Index 455-001 Series Concrete Piles

Design Criteria

AASHTO LRFD Bridge Design Specifications; Structures Detailing Manual (SDM); Structures Design Guidelines (SDG)

Design Assumptions and Limitations

Index 455-001 is the lead standard for the Square Prestressed Concrete Pile standard series which includes Indexes 455-001 through 455-031. Use this standard with Indexes 455-002, 455-003, 455-012, 4555-014, 455-018, 455-020, 455-024, 455-030 and 455-031.

Standard piles are designed to have 1000 psi uniform compression after prestress losses without any applied loads to offset tensile stresses that occur during typical driving.

The piles are designed to have 0.0 psi tension using a load factor of 1.5 times the pile self weight during pick-up, storage and transportation as shown in the "Table of Maximum Pile Pick-Up and Support Lengths" on the standard.

Plan Content Requirements

In the Structures Plans:

Show and label the piles on the Foundation Layout, End Bent, Intermediate Bent, Pier, Footing, Typical Section and other sheets as required.

Complete the following "Data Table" in accordance with SDG 3.5 and SDM 11.4 and include it in the contract plans with the "Foundation Layout" sheets. Modify table and notes as required to accommodate the required number of piles, piers and/or bents, use of Test Piles and instrumentation. When not enough space is available on one plan sheet, continuations of the Data Table and/or separate pile cut-off elevation tables are acceptable. See FDM 115 for more information regarding use of Data Tables.

For projects without Test Piles change data table column heading "TEST PILE LENGTH (ft.)" to "PILE ORDER LENGTH (ft.)".
<table>
<thead>
<tr>
<th>PILE NUMBER</th>
<th>PILE SIZE (in)</th>
<th>NOMINAL BEARING RESISTANCE (kips)</th>
<th>TOTAL UPLIFT ELEVATION (ft)</th>
<th>TEST PILE LENGTH (ft)</th>
<th>REQUIRED SET ELEVATION (ft)</th>
<th>FACTORED DESIGN UPLIFT LOAD (kips)</th>
<th>TOTAL SCOUR RESISTANCE (kips)</th>
<th>TOTAL SCOUR ELEVATION (ft)</th>
<th>NET SCOUR RESISTANCE (kips)</th>
<th>TOTAL ELEVATION (ft)</th>
<th>TOTAL COMPRESSION OF UPLIFT</th>
</tr>
</thead>
</table>

**PILE INSTALLATION NOTICE (Notes Date 6/2021):**

Contractor to verify location of all utilities prior to any pile installation activities.

Minimum Base elevation is required for lateral stability.

When a required bearing resistance is shown, the pile shall be extended to the elevation shown or to any required utilities or sewerage elevations.

Net scour resistance provided by the designer.

**Pile Installation Notice:**

Contractor must notify the engineer prior to any pile installation activities.

Minimum base elevation is required for lateral stability.

Net scour resistance must be provided by the designer.

For new groups, pile driving is to commence at the center of the group and proceed outward.
## Payment

<table>
<thead>
<tr>
<th>Item number</th>
<th>Item Description</th>
<th>Unit Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>455-34-ABB</td>
<td>Prestressed Concrete Piling</td>
<td>LF</td>
</tr>
</tbody>
</table>
Design Assumptions:
- Concrete compressive strength $f'_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 28,500$ ksi.
- Resistance factor for axial, $\phi_{axial} = 0.75$ & for flexure, $\phi_{flexure} = 1.0$.
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-012.
Design Assumptions:
- Concrete compressive strength $f_c = 6$ksi.
- Modulus of elasticity of prestressing strands, $E_p = 28,500$ ksi.
- Resistance factor for axial, $\phi_{axial} = 0.75$ & for flexure, $\phi_{flexure} = 1.0$.
- All piles assumed to have spirals.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-014.
18" SQUARE PRESTRESSED CONCRETE PILE INTERACTION DIAGRAM

Design Assumptions:
- Concrete compressive strength $f_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 28,500$ ksi.
- Resistance factor for axial, $\phi_{axial} = 0.75$ & for flexure, $\phi_{flexure} = 1.0$.
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-018.
Design Assumptions:
- Concrete compressive strength $f_c = 6$ ksi.
- Modulus of elasticity of prestressing strands $E_p = 28,500$ ksi.
- Resistance factor for axial, $\phi_{axial} = 0.75$ & for flexure, $\phi_{flexure} = 1.0$.
- All piles assumed to have spirals.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-020.
Design Assumptions:
- Concrete compressive strength $f'_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 28,500$ ksi.
- Resistance factor for axial, $\phi_{axial} = 0.75$ & for flexure, $\phi_{flexure} = 1.0$.
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-024.
Design Assumptions:
- Concrete compressive strength $f_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 28,500$ ksi.
- Resistance factor for axial, $\phi_{axial} = 0.75$ & for flexure, $\phi_{flexure} = 1.0$.
- All piles assumed to have spirals.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-030.
Design Assumptions:
- Concrete compressive strength $f'_c = 8.5$ ksi.
- Strand Pattern: (28) 0.6" Diameter, Grade 270 LRS.
- Modulus of elasticity of prestressing strands, $E_p = 28,500$ ksi.
- Resistance factor for axial, $\phi_{axial} = 0.75$ & for flexure, $\phi_{flex} = 1.0$.
- All piles assumed to have spiral ties.
- Refer to Design Standard Index 20631 for details of pile sections B-B and C-C.

*The curve for Section C-C is limited to the axial capacity (tension and compression) of the voided section of the pile (Section B-B).