Index 22600 Series Square CFRP & SS Prestressed Concrete Piles (Rev. 01/16)

Design Criteria

AASHTO LRFD Bridge Design Specifications; ***Structures Design Guidelines (SDG)***; ***Structures Detailing Manual (SDM)***; ***Fiber Reinforced Polymer Guidelines (FRPG)***

Design Assumptions and Limitations

Index 22600 is the lead standard for the Square CFRP & SS Prestressed Concrete Pile standard series which includes Indexes 22600 through 22630. Use this standard with Indexes 22601, 20602, 22612, 22614, 22618, 22624 and 22630.

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 Introduction I.3 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.)".

PILE DATA TABLE																Table Date 01/01/16							
INSTALLATION CRITERIA								DESIGN CRITERIA								PILE CUT-OFF ELEVATIONS							
PIER or BENT NUMBER	PILE SIZE (in.)	NOMINAL BEARING RESISTANCE (tons)	NOMINAL UPLIFT RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft.)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft.)	REQUIRED PREFORM ELEVATION (ft.)	FACTORED DESIGN LOAD (tons)	FACTORED DESIGN UPLIFT LOAD (tons)	DOWN DRAG (tons)	TOTAL SCOUR RESISTANCE (tons)	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION (ft.)	Ø COMPRESSION	Ø UPLIFT	PILE 1	PILE 2	PILE 3	PILE 4	PILE 5	PILE 6	PILE 7

$$\frac{\text{Factored Design Load + Net Scour Resistance + Down Drag}}{\text{Ø}} \leq \text{Nominal Bearing Resistance}$$

UPLIFT RESISTANCE – The ultimate side friction capacity that must be obtained below the 100 year scour elevation to resist pullout of the pile (Specify only when design requires uplift capacity).

TOTAL SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the scourable soil.

NET SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the soil from the required preformed or jetting elevation to the scour elevation.

100-YEAR SCOUR ELEVATION – Estimated elevation of scour due to the 100 year storm event.

PILE INSTALLATION NOTES [Notes Date 7-01-13]:

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

Minimum Tip Elevation is required for lateral stability.

When a required jetting elevation is shown, the jet shall be lowered to the elevation and continue to operate at this elevation until the pile driving is completed. If jetting or preforming elevations differ from those shown on the table, the Engineer shall be responsible for determination of the required driving resistance.

No jetting will be allowed without the approval of the Engineer.

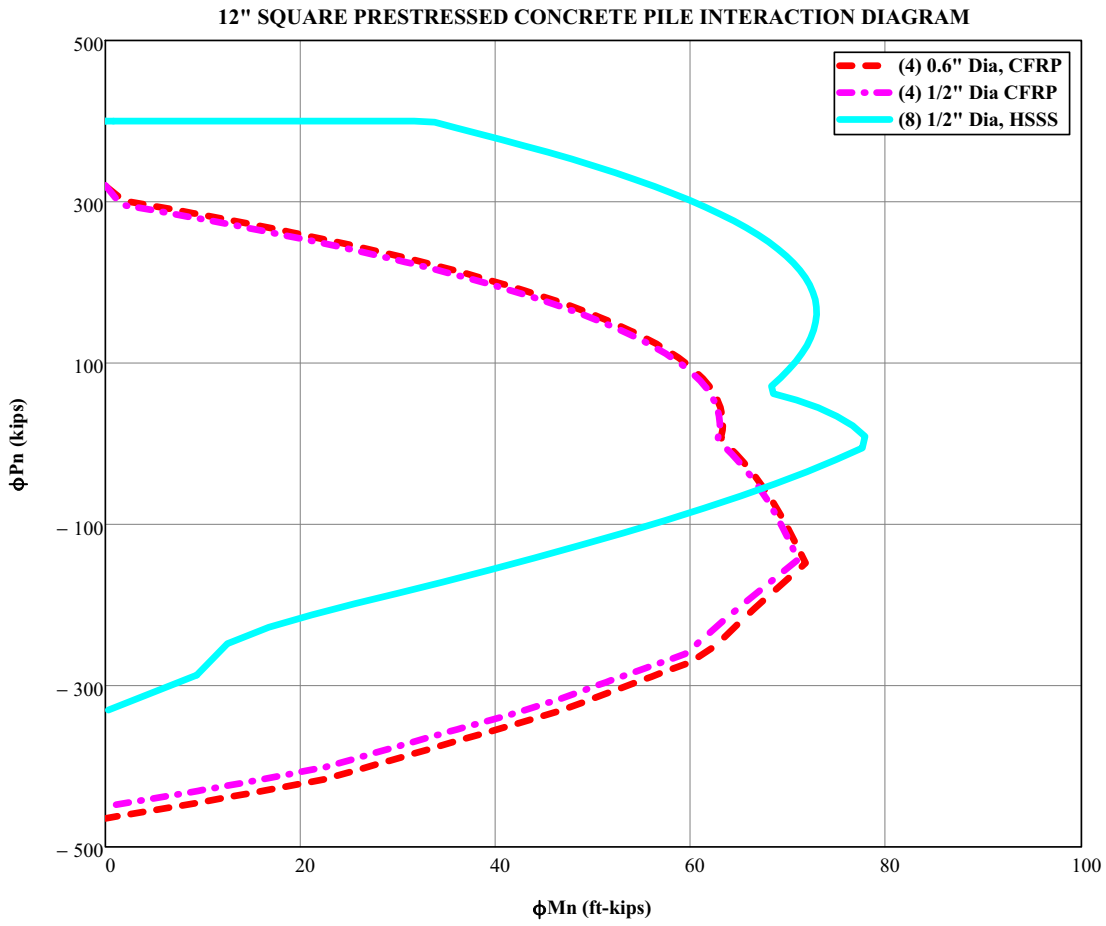
The Contractor should not anticipate being allowed to jet piles below the 100-year scour elevation or required jet elevation, whichever is deeper.

At each Bent, pile driving is to commence at the center of the Bent and proceed outward.

Payment

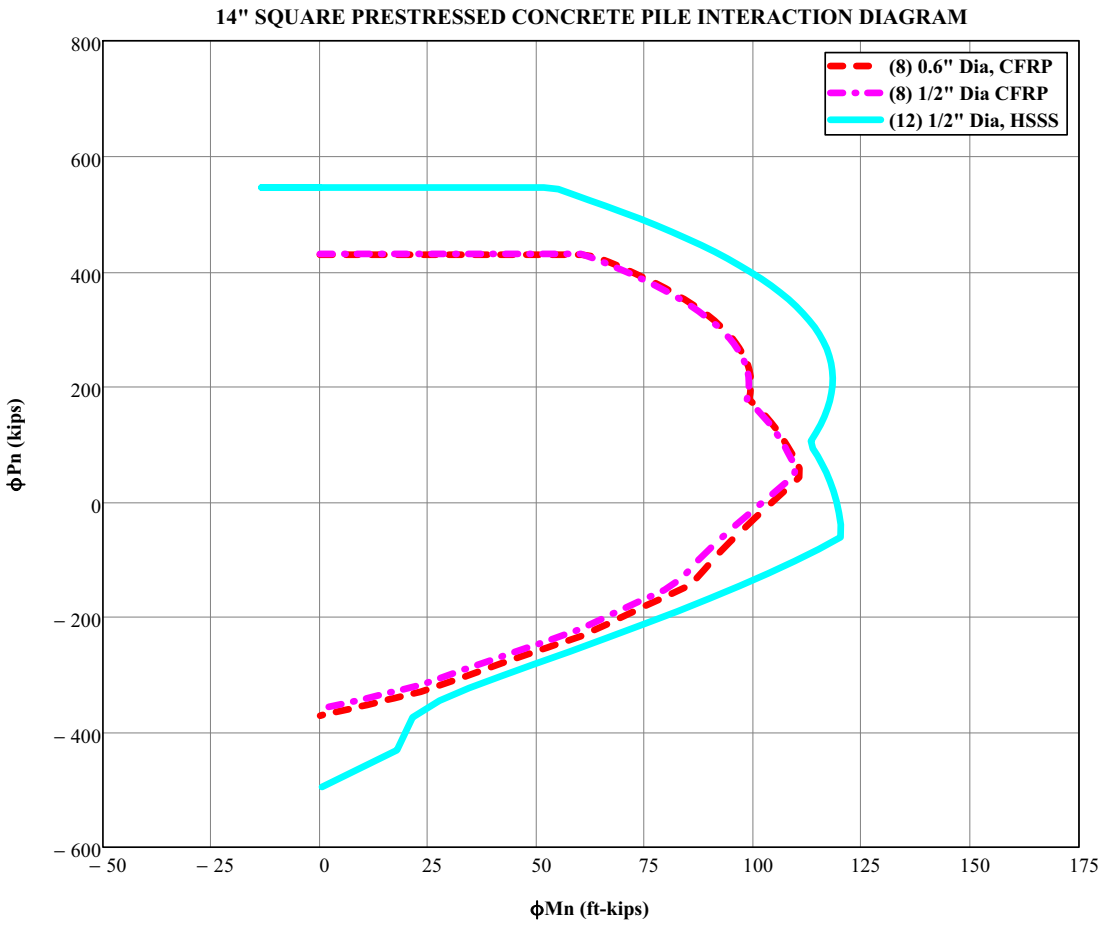
Item number	Item description	Unit Measure
455-34-AA	Prestressed Concrete Piling (CFRP or SS)	LF

Design Aids



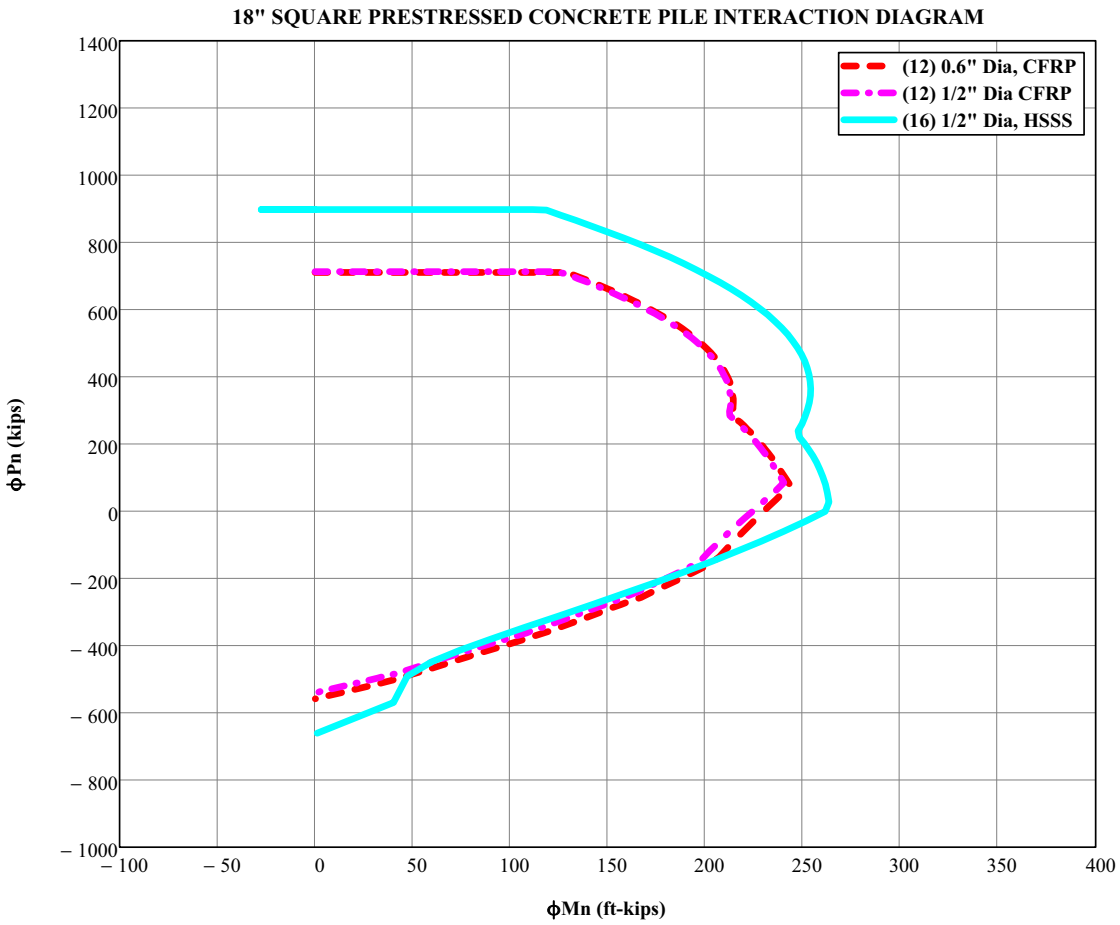
Design Assumptions:

- Concrete compressive strength $f'_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 18{,}000$ ksi (1/2" CFRP), 22,480 ksi (0.6" CFRP) & 23,500 ksi (HSSS).
- Resistance factors ϕ based on ACI 440.4R for CFRP strands (0.65 compression-controlled, 0.85 tension-controlled); and AASHTO LRFD 5.5.4.2.1 for HSSS strands (0.75 compression-controlled, 1.0 tension-controlled).
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 22612.



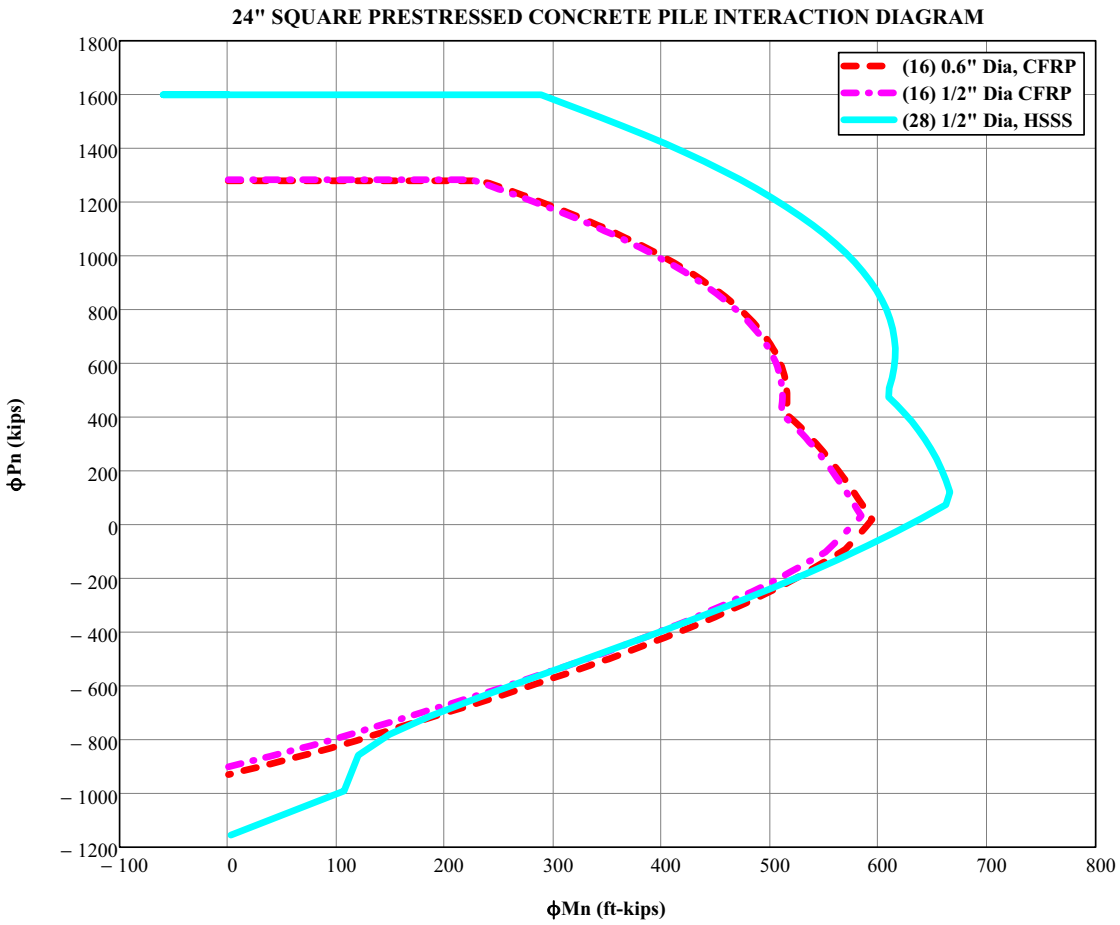
Design Assumptions:

- Concrete compressive strength $f'_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 18{,}000$ ksi (1/2" CFRP), 22,480 ksi (0.6" CFRP), 23,500 ksi (HSSS)
- Resistance factors ϕ based on ACI 440.4R for CFRP strands (0.65 compression-controlled, 0.85 tension-controlled); and AASHTO LRFD 5.5.4.2.1 for HSSS strands (0.75 compression-controlled, 1.0 tension-controlled).
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 22614.



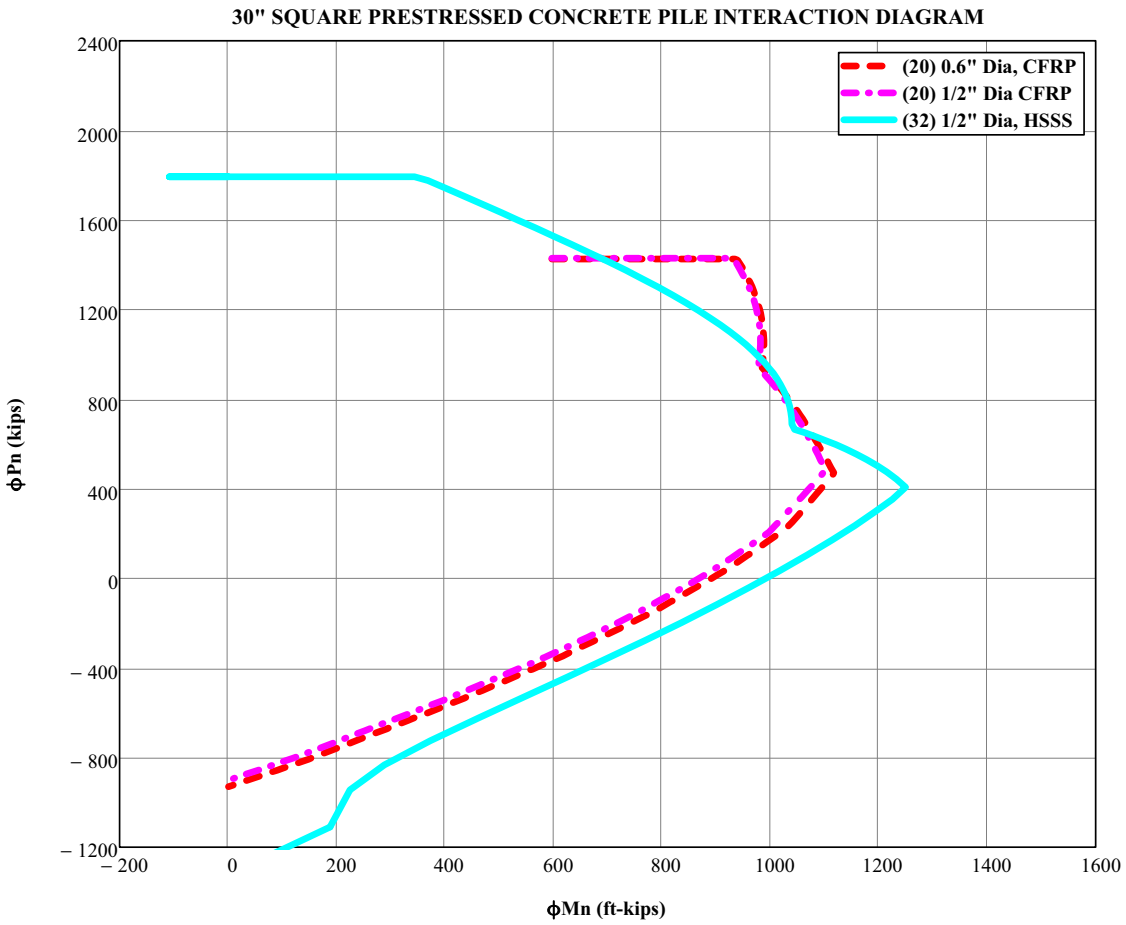
Design Assumptions:

- Concrete compressive strength $f'_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 18{,}000$ ksi (1/2" CFRP), 22,480 ksi (0.6" CFRP) & 23,500 ksi (HSSS)
- Resistance factors ϕ based on ACI 440.4R for CFRP strands (0.65 compression-controlled, 0.85 tension-controlled); and AASHTO LRFD 5.5.4.2.1 for HSSS strands (0.75 compression-controlled, 1.0 tension-controlled).
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 22618.



Design Assumptions:

- Concrete compressive strength $f'_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 18{,}000$ ksi (1/2" CFRP), 22,480 ksi (0.6" CFRP), 23,500 ksi (HSSS)
- Resistance factors ϕ based on ACI 440.4R for CFRP strands (0.65 compression-controlled, 0.85 tension-controlled); and AASHTO LRFD 5.5.4.2.1 for HSSS strands (0.75 compression-controlled, 1.0 tension-controlled).
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 20624.



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- Concrete compressive strength $f'_c = 6$ ksi.
- Modulus of elasticity of prestressing strands, $E_p = 18{,}000$ ksi (1/2" CFRP), 22,480 ksi (0.6" CFRP), 23,500 ksi (HSSS)
- Resistance factors ϕ based on ACI 440.4R for CFRP strands (0.65 compression-controlled, 0.85 tension-controlled); and AASHTO LRFD 5.5.4.2.1 for HSSS strands (0.75 compression-controlled, 1.0 tension-controlled).
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 22630.