

## PILE REMEDIATION AND TESTING

THE FOLLOWING NOTES AND RECOMMENDATIONS ARE PROVIDED AS A GUIDE FOR REMEDIATION AND PILE TESTING. IF OTHER SCENARIOS ARISE THAT ARE NOT COVERED WITHIN THESE NOTES, NOTIFY KIMLEY-HORN TO CONFIRM DETAILS.

## PILE TESTING PROGRAM

CONTRACTOR MAY SELF-PERFORM PILE LOAD TESTING AND MAY SUBMIT THE RESULTS FOR EOR REVIEW. THE FOLLOWING TESTING PROGRAM MAY BE USED TO VERIFY PILE CAPACITY:

- TESTING FREQUENCY:
    - a. PRODUCTION PILE TESTING:
      - o. PRODUCTION PILE TESTING IS TO BE PERFORMED TO CONFIRM THE SOIL CONDITIONS ARE REPRESENTATIVE OF THE SOIL OBSERVED BY THE GEOTECHNICAL ENGINEER AND USED FOR THE FOUNDATION DESIGN.
      - o. KIMLEY-HORN WOULD RECOMMEND TESTING TEN (10) RANDOM PILES PER INVERTER BLOCK.
    - b. IF A PILE FAILS THE TESTING:
      - TEST THE PILE DIRECTLY NORTH, SOUTH, EAST, AND WEST (4 PILES TOTAL). CONTINUE TO EXPAND THE TESTING AREA IN SUCH A MANNER UNTIL NO PILES ARE FAILING.
      - REMOVE AND REINSTALL THE FAILING PILES USING THE PRE-DRILL OR THE CAST-IN-PLACE METHOD. SEE "SUPPLEMENTAL REMEDIATION PROCEDURE DETAILS". PILES INSTALLED IN THIS MANNER DO NOT NEED TO BE PILE LOAD TESTED.
  - UNREPRESENTATIVE CONDITIONS TESTING:
    - a. UNREPRESENTATIVE CONDITIONS TESTING IS TO BE PERFORMED WHEN SOIL CONDITIONS VARY SUCH THAT THE ORIGINAL PILE DESIGN CANNOT BE INSTALLED AS ORIGINALLY DESIGNED. EXAMPLES INCLUDE PRE-DRILLING IS REQUIRED WHEN NOT ORIGINALLY DESIGNED, REFUSAL IS OBTAINED PRIOR TO THE MINIMUM EMBEDMENT IN THE PILE SCHEDULE, OR OTHER REASONS.
    - b. FOR EACH UNIQUE UNREPRESENTATIVE CONDITION, NOTIFY THE ENGINEER. TEST THE FIRST TWO (2) PILES AND NOTIFY THE ENGINEER OF THE RESULTS. TESTING SHALL BE PRIORITIZED FOR THE SHALLOWEST PILES (FOR EACH UNIQUE PILE TYPE).
      - IF THE FIRST TWO (2) PILES PASS, CONTRACTOR SHALL PROCEED TESTING 20% (TEST 1 & SKIP 4) OF THE REMAINING PILES. TESTING SHALL BE PRIORITIZED FOR THE SHALLOWEST PILES (FOR EACH UNIQUE PILE TYPE).
      - IN THE EVENT OF A FAILURE: NOTIFY THE ENGINEER, TESTING FREQUENCY WILL INCREASE.
      - TO REMEDIATE FAILING PILE:
        1. OPTION A: P4: PULL THE PILE OUT, PRE-DRILL TO THE DESIGN DEPTH, FILL WITH SOIL COMPACTED TO GEOTECHNICAL REPORT SPECIFICATIONS, REINSTALL, AND TEST THE PILE. SEE "SUPPLEMENTAL REMEDIATION PROCEDURE DETAILS".
        2. OPTION B: P7: CAST-IN-PLACE. SEE "SUPPLEMENTAL REMEDIATION PROCEDURE DETAILS".
      - IF TEN (10) CONSECUTIVE PILES PASS, THE TESTING FREQUENCY CAN BE HALVED, BUT MAY NOT BE LESS THAN 20% (TEST 1, SKIP 4).
- B. TESTING PROCEDURE:
- LOAD TESTING CRITERIA: AXIAL TENSION TEST PER ASTM D3689 AND LATERAL LOAD TESTING CRITERIA PER ASTM D3966 TO THE MAXIMUM LOADS LISTED IN THE TABLE BELOW.
  - LOADS SHALL BE APPLIED AT TOP OF PILE.
    - a. IN LIEU OF A COMPRESSION TEST, A TENSION TEST TO THE LARGER OF THE COMPRESSION AND TENSION LOADS MAY BE PERFORMED.
  - LOADS SHALL BE APPLIED IN 25% PEAK LOAD INCREMENTS. ALL LOAD INCREMENTS, INCLUDING THE PEAK LOAD, SHALL BE HELD FOR A MINIMUM OF 30 SECONDS OR UNTIL THE DEFLECTION GAUGE HAS STABILIZED, WHICHEVER IS GREATER.
  - AT EACH LOAD INCREMENT, THE ASSOCIATED DEFLECTION SHALL BE RECORDED.
  - FOR LATERAL TESTING: THERE SHALL BE TWO GAUGES, ONE DIAL AT APPROXIMATELY 1" ABOVE GRADE AND ONE DIAL WITHIN 6" OF TOP-OF-PILE.
  - FULLY UNLOAD THE PILE AND RECORD REBOUND DEFLECTION AFTER THE PILE HAS STABILIZED.
  - ACCEPTANCE CRITERIA:
    - a. PILES SHALL BE DEEMED ACCEPTABLE IF THE DISPLACEMENT AT PEAK LOAD IS LESS THAN OR EQUAL TO THE DISPLACEMENT LISTED IN THE TABLE BELOW. ADDITIONALLY, FOR LATERAL LOADS, THE PERMANENT DEFLECTION AFTER REMOVING THE DESIGN LOAD MUST NOT EXCEED 20% OF THE MAXIMUM ALLOWABLE LATERAL GROUND DEFLECTION UNDER PEAK LOAD.
- C. PILES THAT PASS THE REQUIREMENTS IN THE PILE TESTING PROGRAM ARE ACCEPTABLE AND IF REQUIRED, MAY BE CUT AT THE REQUIRED TOP OF PILE ELEVATION.

			MAX. TEST LOADS [LBS]			MAX. ALLOWABLE DEFLECTIONS [IN]		
		UPHEAVAL CONDITION	LATERAL	TENSION	COMPRESSION	LATERAL ⊕ GROUND    ⊕ PILE HEAD		TENSION/ COMPRESSION
BOS PILES	COMBINER BOX	NO FROST	300	—	650	0.50	1.50	0.25
	STRING INVERTER		250	—	700	0.50	1.50	0.25
	COMBINER BOX	FROST	300	4500	650	0.50	1.50	0.25
	STRING INVERTER		250	4450	700	0.50	1.50	0.25

## REMEDIATIONS

CONTRACTOR SHALL REVIEW THE GEOTECHNICAL REPORT IN DETAIL AND COORDINATE WITH THE GEOTECHNICAL ENGINEER TO UNDERSTAND THE POTENTIAL SCENARIOS WHERE PILE REMEDIATION MAY BE REQUIRED AND PLAN ACCORDINGLY. THIS MAY INCLUDE, PILE REFUSAL, UNREPRESENTATIVE SOIL CONDITIONS, AND/OR OTHER SCENARIOS. PILE DESIGNS MAY NEED TO BE REVISED FOR REMEDIATION CONDITIONS THAT ARE UNKNOWN AT THE TIME OF DESIGN.

PLANS THAT DO NOT MEET THE PROJECT REQUIREMENTS AND ALLOWABLE TOLERANCES SHALL BE REMEDIATED, AS REQUIRED BY THE ENGINEER OR AS SPECIFIED BELOW. FOR SCENARIOS LISTED BELOW WITH MULTIPLE OPTIONS, CONTRACTOR MAY SELECT THEIR PREFERRED OPTION. FOR SCENARIOS NOT LISTED BELOW, NOTIFY THE ENGINEER. CONSULT WITH THE ENGINEER FOR ALTERNATIVE OPTIONS FOR SPECIFIC OCCURRENCES IN THE FIELD.

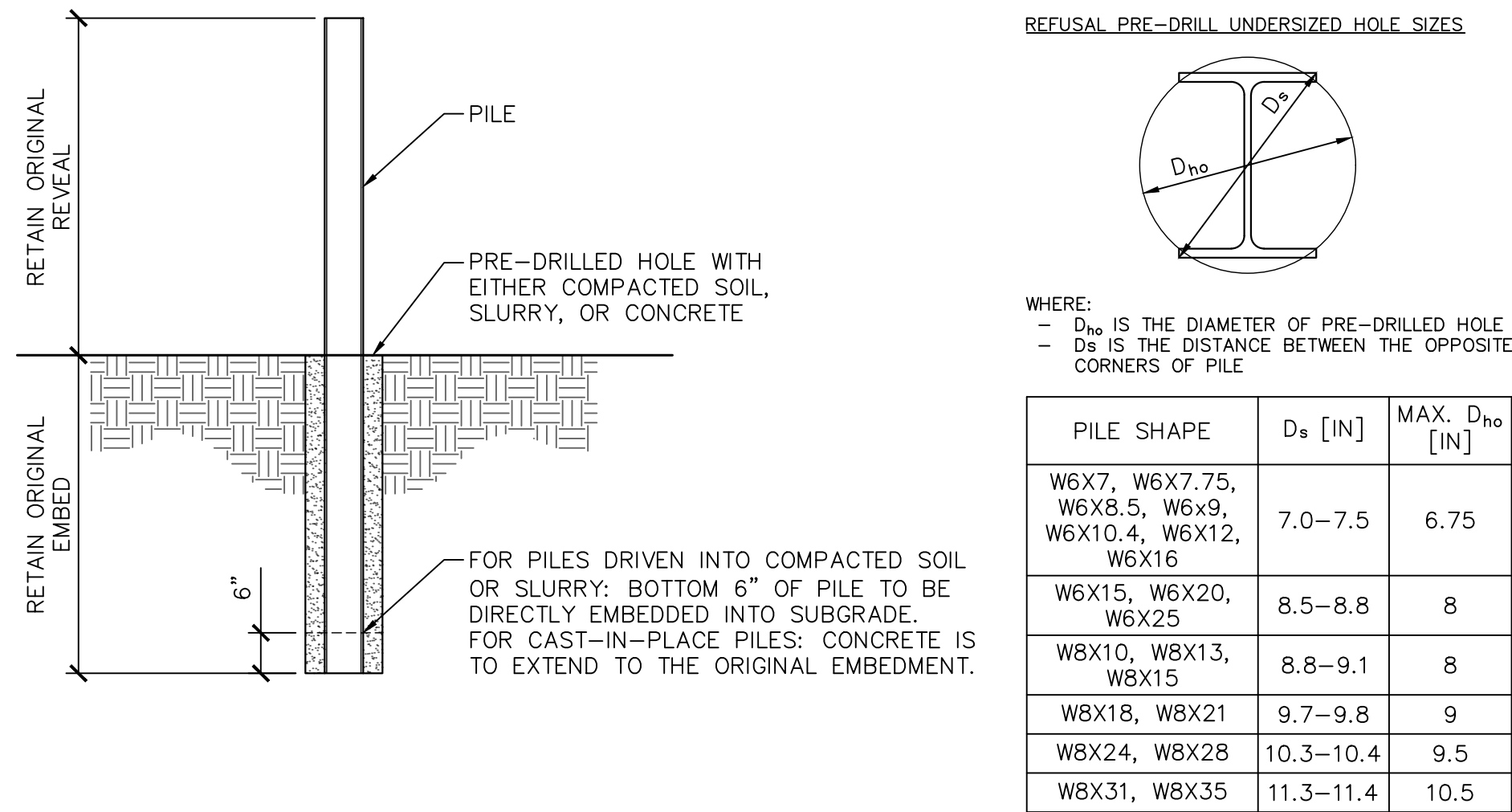
THE FOLLOWING REMEDIATION PROCEDURES ARE STANDARD TERMS AND PROCESSES. DURING CONSTRUCTION, IF REMEDIATION IS REQUIRED, THESE PROCESSES MAY BE USED ON A CASE-BY-CASE BASIS AND WILL BE REFERRED TO IN AN RFI.

- P1: "REDRIVE" - RE-ALIGN PILE DRIVE OVER PILE AND HAMMER PILE TO CORRECT HEIGHT.
- P2: "BEND AND ALIGN" - USE A FLANGE FORK TO BEND THE DAMAGED PART OF THE FLANGE BACK INTO ALIGNMENT.
- P3: "PUSH/PULL" - WITHIN 2' OF THE GROUND SURFACE, USE SKID-STEER TO GENTLY PUSH/PULL THE PILE INTO TOLERANCE.
- P4: "REMOVE, PRE-DRILL, REDRIVE, AND TEST" - REMOVE PILE AND PRE-DRILL HOLE. SEE "SUPPLEMENTAL REMEDIATION PROCEDURE DETAILS" FOR MORE INFORMATION. REDRIVE PILE AND ADD TO UNREPRESENTATIVE CONDITIONS TESTING.
- P5: "CUT AND WELD" - CUT THE TOP OFF PILE, WELD NEW PILE TOP ONTO EXISTING PILE, AND APPLY GALVANIZATION.
- P6: "PUNCH HOLES" - USE A DRILL OR A HOLE PUNCH TO CREATE HOLES IN THE CORRECT LOCATIONS IN THE PILE.
- P7: "REMOVE AND CIP" - REMOVE PILE AND PLACE A NEW PILE USING CAST IN PLACE METHOD. SEE "SUPPLEMENTAL REMEDIATION PROCEDURE DETAILS" FOR MORE INFORMATION.
- P8: "CUT" - CUT PILE TO CORRECT HEIGHT AND PERFORM PROCEDURE #6. IF PILE-SPECIFIC MINIMUM EMBEDMENT WAS NOT ACHIEVED, ADD PILE TO UNREPRESENTATIVE CONDITIONS TESTING.
- P9: "GRADING" - GRADE THE SURROUNDING AREA TO BRING PILE HEIGHT INTO TOLERANCE. CONFIRM PILE-SPECIFIC MINIMUM EMBEDMENT DEPTH IS ACHIEVED.
- P10: "EXTENSION" - WELD PILE EXTENSION TO TOP OF PILE AND PERFORM PROCEDURE #6. SEE "SUPPLEMENTAL REMEDIATION PROCEDURE DETAILS" FOR MORE INFORMATION.

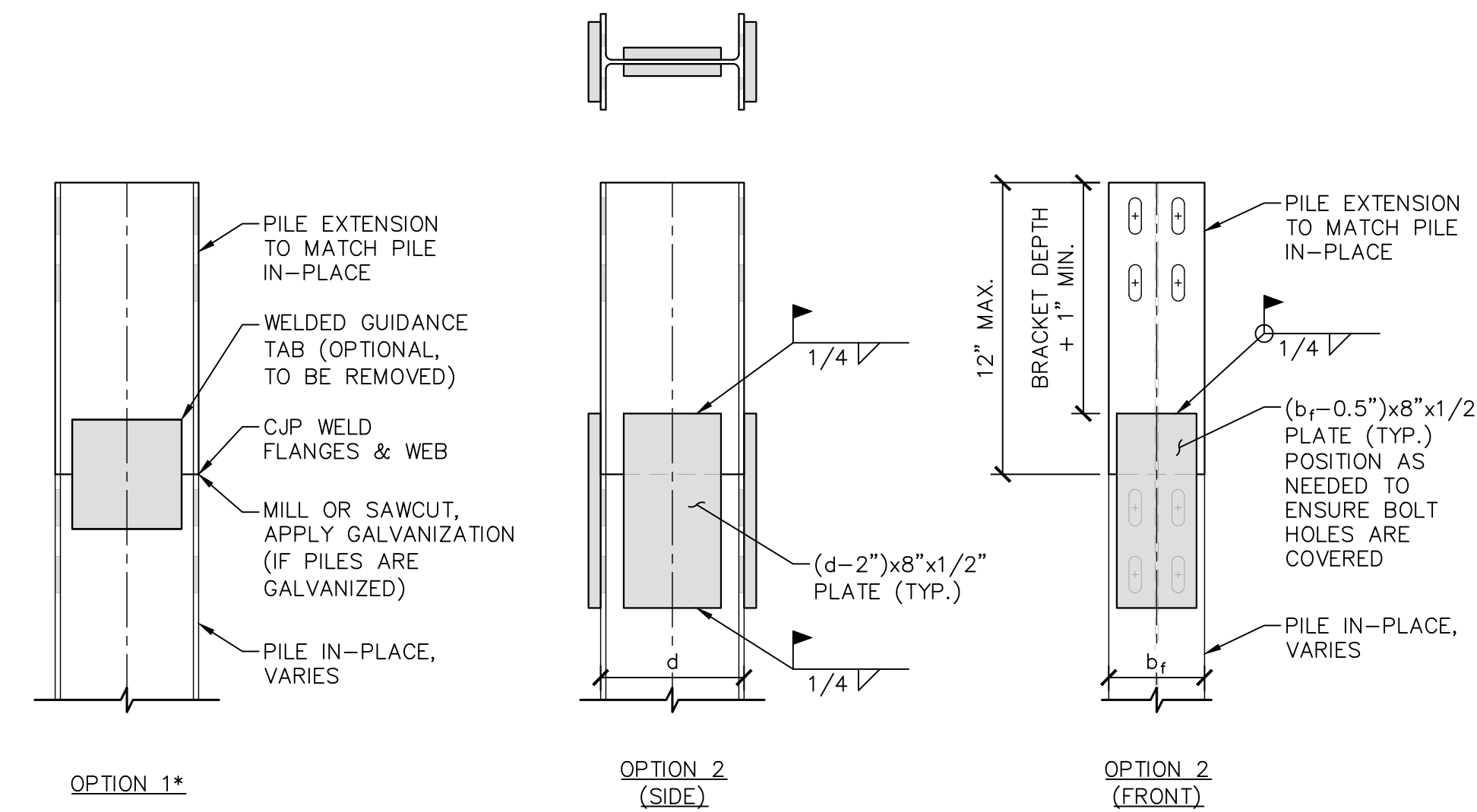


4. FOR PRE-DRILLED PILES: RECOMPACT SOIL OR USE 200 PSI SURRY.
- A. IF PRE-DRILLING IS PERFORMED DURING CONSTRUCTION, NOTIFY THE ENGINEER AND TEST A SAMPLE OF THE PILES TO CONFIRM THE CAPACITY OF THE PRE-DRILLED PILES.
  - B. FOR REFUSAL, SELECT A PRE-DRILL HOLE DIAMETER IN SUCH A WAY THAT ONLY THE EDGES OF THE PILE FLANGE COME IN CONTACT WITH THE SURFACE. TABLE BELOW RECOMMENDED PRE-DRILL DIAMETERS. TRIAL DRIVING WITH VARIOUS HOLE DIAMETERS WOULD NEED TO BE PERFORMED TO OPTIMIZE THE HOLE DIAMETER THAT RESULTS IN THE LEAST DAMAGE TO THE PILE BUT STILL ENGAGES THE ROCK TO MEET THE REQUIRED DESIGN CAPACITY.
  - C. FOR SOIL, HOLE SIZE MAY BE LARGER THAN THE PILE. A LARGER HOLE MAY REDUCE ENGAGEMENT OF THE EXISTING SOIL, BUT EASE COMPACTION.
  - D. COMPACT SOIL PER GEOTECHNICAL REPORT RECOMMENDATIONS.
  - E. DRIVE PILE INTO COMPACTED SOIL. PRE-DRILLED HOLE DEPTH SHALL BE 6" SHALLOWER THAN THE PILE EMBEDMENT DEPTH.

P7. FOR CAST-IN PLACE PILES: USE 4500 PSI CONCRETE MIX AND 12" HOLE DIAMETER. LOAD TESTING IS NOT REQUIRED.



P10: "EXTENSION"



- \*NOTES:
- ALL W6x8.5 AND W6x9 PILES REQUIRE OPTION 1.
  - EXTENSIONS WHERE THE PILE SPLICE WILL BE DRIVEN BELOW GRADE REQUIRE OPTION 1.