



Shored Mechanically Stabilized Earth Walls at the NC194 Avery-Watagua Project

Keith Brabant, P.E.
(Reinforced Earth)

Scott Ballenger, P.E.
(Schnabel Foundation Co.)

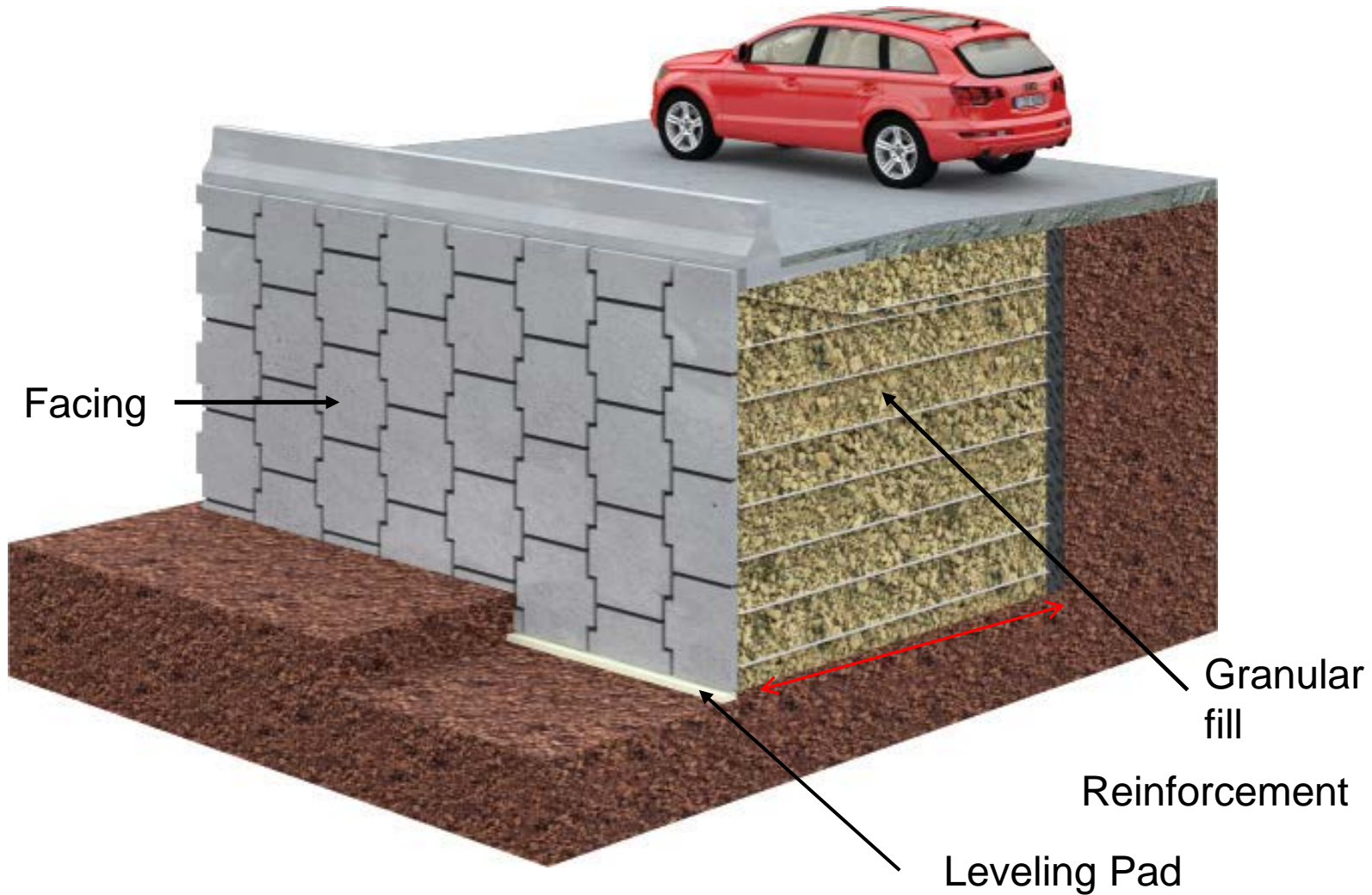
Outline

- A. *Project Overview***
- B. *Traditional MSE Wall Construction Sequence***
- C. *Advantages of SMSE Walls***
- D. *MSE Wall Design***
- E. *MSE Wall Construction***
- F. *Soil Nail Wall Design***
- G. *Soil Nail Wall Construction***

Project Overview – NC 194 From Avery County Line to SR 1112 in Valle Crucis



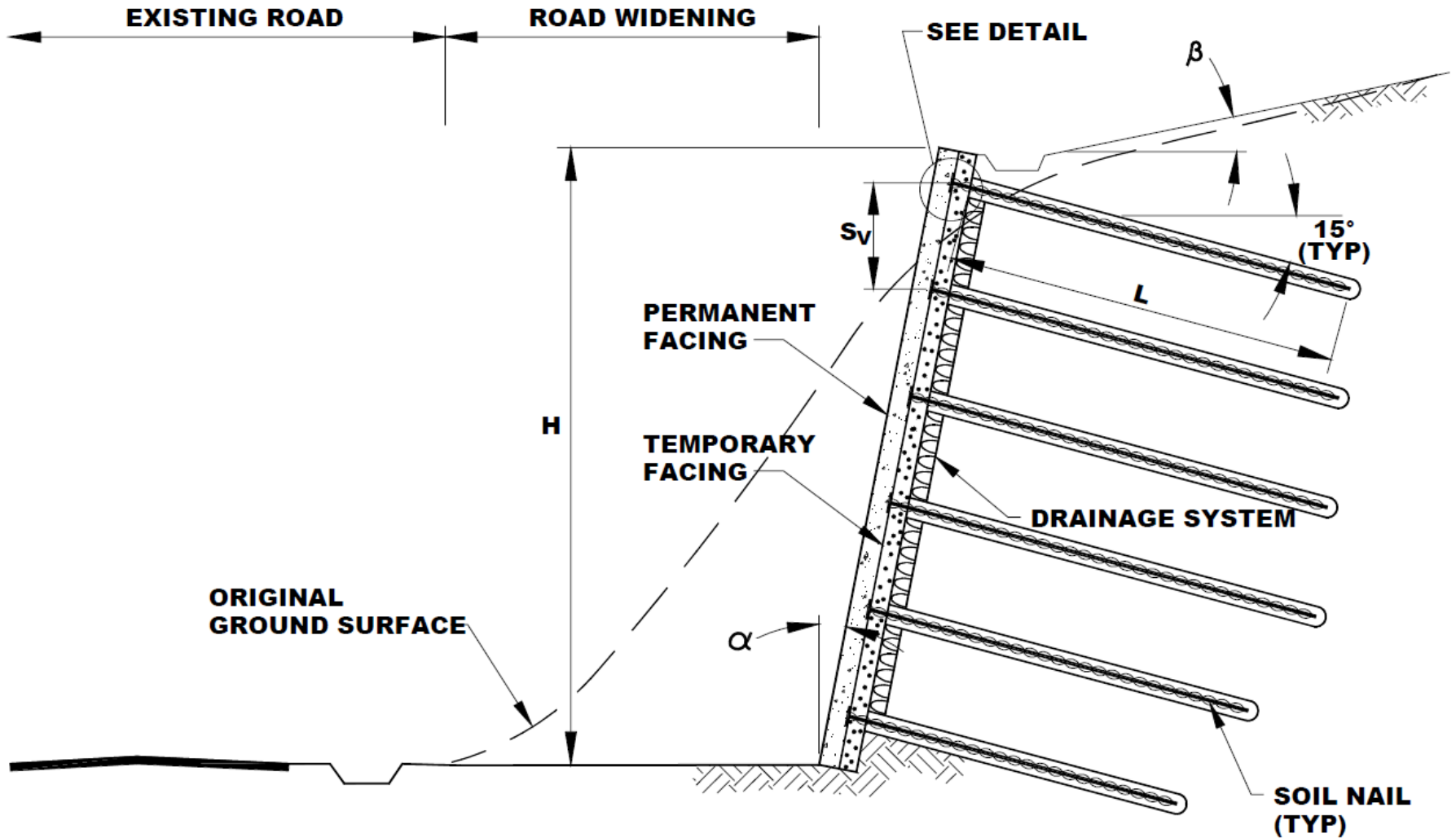
Conventional Mechanically Stabilized Earth



Conventional MSE Wall Construction



TYPICAL SOIL NAIL WALL SECTION "CUT WALL"



COMPLEX MSE STRUCTURES – SHORED MSE WALL

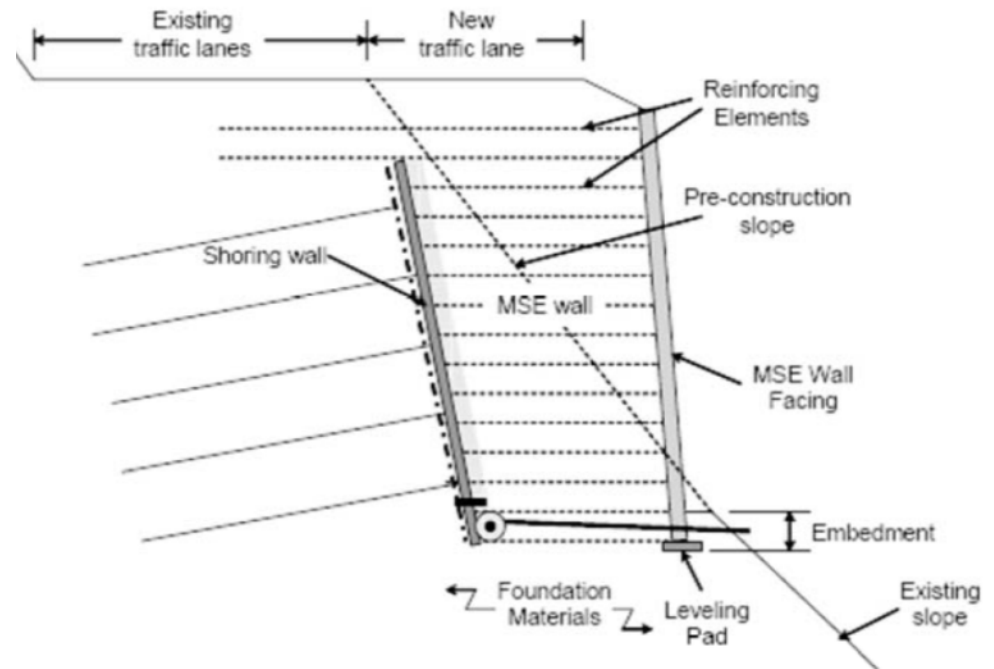
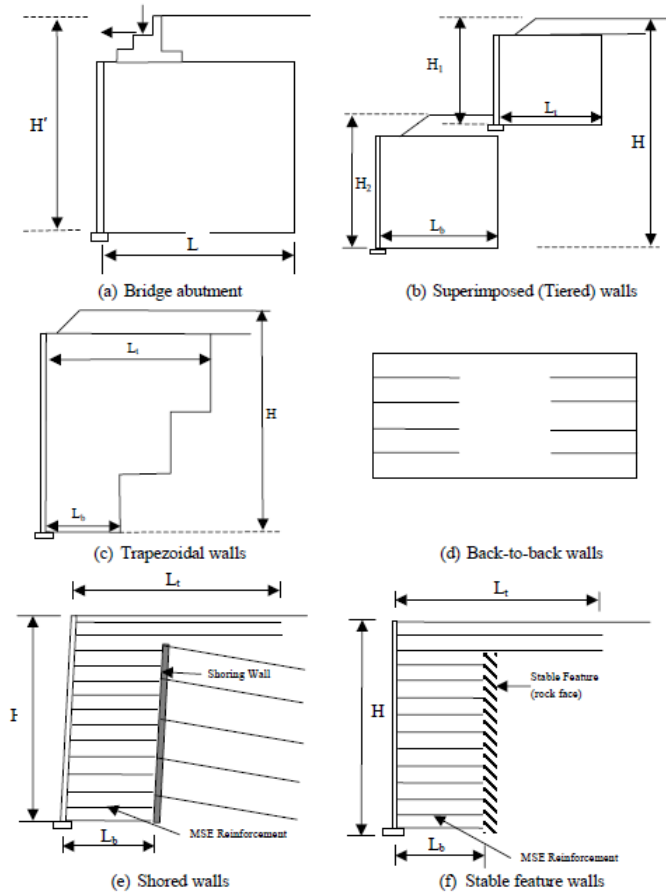
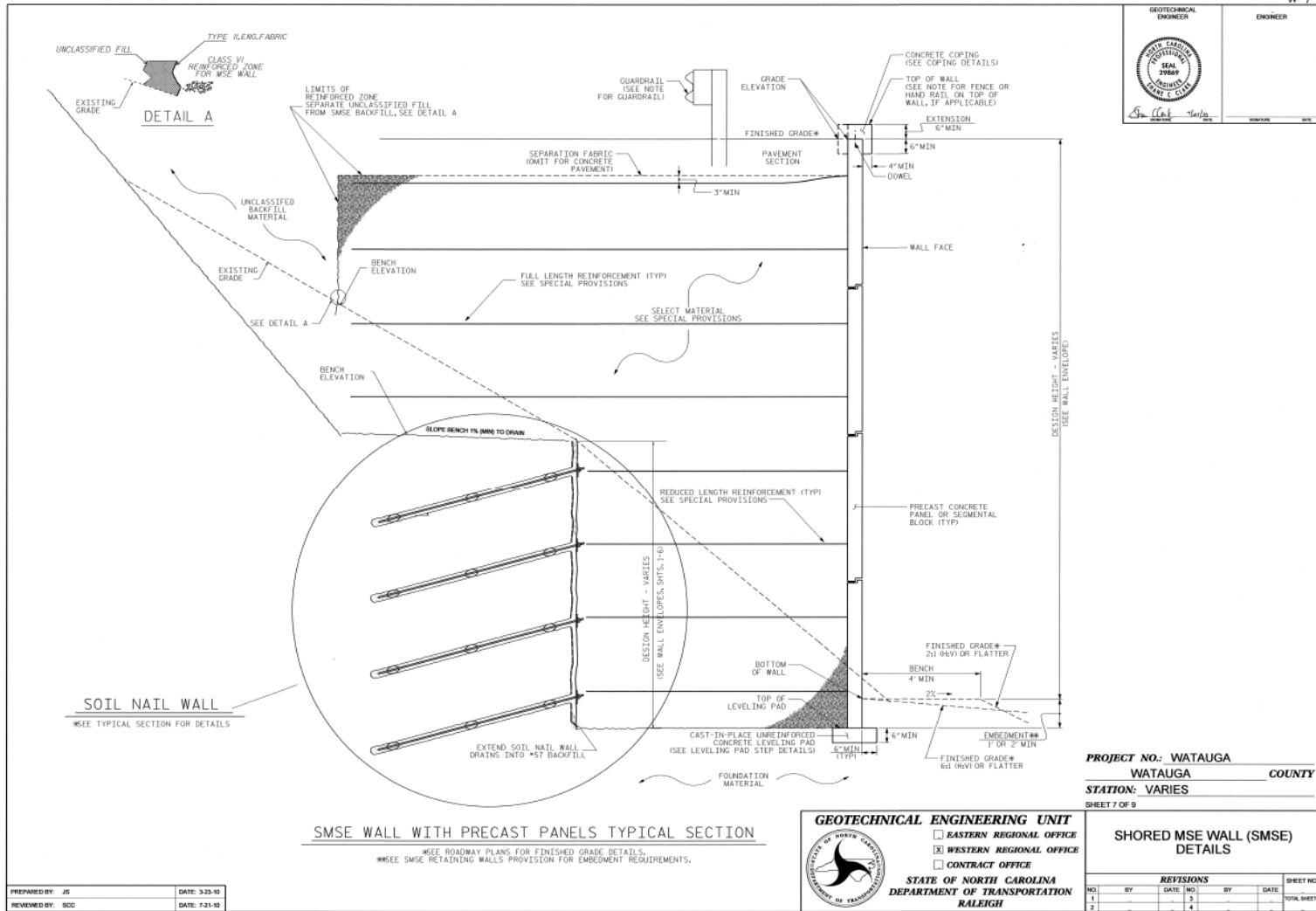


Figure 6-1. Types of complex MSE structures.

CURRENT FHWA MANUAL

Excerpt from NCDOT Plans



W-7

GEOTECHNICAL ENGINEER

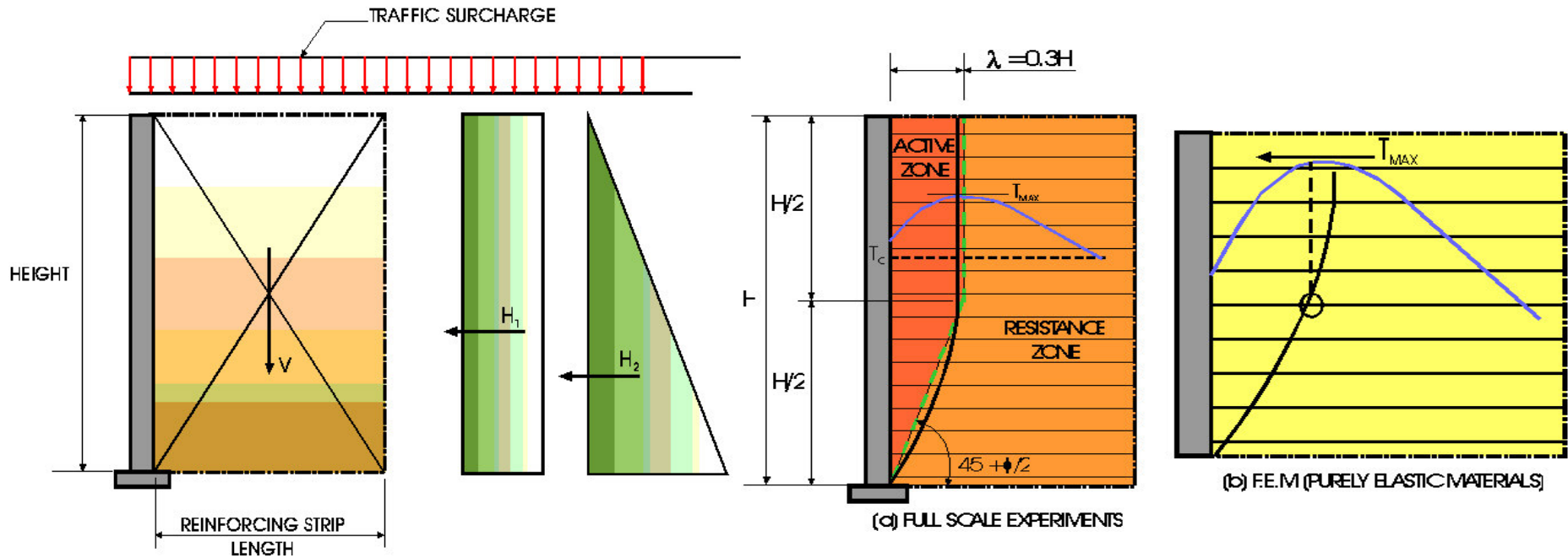
ENGINEER

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

DATE: 7/21/10

Basic Design of MSE Walls

MSE WALL DESIGN



External Stability

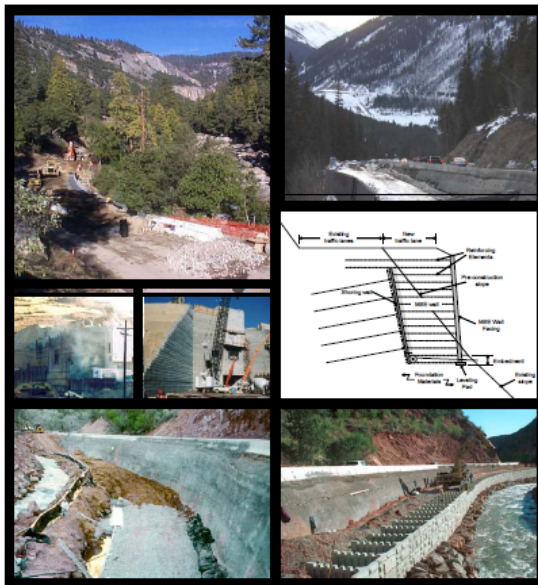
Internal Stability

Shored MSE Walls

Shored Mechanically Stabilized Earth (SMSE) Wall Systems Design Guidelines

Publication No. FHWA-CFL/TD-06-001

February 2006



U.S. Department of Transportation
Federal Highway Administration



Central Federal Lands Highway Division
12300 West Dakota Avenue
Lakewood, CO 80228

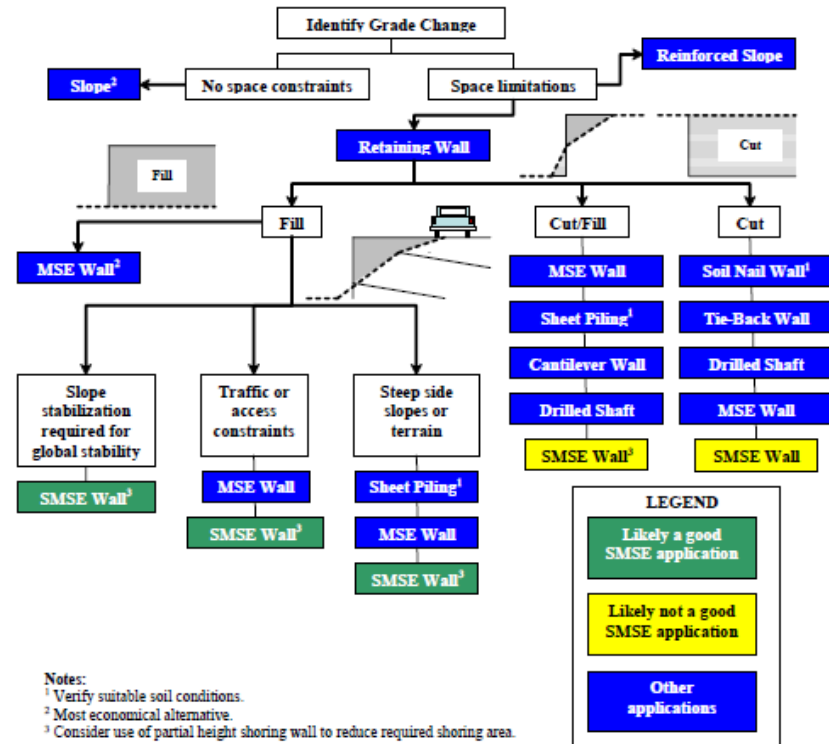


Figure 5. Flow chart. Flow chart for assistance in SMSE wall selection.

SMSE – DESIGN ASPECTS

5.1 POTENTIAL FAILURE MODES

Stability analysis of an SMSE wall system must consider failure modes associated with conventional MSE walls and shoring walls, plus internal failure modes specific to the compound nature of the SMSE wall system. Figure 13 illustrates the various failure modes of the composite SMSE wall system.

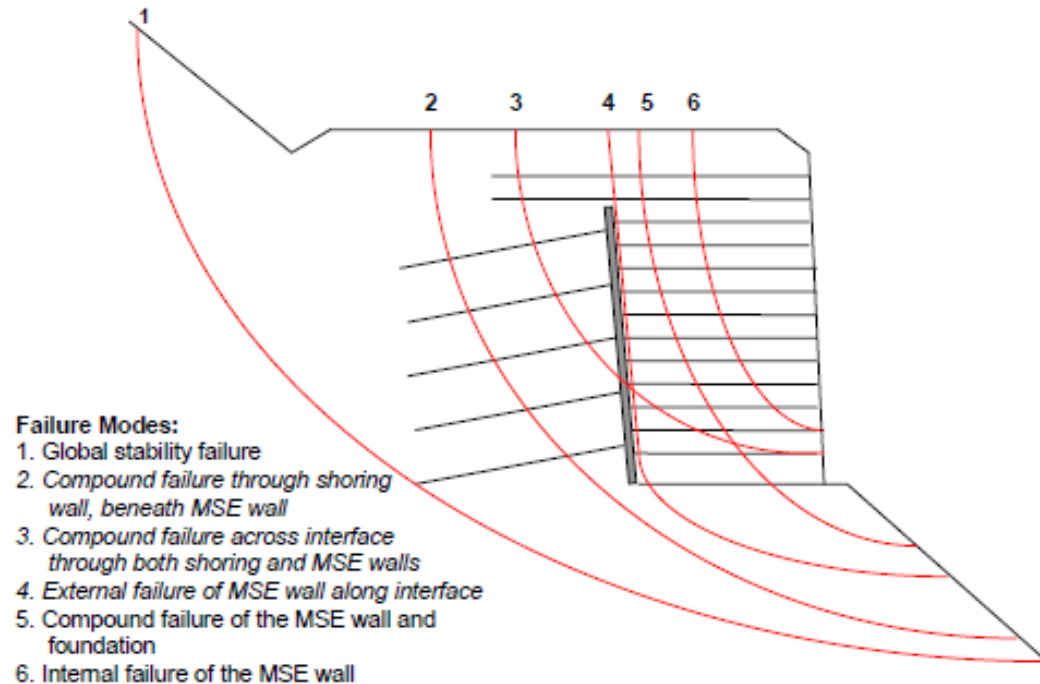
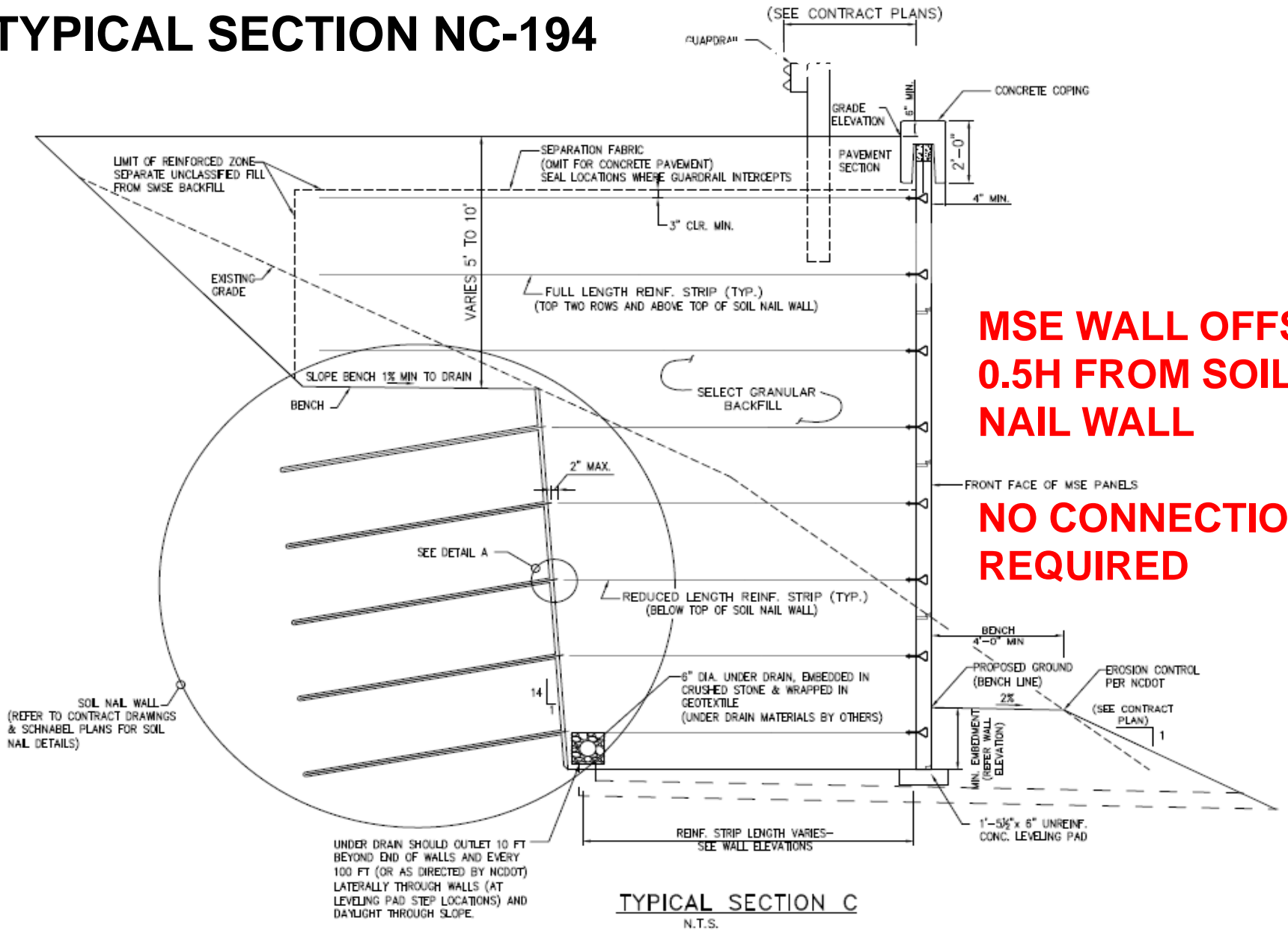


Figure 13. Diagram. SMSE wall system failure modes.

TYPICAL SECTION NC-194



**MSE WALL OFFSET
0.5H FROM SOIL
NAIL WALL**

**NO CONNECTIONS
REQUIRED**

SHORED MSE WITH “SANDWICH REINFORCEMENTS”

-NOT USED ON NC-194

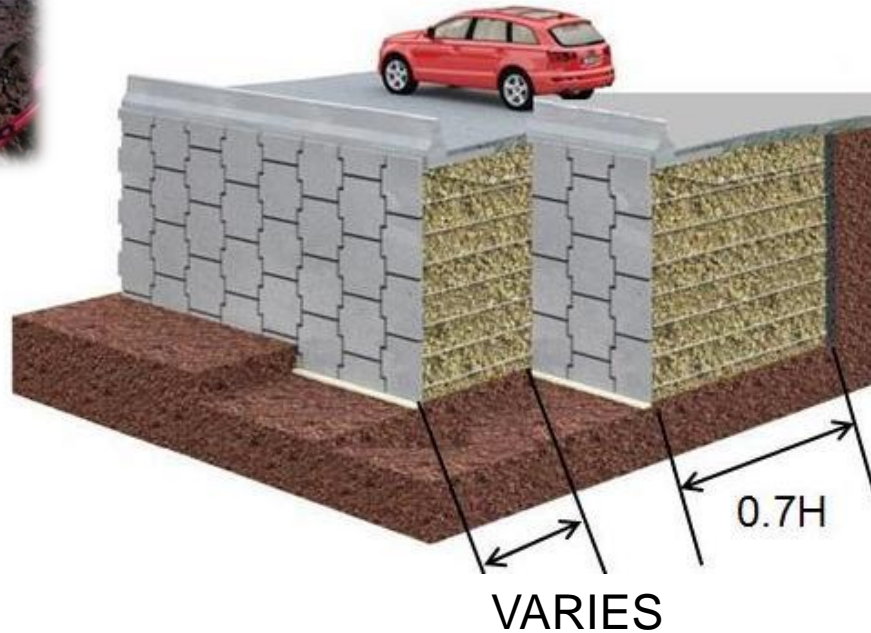


Terranail™

IF SPACE BETWEEN MSE AND SOIL NAIL WALL IS LESS THAN $0.5H \pm$, IT MAY BE NECESSARY TO ATTACH SOIL REINF. TO SOIL NAIL HEADS TO PROVIDE REINFORCEMENT IN BOTH DIRECTIONS.



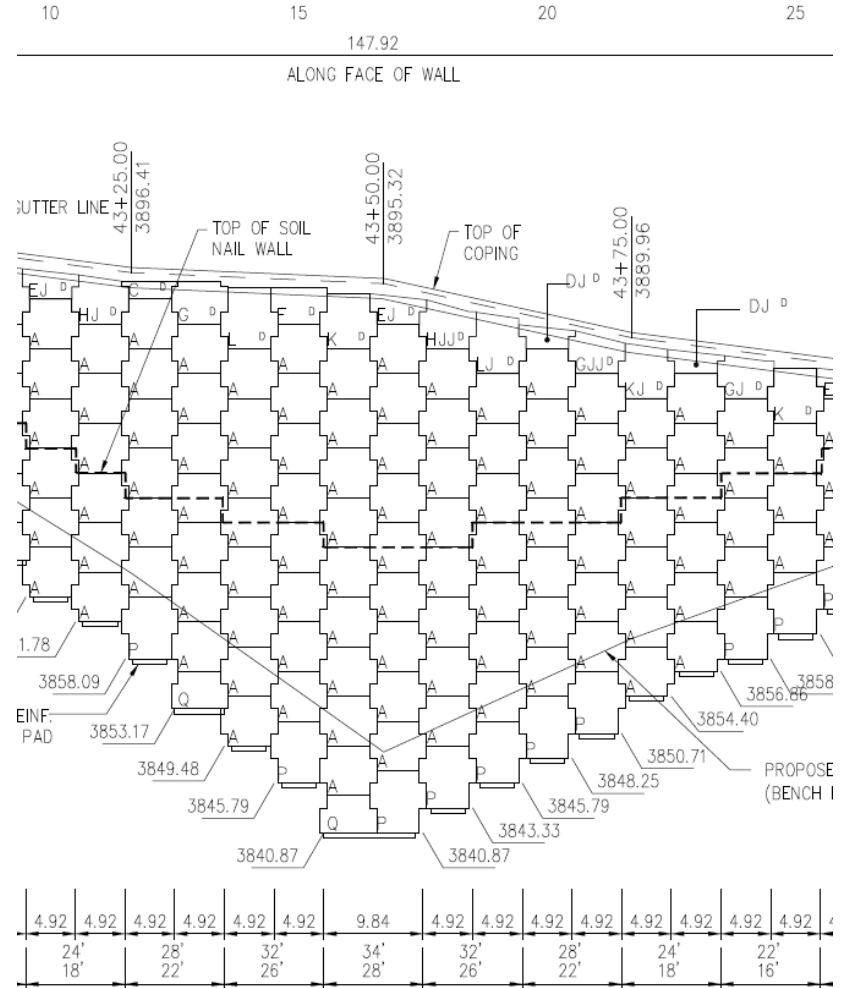
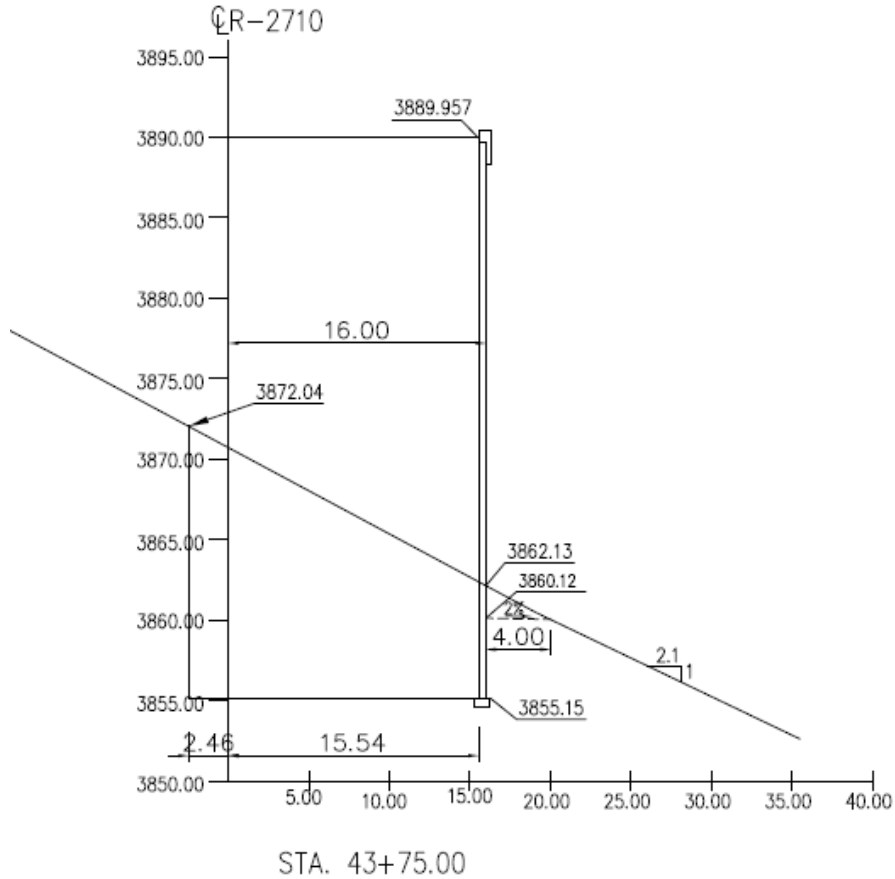
Widening Applications



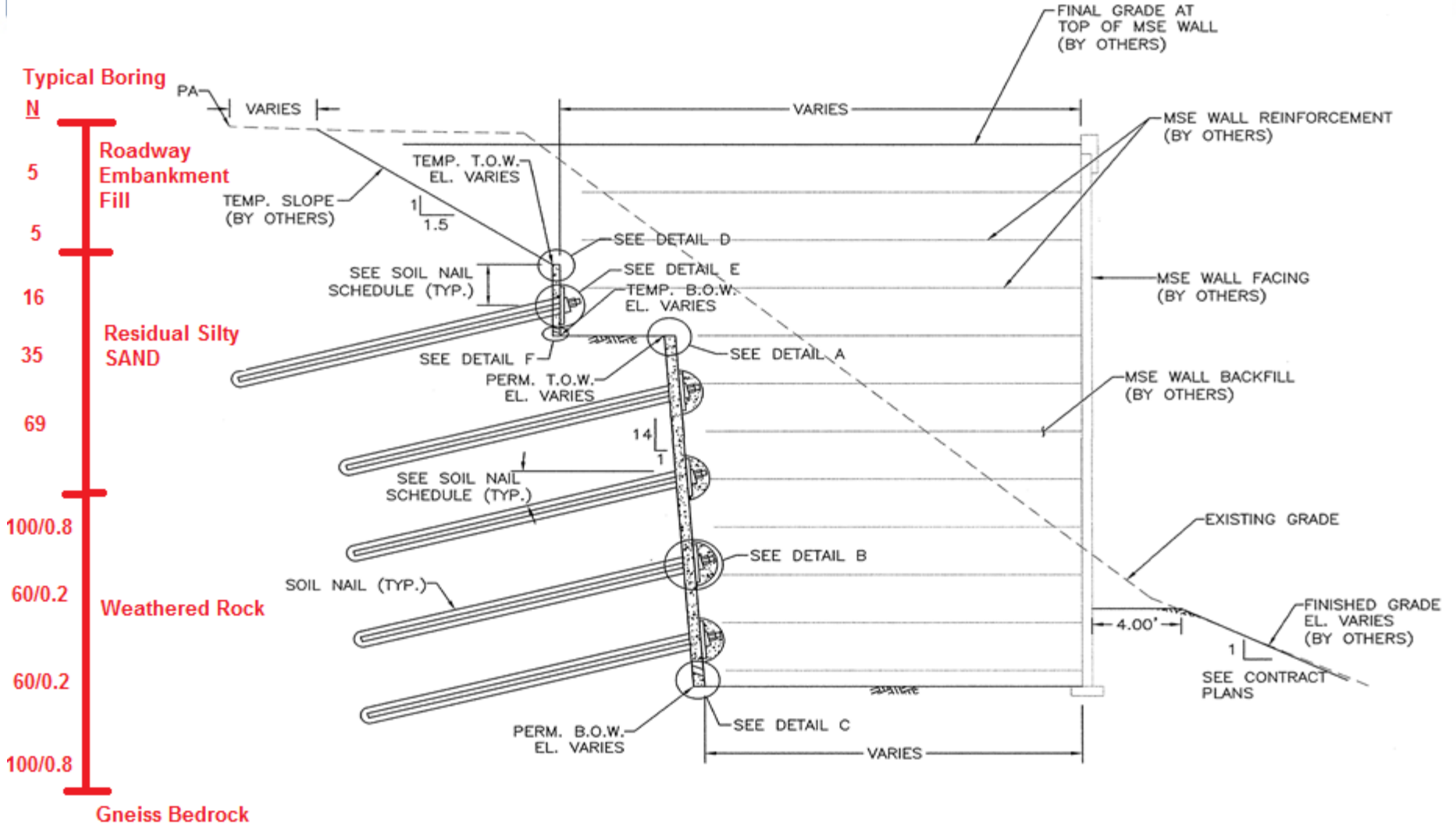
DESIGN PROCESS – SHORED MSE WALLS

- **OBTAIN FIELD SURVEY FROM CONTRACTOR – DEVELOP CROSS SECTIONS**
- **DETERMINE PRELIMINARY MSE WALL STRIP LENGTHS**
- **PROVIDE PRELIMINARY LAYOUT AND CROSS SECTIONS TO SOIL NAIL WALL DESIGNER**
- **COORDINATE SUBMITTALS WITH CONTRACTOR (2 SEPARATE DESIGN PACKAGES)**
- **NCDOT REVIEWS SOIL NAIL WALL SUBMITTAL AND MSE WALL SUBMITTAL AND CHECKS GLOBAL STABILITY**

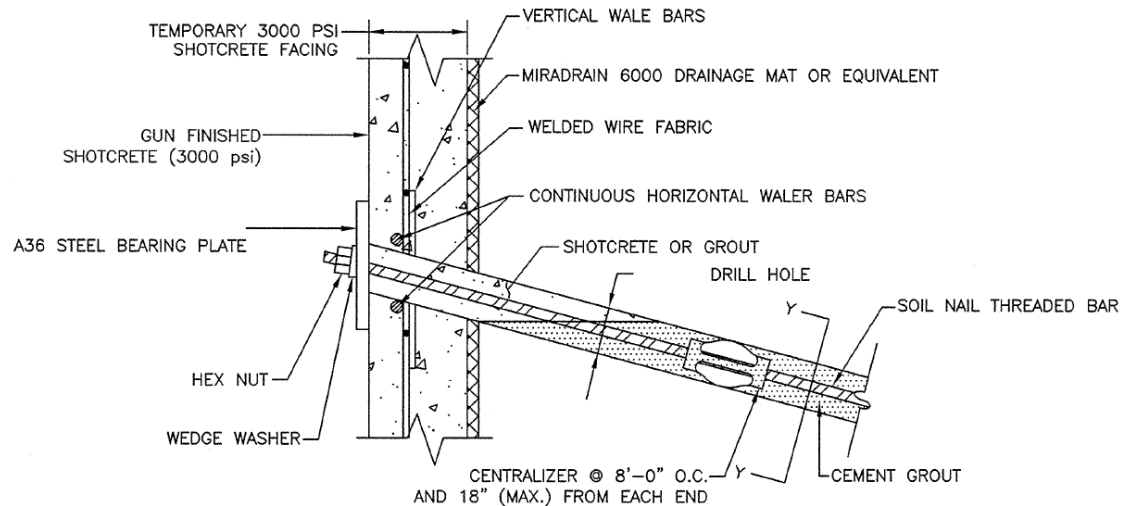
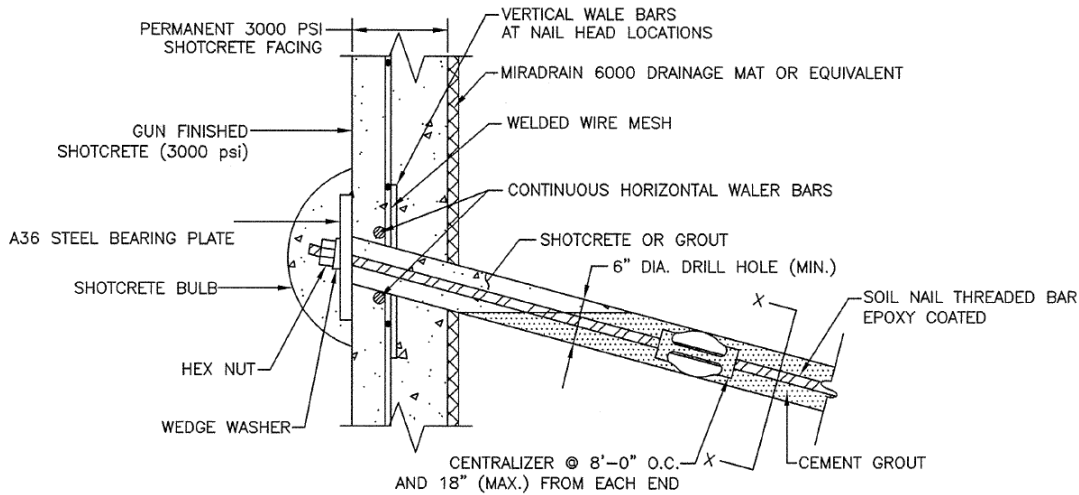
CROSS SECTION DEVELOPMENT



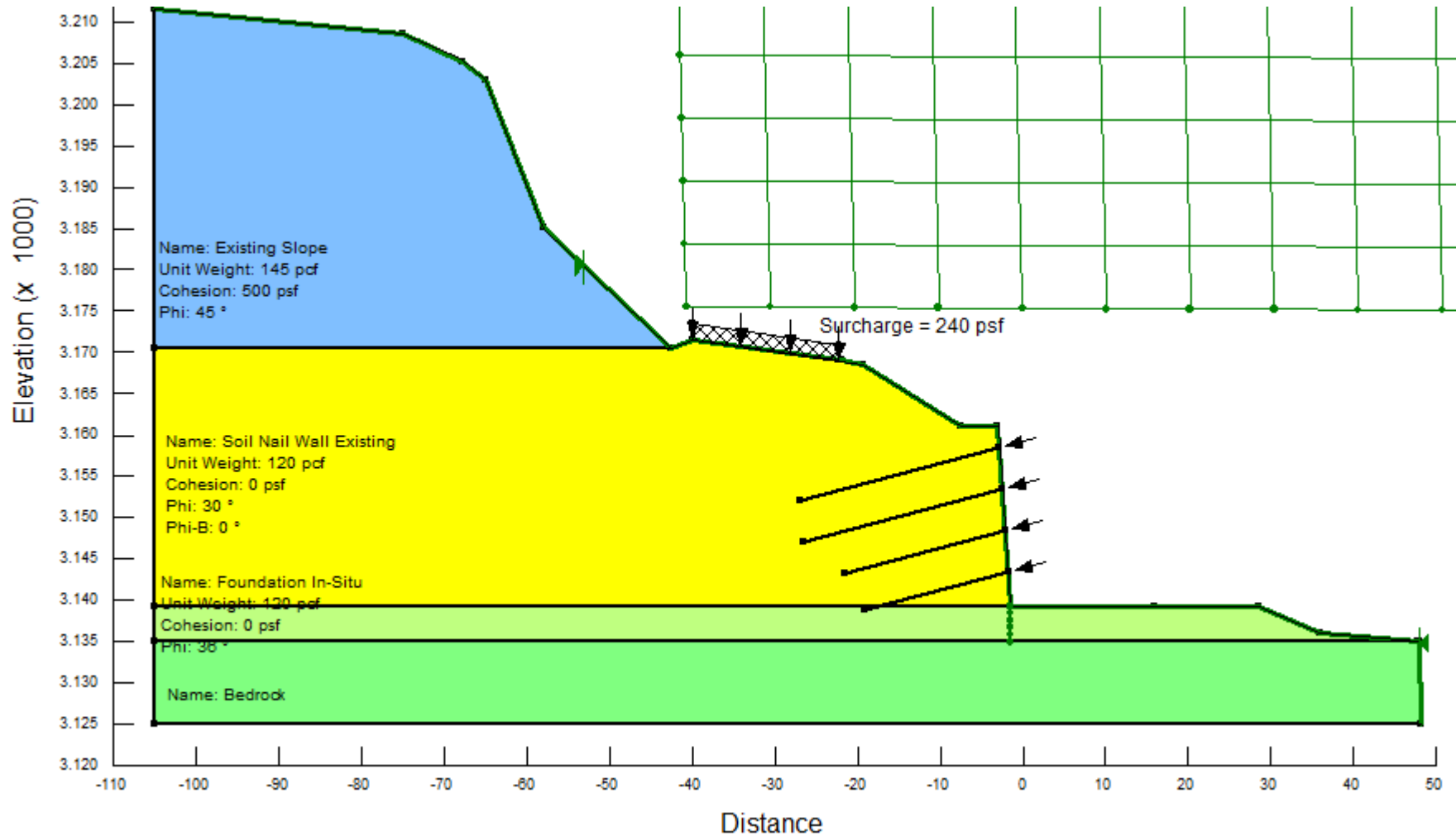
Soil Nail Wall Design - Typical Section



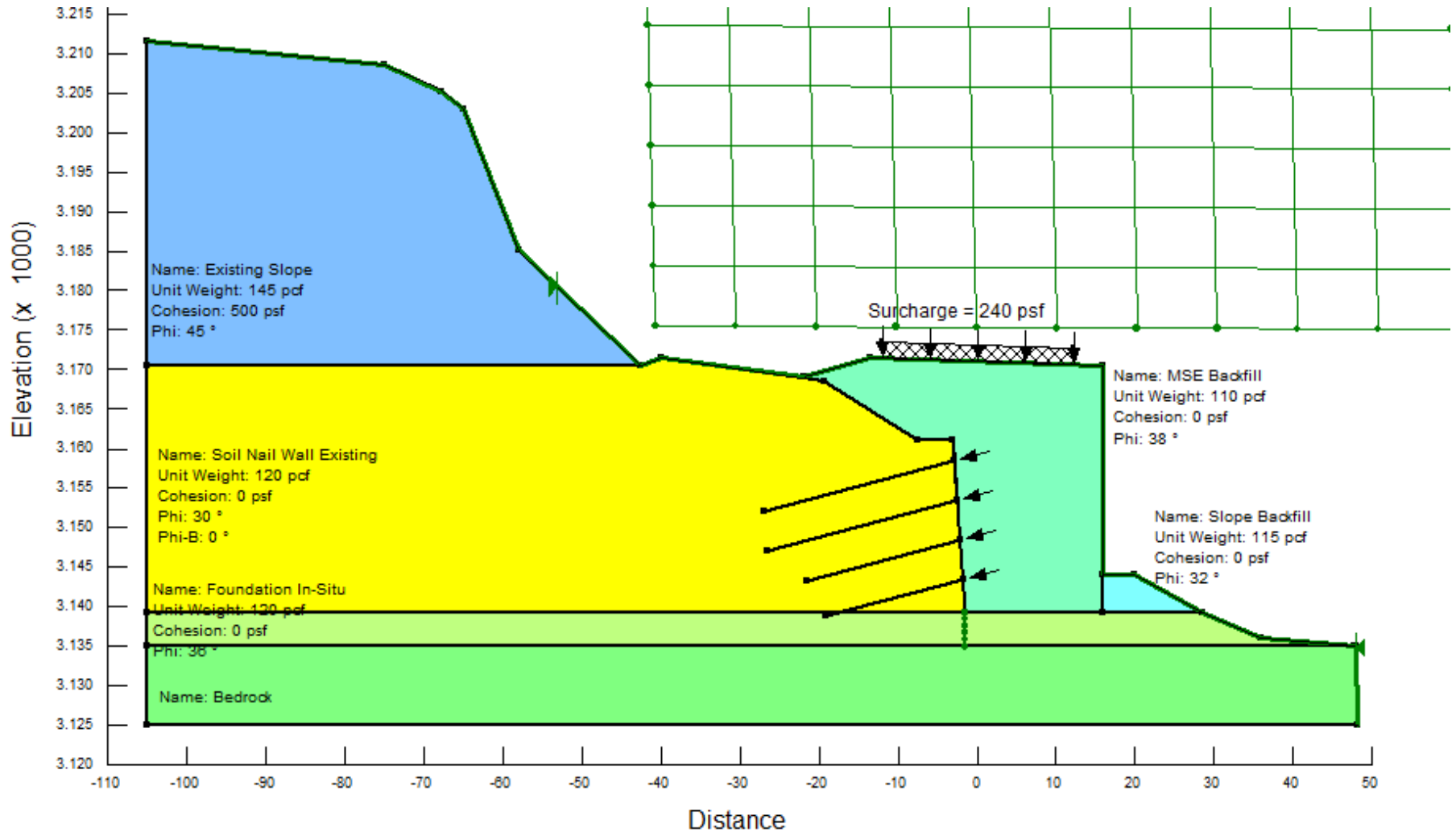
Soil Nail Wall Design – Soil Nail Detail



Soil Nail Wall Design – Temporary Condition



Soil Nail Wall Design – Permanent Condition







05/25/2012 08:56





07/02/2012 12:27

Shored MSE Wall Construction





07/02/2012 12:26





THANK YOU

PARTNERS

