

TYPICAL CONDUIT INSTALLATION FOR PVC ENCASED MAJOR CONDUIT LINE

DETAIL #18

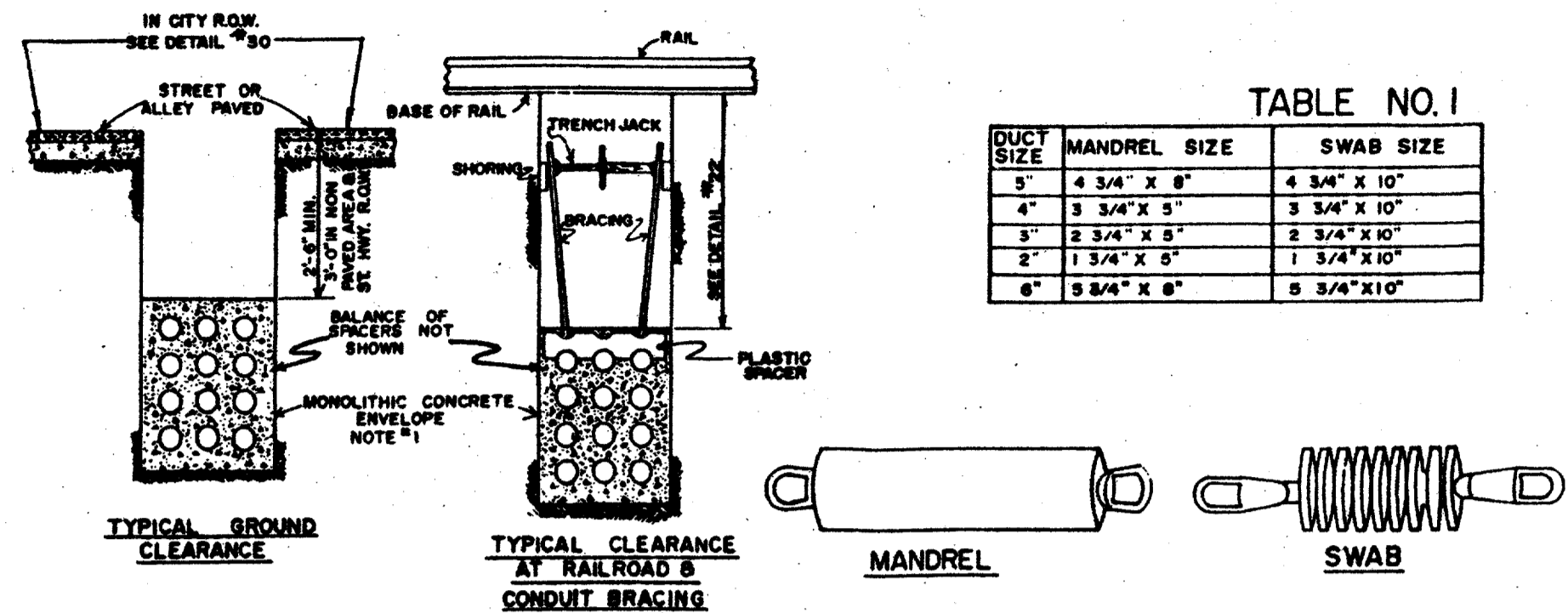
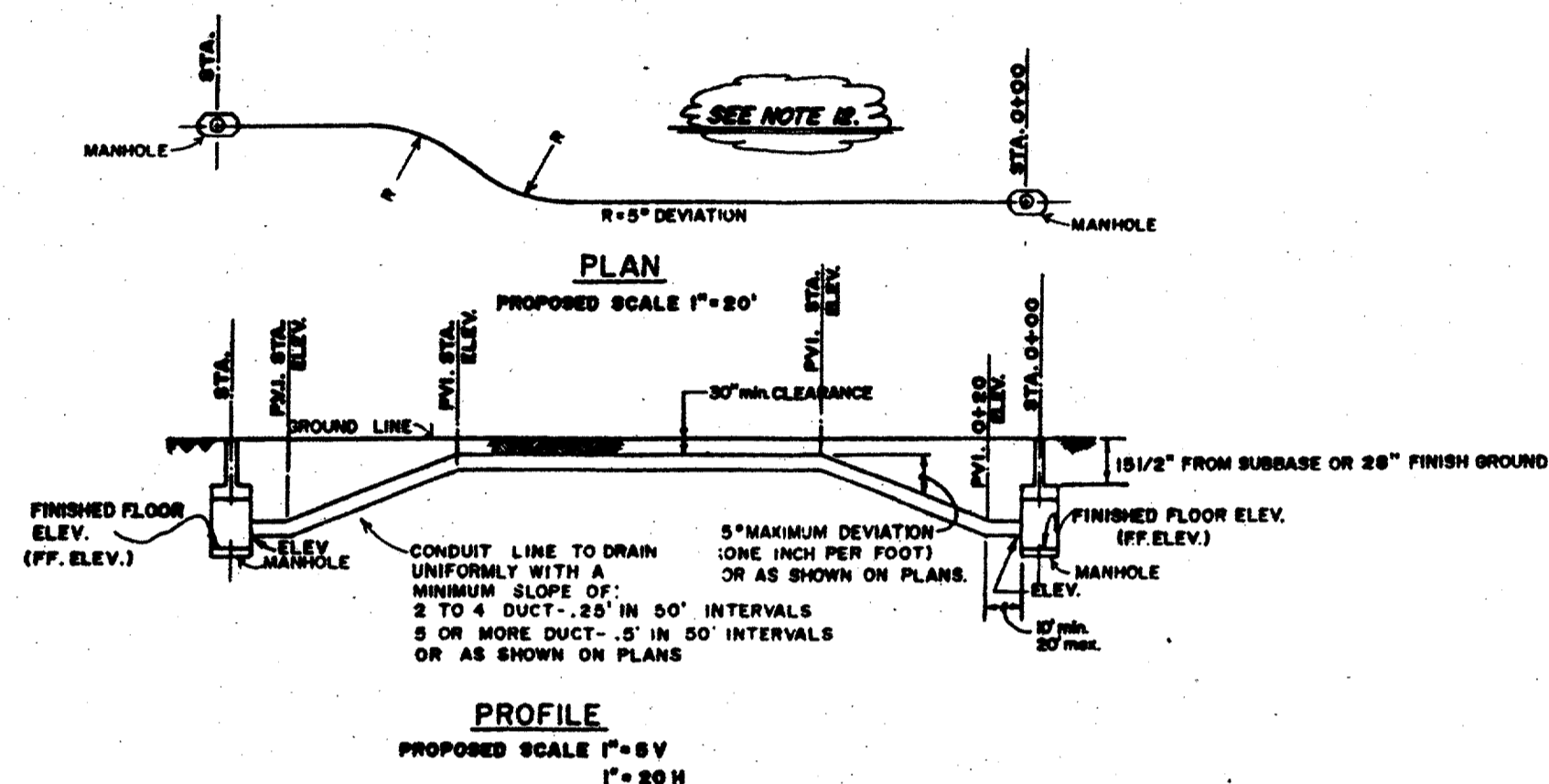


TABLE NO. 1

DUCT SIZE	MANDREL SIZE	SWAB SIZE
5"	4 3/4" X 8"	4 3/4" X 10"
4"	3 3/4" X 8"	3 3/4" X 10"
3"	2 3/4" X 8"	2 3/4" X 10"
2"	1 3/4" X 8"	1 3/4" X 10"
6"	5 3/4" X 8"	5 3/4" X 10"



NOTES:

- ALL SECTIONS OF THE CONDUIT WILL BE RUN IN A STRAIGHT LINE AS CONDITIONS WILL PERMIT. DEVIATIONS WILL BE LAID OUT BY THE POWER COMPANY ENGINEER.
- THE CONDUIT & FITTINGS WILL BE COATED LIBERALLY WITH PVC CEMENT, PUSH CONDUIT AND FITTING TOGETHER UNTIL CONDUIT BUTTS AGAINST FITTING SHOULDER. TWIST CONDUIT 1/4 TURN TO ASSURE SMOOTH SPREADING OF CEMENT. MINIMUM MIN. COVER TO BE 50\"/>

SECTIONS OF TYPICAL FORMATION

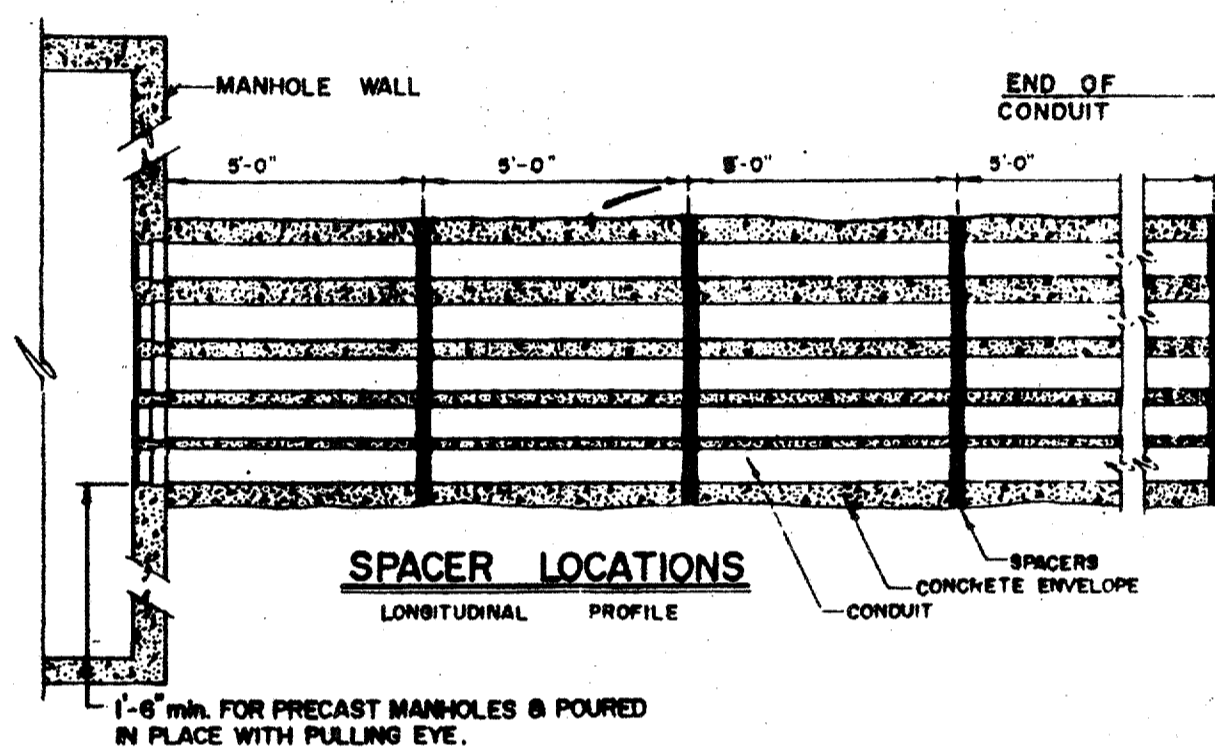
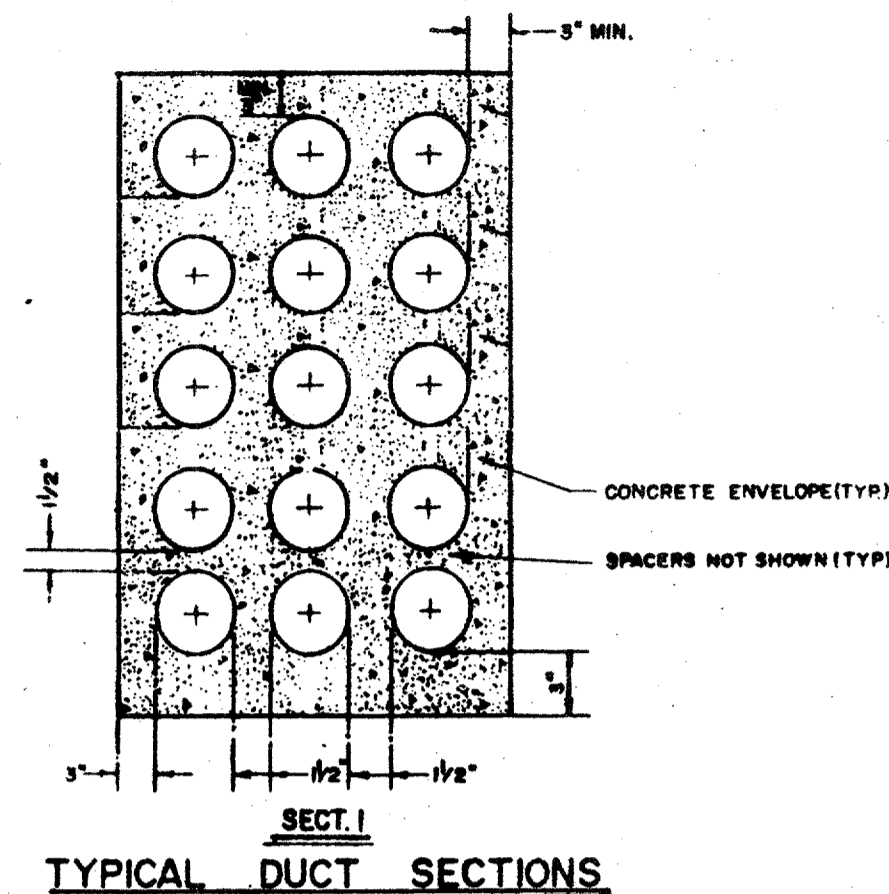


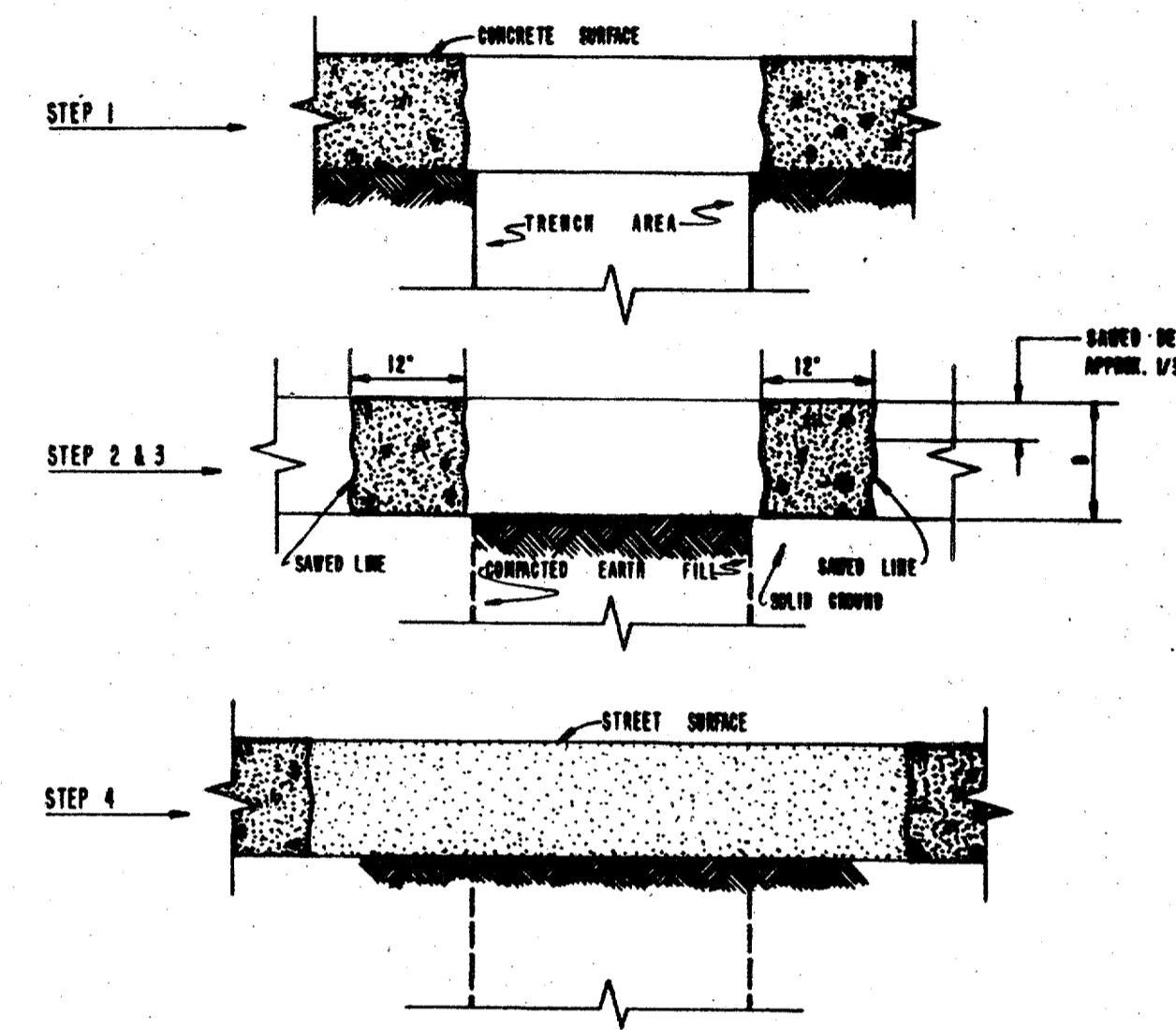
TABLE 2

CONDUIT SIZE	OUTSIDE DIAMETER	TYPE
2"	2.38"	PVC
3"	3.50"	PVC
4"	4.50"	PVC
5"	5.50"	PVC
6"	6.50"	PVC
PVC CEMENT		

DETAIL #20

SEQUENCE OF CONSTRUCTION

- SUFFICIENT CONCRETE WILL BE REMOVED TO PERMIT TRENCH EXCAVATION.
- UPON COMPLETION OF THE INSTALLATION OF THE CONDUIT LINE, THE TRENCH WILL BE BACKFILLED AND COMPACTED TO THE REQUIRED DENSITY UP TO THE BASE OF PAVEMENT.
- THE CONCRETE PAVEMENT WILL BE SAVED TO A DEPTH OF APPROXIMATELY ONE THIRD OF THE DEPTH OF PAVEMENT PARALLEL TO THE LINE OF TRENCH ONE FOOT BACK OF SOLID GROUND. PAVING BREAKERS CAN THEN BE USED TO BREAK THE EXCESS CONCRETE.
- THE EXPOSED EDGES OF THE CONCRETE WILL BE CLEANED SO A GOOD BOND CAN BE OBTAINED WHEN VOID IS FILLED.



NOTE: ASPHALT DRIVING SURFACES;  
SEQUENCE OF CONSTRUCTION ON CONCRETE STREETS WITH ASPHALT DRIVING SURFACES WILL BE THE SAME AS SEQUENCE, EXCEPT STEP 3, THE ASPHALT WILL BE CUT IN A STRAIGHT LINE USING METHODS ACCEPTABLE WITH THE CITY SPECIFICATIONS. SAWING OF THE CONCRETE WILL NOT BE REQUIRED.

STREET BREAKING AND REPLACEMENT DETAILS

DETAIL #19  
CONCRETE SPECIFICATION

I. GENERAL

THESE SPECIFICATIONS APPLY TO MANHOLE, VAULT, AND DUCT LINE CONSTRUCTION ON THE UNDERGROUND SYSTEMS IN THE DOWNTOWN NETWORK. THE CONCRETE SHALL BE OF ONE OF THE CLASSES SPECIFIED ON THE DRAWINGS FOR THE TYPE OF WORK UNDER CONSTRUCTION. THE RATIO OF SAND TO GRAVEL SHALL BE USED SO AS TO OBTAIN AS DENSE AND ECONOMICAL CONCRETE AS POSSIBLE WITH THE MATERIALS AVAILABLE AND FOR THE CLASS OF WORK UNDER CONSTRUCTION. BUT IN NO CASE SHALL THE RATIO OF CEMENT TO THE DRY CONTENTS BE LESS THAN THE CLASS OF CONCRETE SPECIFIED.

II. SPECIFICATIONS FOR MATERIALS

- CEMENT:** THE CEMENT SHALL CONFORM TO "STANDARD SPECIFICATIONS FOR PORTLAND CEMENT" ASTM C-150 FOR TYPE I NORMAL PORTLAND CEMENT AND TYPE III, HIGH-EARLY-STRENGTH PORTLAND CEMENT. THE CEMENT SHALL BE PROPERLY PROTECTED FROM THE WEATHER UNTIL USED AND SHALL BE DRY AND FREE FROM LUMPS WHEN PLACED IN THE MIXER.
- SAND:** THE SAND SHALL CONSIST OF HARD SILICEOUS MATERIAL, FREE FROM VEGETABLE MATTER, ORGANIC MATTER, OR SURFACE COATING, THAT IS INHABITOUS TO CONCRETE. THE GRAINS SHALL BE GRADDED IN SIZE FROM ONE-FOURTH (1/4) INCH DOWN, WITH NOT MORE THAN TWENTY-FIVE PER CENT BY WEIGHT UNDER NO. 20 AND NOODER, PASSING A 20 MESH PER LINEAL FOOT SIEVE, AND NOT MORE THAN FIVE PER CENT PASSING A 100 MESH PER LINEAL FOOT SIEVE. THREE PER CENT BY WEIGHT OF CLAY OR LOAM, OR A COMBINATION OF THE TWO, WILL BE PERMITTED PROVIDED THEY ARE WELL PULVERIZED AND DISTRIBUTED THROUGHOUT THE MIX. THE FINERNESS MODULUS SHALL NOT BE LESS THAN 2.5 AND NOT MORE THAN 3.0.
- GRAVEL:** THE GRAVEL SHALL CONSIST OF CLEAN, HARD, TIGHT STONES FREE FROM VEGETABLE MATTER, ORGANIC MATTER, OR SURFACE COATING, RANGING IN SIZE FROM ONE-HALF (1/2) INCH DOWN, BUT NOT MORE THAN FIVE PER CENT BY WEIGHT UNDER NO. 20 AND NOODER, PASSING A SCREEN HAVING FOUR MESHES PER LINEAL FOOT AND NO INTERMEDIATE SIZES SHALL BE REMOVED.
- CONDUIT GRAVEL:** THE GRAVEL SHALL CONSIST OF CLEAN, TIGHT STONES, FREE FROM VEGETABLE MATTER, ORGANIC MATTER, OR SURFACE COATING, RANGING IN SIZE FROM ONE-HALF (1/2) INCH DOWN, BUT NOT MORE THAN FIVE PER CENT BY WEIGHT UNDER NO. 20 AND NOODER, PASSING A SCREEN HAVING FOUR MESHES PER LINEAL FOOT AND NO INTERMEDIATE SIZES SHALL BE REMOVED.
- WATER:** THE WATER USED FOR MIXING OR SPRINKLING CONCRETE SHALL BE CLEAN AND FREE FROM EARTH, SILT, ALKALI, SALT, OR OTHER DETRIMENTAL IMPURITIES. WHEN POSSIBLE CITY WATER WILL BE USED.
- STEEL:** METAL REINFORCEMENT BEFORE BEING PLACED SHALL BE FREE FROM LARGE RUST SCALE, GREASE, CLAY OR OTHER COATINGS THAT WILL DESTROY OR REDUCE THE BOND. THE STEEL SHALL CONFORM TO THE LATEST EDITION OF "SPECIFICATION FOR DEFORMED WIRE-STEEL BARS FOR CONCRETE REINFORCEMENT" (ASTM A-615.)

III. FIELD TEST FOR MATERIALS

FIELD TESTS SHALL BE MADE AS OFTEN AS IS NECESSARY TO INSURE THE MATERIALS CONFORMING TO THE FOREGOING SPECIFICATIONS. THE METHOD OF MAKING THESE TESTS SHALL BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE AMERICAN SOCIETY FOR TESTING MATERIALS FOR CONCRETE AND CONCRETE AGGREGATES.

IV. CLASSES OF CONCRETE AND MIX DESIGN

A. TABLE 1	A	B	C
CLASS OF CONCRETE:	2000 psi	3000 psi	3000 psi
WATER CONTENT (INCLUDING FREE SURFACE MOISTURE)			
RATIO OF WATER TO CEMENT BY WEIGHT	.60	.58	.58
BALLONS PER SACK	7.5	6.5	6.5
MINIMUM CEMENT CONTENT POUNDS PER CUBIC YARD	275	320	320
SACKS PER CUBIC YARD	6	5.5	5.5
TYPE CEMENT	I	I	III (HIGH EARLY)
ALLOWABLE SLUMP	5"-6"	4"-5"	5"-6"
MINIMUM FINE AGGREGATE CONTENT	405	395	375
MINIMUM AGGREGATE SIZE	1/2"	1 1/2"	1 1/2"

- FOR DUCT LINE INSTALLATION USE CLASS A (2000psi) CONCRETE, OR AS SPECIFIED ON PLANS.
- FOR MANHOLE AND VAULT INSTALLATIONS USE CLASS B (3000psi) CONCRETE.
- FOR STREET WALK REPAIR USE CLASS C (3000psi) CONCRETE.

D. READY-MIX CONCRETE SHALL BE MIXED AND DELIVERED IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN THE LATEST EDITION OF "SPECIFICATIONS FOR READY-MIX CONCRETE" ASTM C-94.

C. CONCRETE MADE BY VOLMETRIC BATCHING AND CONTINUOUS MIXING SHALL CONFORM TO THE REQUIREMENTS SET FORTH IN THE LATEST EDITION OF "SPECIFICATIONS FOR CONCRETE MADE BY VOLMETRIC BATCHING AND CONTINUOUS MIXING" ASTM C-495.

D. ALL CONCRETE SHALL BE PLACED WITHIN ONE HOUR AFTER MIXING.

V. DESIGN AND MIXING OF MORTAR AND CONCRETE MORTAR MIXES

- MORTAR DESIGN:** MORTAR SHALL BE COMPOSED OF ONE PART TYPE I PORTLAND CEMENT TO 2 3/4 PARTS GRADED STANDARD SAND BY VOLUME. THE SAND SHOULD NOT BE EXCESSIVELY WET OR ENTIRELY DRY WHEN MEASURED.
- CONCRETE MORTAR MIX DESIGN FOR SMALL JOBS:** THE FOLLOWING RATIOS REFER TO THE VOLUMES, RESPECTIVELY, OF CEMENT, SAND, AND AGGREGATE TO BE USED FOR EACH MIX.
  - (1:1:2 1/4) FOR USE WITH MAXIMUM AGGREGATE SIZE OF 1/2".
  - (1:1:2 1/8) FOR USE WITH MAXIMUM AGGREGATE SIZE OF 1 1/2".
- MIXING OF CONCRETE:** THE CEMENT AND NATURAL MIXED AGGREGATE SHALL BE MEASURED IN SUITABLE CONTAINERS. THE MIXTURES SHALL BE PROPORTIONED BY VOLUME, EACH ITEM BEING MEASURED, LOOSE AND SEPARATELY. IF MACHINE MIXED IN A ROTARY TYPE BATCH MIXER, THE SPEED OF THE OUTSIDE EDGE OF THE DRUM SHALL BE ABOUT 120 FEET PER MINUTE. DRY MIX THE CEMENT AND AGGREGATES UNTIL OF UNIFORM MIXTURE. WATER SHALL THEN BE ADDED UNTIL A WORKABLE MIXTURE IS PRODUCED. EACH BATCH OF CONCRETE SHOULD BE USED IMMEDIATELY AFTER MIXING.
- MIXING OF MORTAR:** THE CEMENT AND SAND SHALL BE MIXED DRY UNTIL OF UNIFORM COLOR. WATER SHOULD THEN BE ADDED AND THE MIXTURE TURNED UNTIL IT FORMS A UNIFORM AND WORKABLE PASTE. EACH BATCH OF MORTAR SHOULD BE USED IMMEDIATELY AFTER MIXING.

VI. PLACING OF CONCRETE

- DUCT LINES:** THE CONCRETE FOR CONDUIT LINES SHALL BE PLACED MONOLITHICALLY IMMEDIATELY AFTER MIXING. THE CONCRETE WILL BE SO TAMPED OR PULDED SO AS TO MAKE A DENSE CONCRETE ENVELOPE AROUND THE DUCTS. IF NECESSARY TO JOIN A NEW CONDUIT LINE ONTO ONE IN WHICH THE CONCRETE HAS SET, THE OLD SURFACE SHALL BE CLEANED, ROUNDED AND WETTED.
- MANHOLES AND TRANSFORMER VAULTS:** THE CONCRETE FOR MANHOLES AND VAULTS SHALL BE PLACED IMMEDIATELY AFTER MIXING. THE CONCRETE SHALL BE PLACED SO AS TO KEEP THE SURFACE OF THE CONCRETE LEVEL TO PREVENT ANY FLOWING OF THE CONCRETE IN THE FORMS. THE CONCRETE SHALL BE CONTINUOUSLY SPADED TO EXPEL AIR BUBBLES. THE TOP OF THE WALLS SHALL BE WELL CLIPPED, ROUNDED AND WETTED IMMEDIATELY BEFORE POURING THE ROOF SLAB.
- STREET PAVEMENT:** SEE DETAIL #20

VII. PROTECTION OF FRESH CONCRETE

CONCRETE SHALL BE KEPT MOIST BY SPRINKLING WITH WATER FOR A PERIOD SUITABLE TO THE CONTRACTOR OF THE STRUCTURE. WALKING OR WORKING OVER FINISHED SURFACES SHALL NOT BE PERMITTED UNTIL SAND HAS SUFFICIENTLY SET. FINISHED STREET SURFACES SHALL BE WELL AND PROTECTED FOR AT LEAST FORTY-EIGHT HOURS AFTER PLACEMENT. FORMS AND BRACINGS FOR WALLS OF MANHOLES AND TRANSFORMER VAULTS SHALL NOT BE DISTURBED DURING THE FIRST THIRTY-SIX HOURS AFTER CONCRETE HAS BEEN PLACED. FORMS AND BRACINGS FOR ROOFS OF MANHOLES AND TRANSFORMER VAULTS SHALL NOT BE REMOVED FOR AT LEAST SEVEN DAYS AFTER CONCRETE HAS BEEN PLACED.

VIII. FINISH

UNLESS ESPECIALLY CALLED FOR, NO WORK IS TO BE DONE BY WAY OF FINISHING CONCRETE TO SURFACES AFTER THE FORMS ARE REMOVED, EXCEPT THAT SERIOUS FAULTS IN THE CONCRETE SURFACE SHALL BE CHISELED OUT AND POCKET FORMED AND FILLED WITH CEMENT MORTAR IN SUCH A MANNER THAT THE PATCH IS SECURELY KEPT INTO THE CONCRETE SURFACE.

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SCALE (H=NO SCALE) (V=NO SCALE)	LIST OF DRAWINGS	W.A.	ESTIMATE	UNIT ID	DWG TYPE	REVISION DESCRIPTION	DATE	NO.	APP. PRN	APP. JES	APP. JRC	CH. JRC	OWN. MED	DATE 05-12-92
	NETWORK UNDERGROUND APPURTENANCE SHEETS MISCELLANEOUS DETAILS													

E-NUA-1  
SHEET NO. 8