NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS TERMS AND DEFINITIONS SOIL DESCRIPTION GRADATION WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARS UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO 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 0.1 FOOT PER 60 BLOWS. ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. 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 AQUIFER - A WATER BEARING FORMATION OR STRATA. GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ION BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586), SOIL IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONI RENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SYAHLL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: ANGULARITY OF GRAINS ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: RGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS R HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. SUBANGULAR, SUBROUNDED, OR ROUNDED. VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL ROCK (WR) PER FOOT. MINERALOGICAL COMPOSITION SOIL LEGEND AND AASHTO CLASSIFICATION WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT GROUND SURFACE. MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GENERAL CRANIII AR MATERIAI S SILT-CLAY MATERIALS ORGANIC MATERIALS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. GNEISS, GABBRO, SCHIST, ETC CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. CLASS. (\$5% PASSING #200) (>85% PASSING *200) OMPRESSIBILITY NON-CRYSTALLINE A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM GROUP SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD A-2-4 A-2-5 A-2-6 A-2-7 A-3 A-6. A-SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 LIQUID LIMIT 31-50 DASTAL PLAIN ORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SYMBOL EDIMENTARY ROCK HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50 SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. PERCENTAGE OF MATERIAL PASSING WEATHERING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT SILT-MUCK, PEAT RANULA ROCKS OR CUTS MASSIVE ROCK. ORGANIC MATERIAL CLAY OTHER MATERIAL # 40 SOILS SOILS SOILS SOILS FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 RACE OF ORGANIC MATTER 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 5 - 12% LITTLE 10 - 20% VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, LIQUID LIMIT 10 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MI DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF SOILS WITH SOME 20 - 35% ASTIC INDE N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF HIGHLY ORGANIC >20% HICH! Y 35% AND ABOVE THE LINE OF DIP. MEASURED CLOCKWISE FROM NORTH. LITTLE OF >10% OF A CRYSTALLINE NATURE. MODERATE FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE 4 MX 8 MX 12 MX 16 MX No M GROUND WATER AMOUNTS OF SI IGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. SOILS SUAL TYPES STONE FRAGS. INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. SILTY OR CLAYEY CLAYEY ORGANIC (LLJ2) FINE FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. GRAVEL AND OF MAJOR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MATTER GRAVEL AND SAND SOILS SOILS STATIC WATER LEVEL AFTER 24 HOURS. ATERIALS SAND SIGNIFICANT PORTIONS OF BOCK SHOW DISCOLORATION AND WEATHERING FEFECTS. IN MODERATE FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM GEN, RATINO GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS **∇**PW (MOD.) PARENT MATERIAL. FAIR TO PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA POOR AS A EXCELLENT TO GOOD FAIR TO POOR JNSUITABI DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED POOR FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY O-W-SPRING OR SEEPAGE P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > 1 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL MODERATELY MISCELLANEOUS SYMBOLS AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN CONSISTENCY OR DENSENESS RANGE OF UNCONFINED (MOD, SEV.) COMPACTNESS OR ROADWAY EMBANKMENT DPT DMT TEST BORING ENETRATION RESISTENCE COMPRESSIVE STRENGTH (TONS/FT2) IF TESTED. WOULD YIELD SPT REFUSAL PRIMARY SOIL TYPE JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. CONSISTENCY WITH SOIL DESCRIPTION (N-VALUE) DESIGNATIONS ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCE SEVERE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO VERY LOOSE IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELOSPARS ARE KAOLINIZED TO SOME AUGER BORING TS LATERAL EXTENT. - SOIL SYMBOL S- BULK SAMPLE EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. LOOSE 4 TO 10 GRANULAR LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. N/A MEDIUM DENSE IF TESTED, YIELDS SPT N VALUES > 100 BPF ARTIFICIAL FILL OTHER THAN SS- SPLIT SPOON MATERIAL CORE BORING MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN DENSE 30 TO 50 ROADWAY EMBANKMENTS SAMPLE VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT (NON-COHESIVE) VERY DENSE OILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. ST- SHELBY TUBE THE MASS IS FEFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK INFERRED SOIL BOUNDARIES REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN VERY SOF W, MONITORING WELL ITERVENING IMPERVIOUS STRATUM. GENERALLY 2 TO 4 VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF RS- ROCK SAMPLE 0.25 TO 0.5 TIFETTE INFERRED ROCK LINE PIEZOMETER MEDIUM STIFF STI T-CL AY 4 TO 8 Ø.5 TO 1 ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. Δ COMPLETE 8 TO 15 INSTALLATION RT- RECOMPACTED MATERIAL 1 TO 2 TT--- ALLUVIAL SOIL BOUNDARY SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND VERY STIFF (COHESIVE) 15 TO 30 2 TO 4 TRIAXIAL SAMPLE SLOPE INDICATOR ALSO AN EXAMPLE. \bigcirc DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE ROCK HARDNESS EXPRESSED AS A PERCENTAGE. ROCK STRUCTURES TEXTURE OR GRAIN SIZ \bigcirc SPT N-VALUE SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SOUNDING ROD SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK I.S. STD. SIEVE SIZE (REF)--SPT REFUSAL SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND PENING (MM) 4.76 2.0 0.42 0.25 0.075 0.053 **ABBREVIATIONS** HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL COARSE TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS COBBLE GRAVEL AR - ALIGER REFLISAL PMT - PRESSUREMETER TEST MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE LICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR (BLDR.) (COB.) (GR.) (SL.) (CL.) BT - BORING TERMINATED SD. - SAND, SANDY (CSE, SD.) EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED SL. - SILT, SILTY SLI. - SLIGHTLY · CL AY BY MODERATE BLOWS. 2.0 0.25 0.05 0.005 STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION CPT - CONE PENETRATION TEST SIZE IN. 12° MEDIUM CAN BE GROOVED OR GOLIGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFF OR PICK POINT. CSE. - COARSE DMT - DILATOMETER TEST TCR - TRICONE REFUSAL CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE HARD SOIL MOISTURE - CORRELATION OF TERMS γ - UNIT WEIGHT POINT OF A GEOLOGISTS PICK. DPT - DYNAMIC PENETRATION TEST SOIL MOISTURE SCALE 7d - DRY UNIT WEIGHT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS GUIDE FOR FIELD MOISTURE DESCRIPTION SOFT e - VOID RATIO STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. (ATTERBERG LIMITS W - MOISTURE CONTENT FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. FOSS. - FOSSILIFEROUS V. - VERY SATURATED USUALLY LIQUID: VERY WET, USUALLY TRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: FRAC. - FRACTURED VST - VANE SHEAR TEST CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED Y THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. FRAGS. - FRAGMENTS OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY LIQUID LIMIT MED. - MEDIUM FINGERNAIL. LASTIC SEMISOLID; REQUIRES DRYING TO TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. EQUIPMENT USED ON SUBJECT PROJECT RANGE - WET - (W) FRACTURE SPACING ATTAIN OPTIMUM MOISTURE (PI) TERM THICKNESS PLASTIC LIMIT BENCH MARK: T-6 STA. 12+25.60 -T- REBAR & CAP SET TERM SPACING HAMMER TYPE: ADVANCING TOOLS: DRILL UNITS: VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET AUTOMATIC X MANUAL THICKLY BEDDED OPTIMUM MOISTURE - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE 1.5 - 4 FEET 3 TO 10 FEET CLAY BITS ELEVATION: 534.80' 0.16 - 1.5 FEET MOBILE B-___ THINLY BEDDED SHRINKAGE LIMIT MODERATELY CLOSE 1 TO 3 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET X 6 CONTINUOUS FLIGHT AUGER CORE SIZE: * ADDITIONAL BORINGS SUBMITTED WITH STRUCTURE REPORT REQUIRES ADDITIONAL WATER TO 0.008 - 0.03 FEET THICKLY LAMINATED BK-51 - DRY - (D) VERY CLOSE LESS THAN 0.16 FEET ATTAIN OPTIMUM MOISTURE 8" HOLLOW AUGERS THINLY LAMINATED < 0.008 FFFT -B_ PLASTICITY HARD FACED FINGER BITS CME-45 X -N Q2 FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI) DRY STRENGTH TUNG.-CARBIDE INSERTS П-н____ RUBBING WITH FINGER FREES NUMEROUS GRAINS VERY LOW NONPLASTIC CMF-550 0-5 FRIABLE X CASING W/ ADVANCER SLIGHT. GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE, LOW PLASTICITY HAND TOOLS: MEDIUM MED. PLASTICITY 16-25 PORTABLE HOIST GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: TRICONE STEEL TEETH POST HOLE DIGGER MODERATELY INDURATED HIGH HIGH PLASTICITY 26 OR MORE BREAKS EASILY WHEN HIT WITH HAMME TRICONE HAND ALIGER X OTHER RC TRACK GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: INDURATED SOUNDING ROD X CORE BIT DIFFICULT TO BREAK WITH HAMMER. DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YEL-BRN. BLUE-GRAY) VANE SHEAR TEST OTHER OTHER SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. EXTREMELY INDURATED OTHER SAMPLE BREAKS ACROSS GRAINS.

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