Class III, Bulkhead            | CY           |
| 400-4-8     | Concrete Class IV, Bulkhead             | CY           |
| 415-1-8     | Reinforcing Steel - Bulkhead            | LB           |
| 415-2-8     | Reinforcing Steel - Stainless, Bulkhead | LB           |
| 451-70-AA   | Prestressed Soil Anchor                 | EA           |
| 455-14-AA   | Concrete Sheet Piling                   | LF           |
| 455-87      | Anchor Bar, Steel                       | EA           |

See the **BOE** and **Specifications** for additional information on payment, pay item use and compensation.