

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

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SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS	
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>		WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNEQUAL - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE (ALSO POORLY GRADED). GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.		HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm. CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTARY ROCK (CP) COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.		ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.	
GENERAL CLASS. GRANULAR MATERIALS (< 75% PASSING #200) SILT-CLAY MATERIALS (> 75% PASSING #200) ORGANIC MATERIALS		MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		WEATHERED ROCK (WR)		ARTESIAN	
SOIL LEGEND AND AASHTO CLASSIFICATION		MINERALOGICAL COMPOSITION		CRYSTALLINE ROCK (CR)		CALCAREOUS (CALC.)	
GROUP CLASS. A-1, A-1-b, A-3, A-2, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-7-5, A-7-6, A-3, A-4, A-5, A-6, A-7		COMPRESSIBILITY		NON-CRYSTALLINE ROCK (NCR)		COLLUVIUM	
SYMBOL		SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE		COASTAL PLAIN SEDIMENTARY ROCK (CP)		CORE RECOVERY (REC.)	
% PASSING		LIQUID LIMIT LESS THAN 30 LIQUID LIMIT 31-50 LIQUID LIMIT GREATER THAN 50		WEATHERING		DIKE	
LIQUID LIMIT		PERCENTAGE OF MATERIAL		FRESH		DIP	
PLASTIC INDEX		ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL		VERY SLIGHT (V.SL.)		DIP DIRECTION (DIP AZIMUTH)	
GROUP INDEX		TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% MODERATELY ORGANIC 5 - 10% 12 - 20% HIGHLY ORGANIC > 10% > 20%		SLIGHT (SL.)		FAULT	
USUAL TYPES OF MAJOR MATERIALS		GROUND WATER		MODERATE (MOD.)		FISSILE	
GEN. RATING AS A SUBGRADE		WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. STATIC WATER LEVEL AFTER 24 HOURS. PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA SPRING OR SEEPAGE		SEVERE (MOD. SEV.)		FLOAT	
P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30		MISCELLANEOUS SYMBOLS		SEVERE (SEV.)		FORMATION (FM.)	
CONSISTENCY OR DENSENESS		ROADWAY EMBANKMENT WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS INFERRED SOIL BOUNDARIES INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP/DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD		VERY SEVERE (V. SEV.)		JOINT	
PRIMARY SOIL TYPE		SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL		COMPLETE		LEDGE	
COMPACTNESS OR CONSISTENCY		ABBREVIATIONS		ROCK HARDNESS		LENS	
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)		AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED FRAGS. - FRAGMENTS HL - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL - SILT, SILTY SLI - SLIGHTLY TCR - TRICONE REFUSAL W - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST γ - UNIT WEIGHT γ _d - DRY UNIT WEIGHT		VERY HARD		MOTTLED (MOT.)	
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (KN/M ²)		SL - SILT, SILTY SLI - SLIGHTLY TCR - TRICONE REFUSAL W - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST γ - UNIT WEIGHT γ _d - DRY UNIT WEIGHT		HARD		PERCHED WATER	
TEXTURE OR GRAIN SIZE		EQUIPMENT USED ON SUBJECT PROJECT		MODERATELY HARD		RESIDUAL SOIL	
U.S. STD. SIEVE SIZE OPENING (MM)		DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST OTHER OTHER		MEDIUM HARD		ROCK QUALITY DESIGNATION (R.Q.D.)	
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F, SD.) SILT (SL.) CLAY (CL.)		ADVANCING TOOLS: CLAY BITS 152 mm CONTINUOUS FLIGHT AUGER 203 mm HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE mm STEEL TEETH TRICONE mm TUNG-CARB. CORE BIT OTHER		SOFT		SAPROLITE (SAP.)	
GRAIN SIZE		HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DICER HAND AUGER SOUNDING ROD VANE SHEAR TEST OTHER		VERY SOFT		SILL	
SOIL MOISTURE - CORRELATION OF TERMS		FRACTURE SPACING		COMPLETE		SLICKENSIDE	
SOIL MOISTURE SCALE (ATTERBERG LIMITS)		TERM SPACING		ROCK HARDNESS		STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)	
FIELD MOISTURE DESCRIPTION		BEDDING		HARD		STRATA CORE RECOVERY (SREC.)	
GUIDE FOR FIELD MOISTURE DESCRIPTION		TERM THICKNESS		MODERATELY HARD		STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.)	
SATURATED - (SAT.)		VERY THICKLY BEDDED > 1 m		MEDIUM HARD		TOPSOIL (T.S.)	
WET - (W)		THICKLY BEDDED 0.5 - 1 m		SOFT		BENCH MARK: BL 328 -L- STA. 217+25, 5.8 RT.	
SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE		THINLY BEDDED 0.05 - 0.5 m		VERY SOFT		ELEVATION: 272.939 METERS	
SOLID; AT OR NEAR OPTIMUM MOISTURE		VERY THINLY BEDDED 10 - 50 mm		NOTES:			
REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		THICKLY LAMINATED 2.5 - 10 mm					
PLASTICITY		THINLY LAMINATED < 2.5 mm					
PLASTICITY INDEX (PI) DRY STRENGTH		INDURATION					
NONPLASTIC 0-5 VERY LOW		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.					
LOW PLASTICITY 6-15 SLIGHT		FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.					
MED. PLASTICITY 16-25 MEDIUM		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.					
HIGH PLASTICITY 26 OR MORE HIGH		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.					
COLOR		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.					
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL.-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.							