

# TEMPORARY EXCAVATION SUPPORT ROUTE 9 IMPROVEMENTS BRATTLEBORO, VERMONT

## GENERAL NOTES

THIS PLAN SHOWS THE EXCAVATION SHORING SYSTEM FOR THE CONSTRUCTION OF THE RAILROAD BRIDGE ABUTMENTS OVER ROUTE 9 AND SARGENT BROOK IN BRATTLEBORO, VERMONT. THE EXCAVATION SHORING SYSTEM WILL CONSIST OF DRILLED IN OR DRIVEN SOLDIER PILES AND LAGGING OR STEEL SHEET PILES. LATERAL SUPPORT WILL BE PROVIDED BY TIEBACKS, INTERNAL BRACING, OR BY DESIGNING THE SOLDIER PILES TO CANTILEVER.

- DESIGN OF THE EXCAVATION SHORING SYSTEM MAY BE ADJUSTED IN THE FIELD TO ACCOUNT FOR ACTUAL FIELD CONDITIONS. EQUIVALENT MEMBERS MAY BE SUBSTITUTED FOR ANY SHOWN.
- ONLY THOSE PORTIONS OF THE WORK NECESSARY TO CLARIFY THE WORK OF SCHNABEL FOUNDATION COMPANY (SFC) ARE SHOWN. THESE DRAWINGS ARE INTENDED FOR THE EXCLUSIVE USE OF SCHNABEL FOUNDATION COMPANY IN CONSTRUCTING THE EXCAVATION SHORING SYSTEM AND SHOULD NOT BE USED BY THE CONTRACTOR OR ANY OTHER SUBCONTRACTOR(S) FOR ANY OTHER REASON.
- ESTABLISH VERTICAL SURVEY STATIONS AT 15-FOOT ON CENTER ON EACH RAIL OF THE EXISTING (PHASE 1) OR PROPOSED (PHASE 2) RAILS (BY OTHERS). SURVEY STATIONS SHOULD EXTEND AT LEAST 30 FEET BEYOND THE LAST PILE IN THE EXCAVATION SUPPORT SYSTEM. MONITORING SHOULD BE PERFORMED ON A DAILY BASIS DURING EXCAVATION (BY OTHERS). ESTABLISH VERTICAL AND LATERAL MONITORING POINTS ON ALL PILES. MONITORING SHOULD BE PERFORMED ON A WEEKLY BASIS OR WHENEVER EXCAVATION TAKES PLACE IN FRONT OF THE PILES. NOTIFY SCHNABEL FOUNDATION COMPANY IMMEDIATELY OF ANY VERTICAL SETTLEMENT OR LATERAL MOVEMENT. ALL MONITORING RESULTS SHOULD BE SENT TO SFC WITHIN THREE (3) DAYS OF THE READINGS.
- ALL SLOPING SHALL BE IN ACCORDANCE WITH OSHA STANDARDS.
- CALL DIGSAFE (1-888-344-7233 - SFC CONTRACTOR NUMBER 34520) TO MARK THE LOCATION OF ALL EXISTING UTILITIES AT LEAST 72 HOURS PRIOR TO INSTALLATION OF SOLDIER BEAMS AND TIEBACKS AND MONTHLY THEREAFTER. FIELD VERIFY THE LOCATION OF ALL UTILITIES WITH CONTRACTOR PRIOR TO STARTING ANY WORK. VERIFICATION SHALL CONSIST AT A MINIMUM OF EXPOSING ANY UTILITIES WITHIN 5-FEET OF ALL PILES AND PULLING MANHOLES TO MEASURE UTILITY DEPTHS.
- COORDINATE ALL WORK WITH NEW ENGLAND CENTRAL RAILROAD PERSONEL.

## EXCAVATION SUPPORT SYSTEM PROCEDURE

- REMOVE AND/OR CAP OFF EXISTING UTILITIES THAT EXTEND INTO THE EXCAVATION (BY OTHERS). UTILITIES SHOULD BE CAPPED OFF AT LEAST 2-FEET BEHIND SHORING LINE TO PREVENT CONTAMINATION OF EXISTING LINES. VERIFY DEPTH AND LOCATION OF UTILITIES THAT REMAIN IN PLACE (BY OTHERS).
- PRE-TRENCH AREA OF PILE INSTALLATION TO REMOVE OBSTRUCTIONS (BY OTHERS). PRE-TRENCHING IS NOT PERMITTED ADJACENT TO THE TRACKS.
- SLOPE GRADE TO TOP OF PILE ELEVATION (BY OTHERS).
- DRILL HOLES TO THE DEPTHS AND AT THE LOCATIONS SHOWN ON THE PLANS AND INSTALL PILES. ALTERNATELY, DRIVE PILES THAT ARE NOT ADJACENT TO TRACKS. INSTALL STEEL SHEET PILES AT THE LOCATIONS SHOWN. IF TOP OF ROCK IS ENCOUNTERED AT A DEPTH MORE THAN 1-FOOT DEEPER OR SHALLOWER THAN SHOWN ON THE PLAN, RECORD TOE ELEVATION AND NOTIFY SFC ENGINEER. SFC WILL DETERMINE IF REDESIGN IS REQUIRED.
- EXCAVATE A MAXIMUM 5-FOOT HIGH LIFT IN THE AREA TO BE SHORED (BY CONTRACTOR). LIFT HEIGHT SHOULD BE REDUCED IF SOIL WILL NOT STAND VERTICAL AS DIRECTED BY SCHNABEL FOUNDATION COMPANY'S FOREMAN. INSTALL TIMBER LAGGING BETWEEN THE SOLDIER BEAMS. LAGGING MAY EITHER BE PLACED ON THE FACE OF THE SOLDIER BEAM OR BEHIND THE FLANGE.
- CONTINUE EXCAVATION AND LAGGING TO AROUND TWO (2) FOOT BELOW TIEBACK ELEVATION AT TIEBACK PILES.
- INSTALL TIEBACKS IN ACCORDANCE WITH THE TIEBACK INSTALLATION PROCEDURE TO THE LENGTHS AND AT THE LOCATIONS SHOWN ON THE PLANS.
- TEST TIEBACKS IN ACCORDANCE WITH THE TIEBACK TESTING PROCEDURE. AT COMPLETION OF TESTING LOCK-OFF THE TIEBACKS.
- REPEAT STEPS 5 TO 8 FOR SECOND ROW OF TIEBACKS IF REQUIRED.
- CONTINUE EXCAVATION AND LAGGING TO WITHIN 4-FOOT OF TOP OF ROCK IN LOCATION OF TOE TIES OR ROCK DOWELS.
- INSTALL TOE TIES AND/OR ROCK DOWELS.
- CONTINUE EXCAVATION TO SUBGRADE, LAGGING TO TOP OF ROCK. TIEBACK INSTALLATION PROCEDURE

- INSTALL TIEBACKS TO THE LENGTH AND AT THE LOCATIONS SHOWN ON THE PLANS. SFC MAY INSTALL TIEBACK TENDONS WITH REGROUT TUBES TO ALLOW ANCHORS TO BE REGROUTED. TIEBACK INSTALLATION PROCEDURE SHALL BE AS FOLLOWS:
  - INSTALL TIEBACKS USING CONCENTRIC ROTARY DUPLEX DRILLING METHODS WITH AIR OR WATER FLUSHING OR DRIVEN CASING WITH A KNOCK-OFF POINT. USE OF A POLYMER OR SLURRY TO FACILITATE REMOVAL OF DRILL CUTTINGS IS ALSO PERMITTED. CASING IS NOT REQUIRED WHEN DRILLING BEDROCK.
  - INSERT TIEBACK TENDON INTO CASING. TENDON MAY BE INSTALLED BEFORE OR AFTER CASING IS FILLED WITH GROUT.
  - FILL CASING WITH GROUT USING TREMIE METHOD.
  - EXTRACT CASING MAKING SURE TO KEEP CASING FILLED WITH GROUT. ALTERNATELY, ANCHORS MAY BE PRESSURE GROUTED.
  - ALLOW ANCHORS TO CURE A MINIMUM OF FIVE (5) DAYS BEFORE TESTING AND LOCKING OFF.

INSTALLATION METHOD MAY BE ALTERED BASED ON ACTUAL CONDITIONS ENCOUNTERED.

- TEST TIEBACKS ACCORDING TO TIEBACK TESTING PROCEDURE. AT COMPLETION OF TESTING, LOCK-OFF THE TIEBACKS.

## TIEBACK TESTING

- A TOTAL OF 10% OF THE TIEBACKS WILL BE PERFORMANCE TESTED. PERFORMANCE TESTS WILL BE PERFORMED ON THE FIRST THREE (3) TIEBACKS INSTALLED, WHENEVER THE SOIL /ROCK CONDITIONS CHANGE, AND AT THE ENGINEER'S DISCRETION. ALL REMAINING ANCHORS SHALL BE PROOF TESTED.

THE SEQUENCE OF LOAD APPLICATION FOR THE PERFORMANCE TEST SHALL BE AS FOLLOWS:

- (AL) 0.25P
- (AL) 0.25P 0.50P
- (AL) 0.25P 0.50P 0.75P
- (AL) 0.25P 0.50P 0.75P 1.00P
- (AL) 0.25P 0.50P 0.75P 1.00P 1.20P
- (AL) 0.25P 0.50P 0.75P 1.00P 1.20P 1.33P (Max. Test Load; HOLD FOR 60 MINUTES)
- (AL) ADJUST TO LOCK-OFF LOAD (0.75 P)
- LIFT OFF TO VERIFY LOCK-OFF LOAD.

THE SEQUENCE OF LOAD APPLICATION FOR THE PROOF TEST SHALL BE AS FOLLOWS:

- (AL) 0.25P 0.50P 0.75P 1.00P 1.20P (Max. Test Load, HOLD FOR 10 MINUTES)
- (AL) ADJUST TO LOCK-OFF LOAD (0.75 P)
- LIFT OFF TO VERIFY LOCK-OFF LOAD

AL = ALIGNMENT LOAD  
P = DESIGN LOAD

EACH LOAD INCREMENT, EXCEPT THE MAXIMUM TEST LOAD, SHALL BE HELD LONG ENOUGH TO OBTAIN A MOVEMENT READING.

- THE TIEBACKS SHALL BE TESTED USING A CENTER HOLE JACK WITH A CALIBRATED PRESSURE GAUGE CAPABLE OF READING TO AN ACCURACY OF 100 PSI. LOAD CELLS SHOULD BE INSTALLED ON TWO TIEBACKS IN EACH ROW OF TIES TO MONITOR TIEBACK LOADS DURING EXCAVATION. LOAD CELL READINGS SHALL TAKE PLACE ON A DAILY BASIS (MINIMUM), WHENEVER EXCAVATION CHANGES ARE MADE WITHIN VICINITY OF EACH LOAD CELL, OR AS DIRECTED BY THE ENGINEER.
- MOVEMENT MEASUREMENTS SHALL BE TAKEN AT THE ALIGNMENT LOAD (AL), USED TO SEAT THE ANCHOR AND JACKING CHAIR ASSEMBLY (NOT TO EXCEED 5 PERCENT OF THE DESIGN LOAD (P)), AND AT EACH LOAD INCREMENT. MOVEMENT READINGS SHALL BE TAKEN USING AN AMES DIAL GAUGE CAPABLE OF READING TO .001". THE PRESSURE IN THE TEST JACK SHALL BE MAINTAINED DURING ALL LOAD HOLDS.
- THE MAXIMUM TEST LOAD SHALL BE HELD FOR TEN (10) MINUTES. THE MOVEMENT SHALL BE RECORDED AT 1, 2, 3, 4, 5, 6 AND 10 MINUTES. IF THE TOTAL MOVEMENT BETWEEN THE 1 AND 10 MINUTE READING EXCEEDS 0.04", THE TEST LOAD SHALL BE HELD FOR AN ADDITIONAL 50 MINUTES. TOTAL MOVEMENTS SHALL BE RECORDED AT 15, 20, 25, 30, 45 AND 60 MINUTES.
- AN ANCHOR SHALL BE CONSIDERED ACCEPTABLE IF IT MEETS OR EXCEEDS THE FOLLOWING CRITERIA:
  - THE TIEBACK DEVELOPS THE MAXIMUM TEST LOAD WITHOUT CONTINUOUS LOSS OF JACK PRESSURE.
  - THE TOTAL ELASTIC MOVEMENT OBTAINED FROM A PERFORMANCE TEST EXCEEDS 80 PERCENT OF THE THEORETICAL ELASTIC ELONGATION OF THE FREE STRESSING AND UNBONDED ANCHOR LENGTHS.

THE TOTAL MOVEMENT OBTAINED FROM A PROOF TEST, MEASURED BETWEEN 50 PERCENT OF THE DESIGN LOAD AND THE MAXIMUM TEST LOAD EXCEEDS 80 PERCENT OF THE THEORETICAL ELASTIC ELONGATION OF THE FREE STRESSING AND UNBONDED ANCHOR LENGTHS FOR THE RESPECTIVE LOAD RANGE.

## LIST OF DRAWINGS

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SFC-5	SUPPORT AT SARGENT BROOK
SFC-6	SECTIONS
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## MATERIALS

- CENTRALIZERS:** CENTRALIZERS, WHERE REQUIRED, SHALL BE FABRICATED FROM ANY MATERIAL EXCEPT WOOD WHICH IS NON-DETRIMENTAL TO THE PRE-STRESSED STEEL BAR. THE CENTRALIZER SHALL POSITION THE ANCHOR IN THE DRILL HOLE SO A MINIMUM OF 0.5 INCH OF GROUT OR CONCRETE COVER IS PROVIDED. SPACE CENTRALIZERS AT MAXIMUM 10-FOOT INTERVALS.
- GROUT:** GROUT SHALL BE NEAT CEMENT, WITH A MAXIMUM WATER/CEMENT RATIO OF AROUND 0.5 (5 TO 6 GALLONS OF WATER TO ONE 94 LB SACK OF CEMENT) BY WEIGHT. FX-32 ADMIXTURE MAY BE USED TO INCREASE STRENGTH AND REDUCE SHRINKAGE. OTHER ADMIXTURES MAY ALSO BE USED. CEMENT SHALL BE ASTM C-150, TYPE I, II, OR III.
- TIEBACK TENDONS:** TIEBACKS SHALL BE:
  - GRADE 270 7-WIRE STRANDS CONFORMING TO ASTM A-416.
  - GRADE 150 ALL-THREAD BARS CONFORMING TO ASTM A-722.
- TIMBER LAGGING:** TIMBER LAGGING MAY CONSIST OF ANY SPECIES, ROUGH CUT, MIXED HARDWOOD, UNLESS OTHERWISE INDICATED. A GAP SHALL BE PROVIDED BETWEEN LIFTS OF LAGGING TO REDUCE HYDROSTATIC PRESSURES AND ALLOW BOARDS TO BE BACKFILLED. TIMBER LAGGING SHALL BE 3-INCH NOMINAL THICKNESS.
- BEARING PLATE AND WEDGE PLATE OR HEXAGONAL NUT:** STEEL BEARING PLATE AND WEDGE PLATE SHALL CONFORM TO ASTM A-36. HEXAGONAL NUT SHALL CONFORM TO ASTM A-325 OR BAR MANUFACTURER'S SPECIFICATIONS.
- SOLDIER PILES:** SOLDIER PILES SHALL BE GRADE 50 STEEL OR EQUIVALENT GRADE 36 (ASTM A-36). NEW OR USED STEEL MAY BE USED.
- STEEL SHEET PILES:** STEEL SHEET PILES SHALL CONFORM TO ASTM A-36.
- TOE TIES AND ROCK DOWELS:** TOE TIES AND ROCK DOWELS SHALL BE GRADE 75 ALL-THREAD BARS CONFORMING TO ASTM A615.



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## REVISIONS

NO	DATE	DESCRIPTION
1	4/21/03	REVIEW COMMENTS/GEN. REVISIONS

**Schnabel**  
Foundation Company  
Engineers and Contractors  
200 Turnpike Road  
Southborough, Massachusetts  
Atlanta • Denver • Chicago  
Houston • Los Angeles • Philadelphia  
San Francisco • Washington D.C.

Excavation Support Notes	
Route 9 Improvements	
Brattleboro, Vermont	
Date: 02/27/03	Job Number: 06-3392
Scale: N.T.S.	Drawing No: SFC-1

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