VIRGINIA DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

MEMORANDUM

GENERAL SUBJECT: Revision to Virginia Test Method 140	NUMBER: MD 462-23
SPECIFIC SUBJECT: **Adding an example calculation to Section 9 of VTM 140 (Determination of Unconfined Compressive Strength of Cohesive Soil to Estimate Resilient Modulus)**	DATE: **July 28, 2023**
	SUPERSEDES:
APPROVED: Babish Charles dax24016 *Digitally signed by Babish Charles dax24016 Date: 2023.07.28 14:11:46 -04'00'*	**Charles A. Babish, PE** **State Materials Engineer**

EFFECTIVE DATE

- This memorandum is effective August 1, 2023.

PURPOSE/NEED/SCOPE/REQUIREMENTS

- To add an example calculation to VTM 140 to provide clarity on the input parameters used in the correlations shown in Section 9 below.

<div align="center">Changes are BLUE</div>

PROCEDURES

9. <u>Report</u>

9.1.4. Unconfined compressive strength and shear strength in psi (to nearest 0.1 psi)
9.1.8. Liquid limit, plastic limit, and plasticity index in accordance with VTM-7
9.1.13. Particle-size analysis in accordance with T 88
9.1.15. Maximum dry density and optimum water content in accordance with VTM-1
9.1.16. Report the specimen preparation method used: static or impact
9.1.17. Resilient modulus in psi (to nearest 1 psi) calculated using the following correlation:

Sample preparation method	Correlation
Static compaction	$M_r = 7884.2 + 99.7 \times Q_u + 193.1 \times PI - 47.9 \times P_{200}$
Impact compaction	$M_r = 6113 + 95.1 \times Q_u + 173.7 \times PI - 27.8 \times P_{200}$

Where M_r = Resilient Modulus (psi) at confining stress of 2 psi and deviator stress of 6 psi; Q_u = Unconfined Compressive Strength (psi); PI = Plasticity Index (%); and P_{200} = % passing No. 200 sieve

Example Calculation:
    (a) For Static Compaction Sample:
        Given:
        Q_u = 42.4 psi
        PI = 15 (Note: For non-plastic soils, PI = 0)
        P_{200} = 51.3%
        So,

$$M_r = 7884.2 + 99.7 \times \mathbf{Q_u} + 193.1 \times \mathbf{PI} - 47.9 \times \mathbf{P_{200}}$$
$$= 7884.2 + 99.7 \times \mathbf{42.4} + 193.1 \times \mathbf{15} - 47.9 \times \mathbf{51.3}$$
$$= 12{,}551 \text{ psi}$$

    (b) For Impact Compaction Sample:
        Given:
        Q_u = 53.7 psi
        PI = 15 (Note: For non-plastic soils, PI = 0)
        P_{200} = 51.3%
        So,

$$M_r = 6113 + 95.1 \times \mathbf{Q_u} + 173.7 \times \mathbf{PI} - 27.8 \times \mathbf{P_{200}}$$
$$= 6113 + 95.1 \times \mathbf{53.7} + 173.7 \times \mathbf{15} - 27.8 \times \mathbf{51.3}$$
$$= 12{,}399 \text{ psi}$$

NOTES

REFERENCES

COPY DISTRIBUTION:

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District Administrators	Virginia Ready Mix Association
District Location & Design Engineers	Precast Concrete Association of Virginia
District Construction Engineers	Virginia Transportation Construction Alliance
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District Bridge Engineers	American Concrete Paving Association Mid-Atlantic Chapter
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