

TYPICAL CONDUIT INSTALLATION FOR PVC ENCASED MAJOR CONDUIT LINE

DETAIL #18

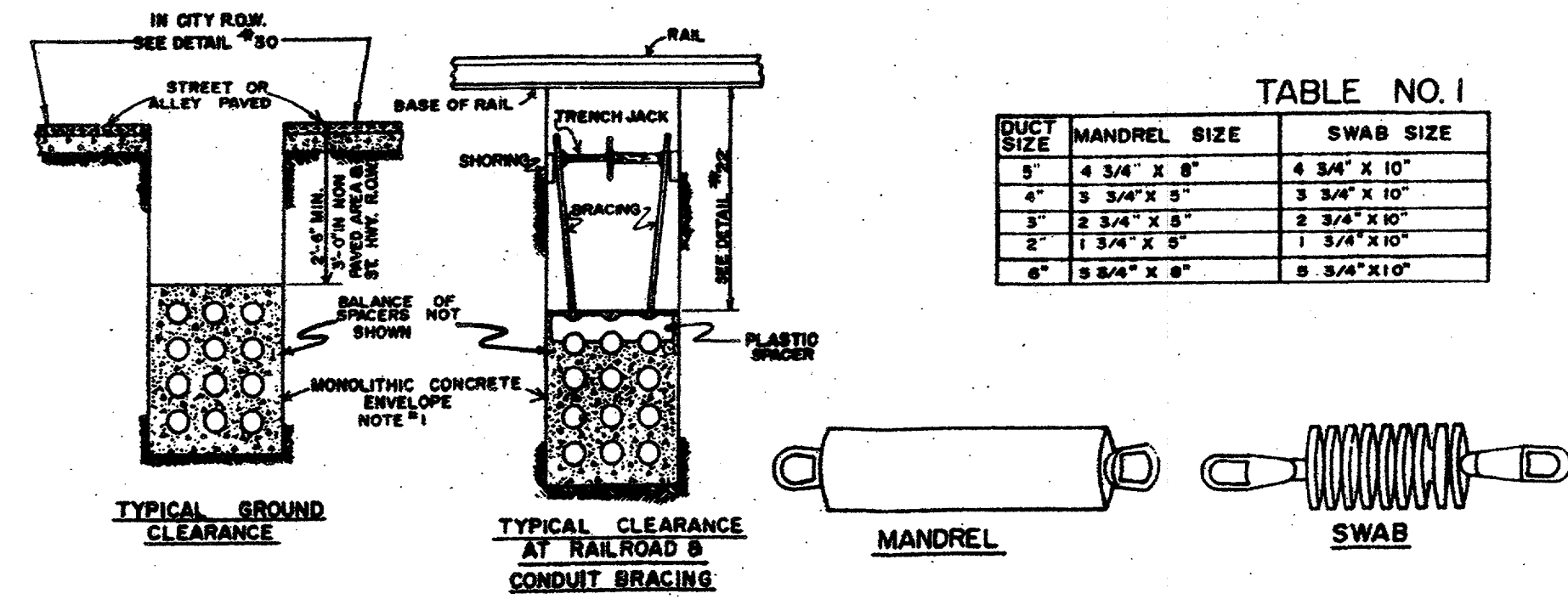


TABLE NO. 1

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

SECTIONS OF TYPICAL FORMATION

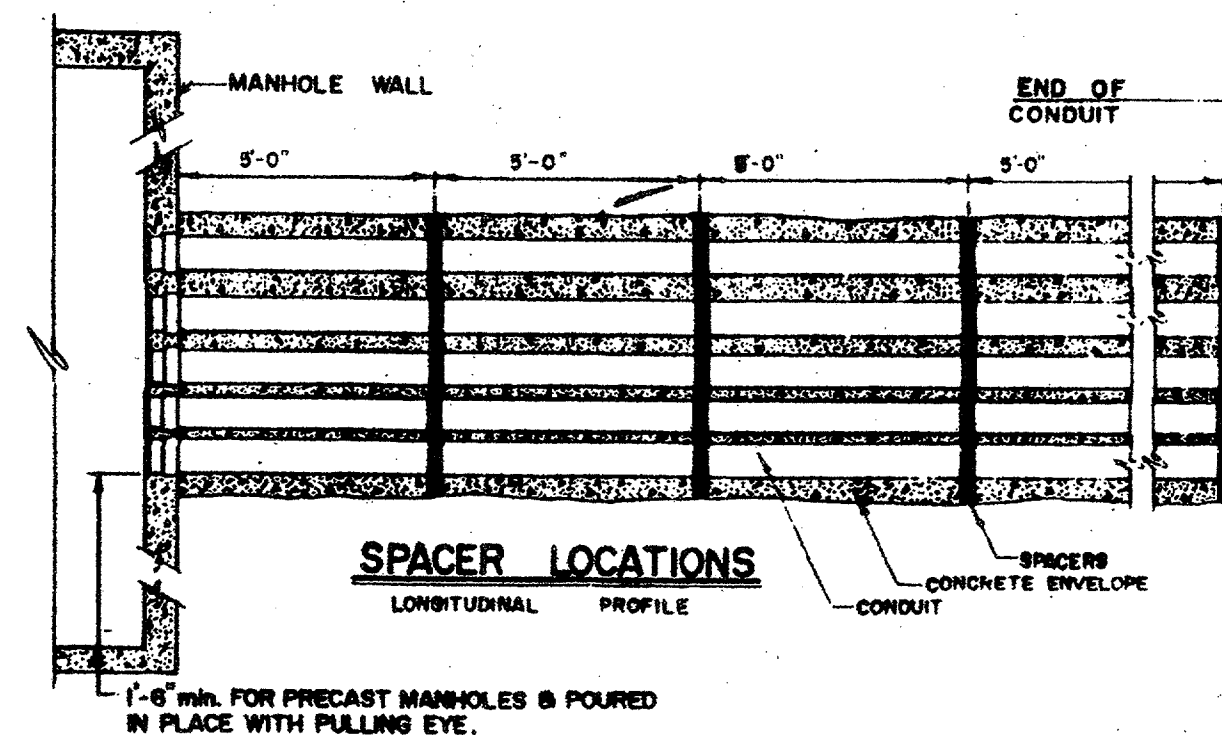
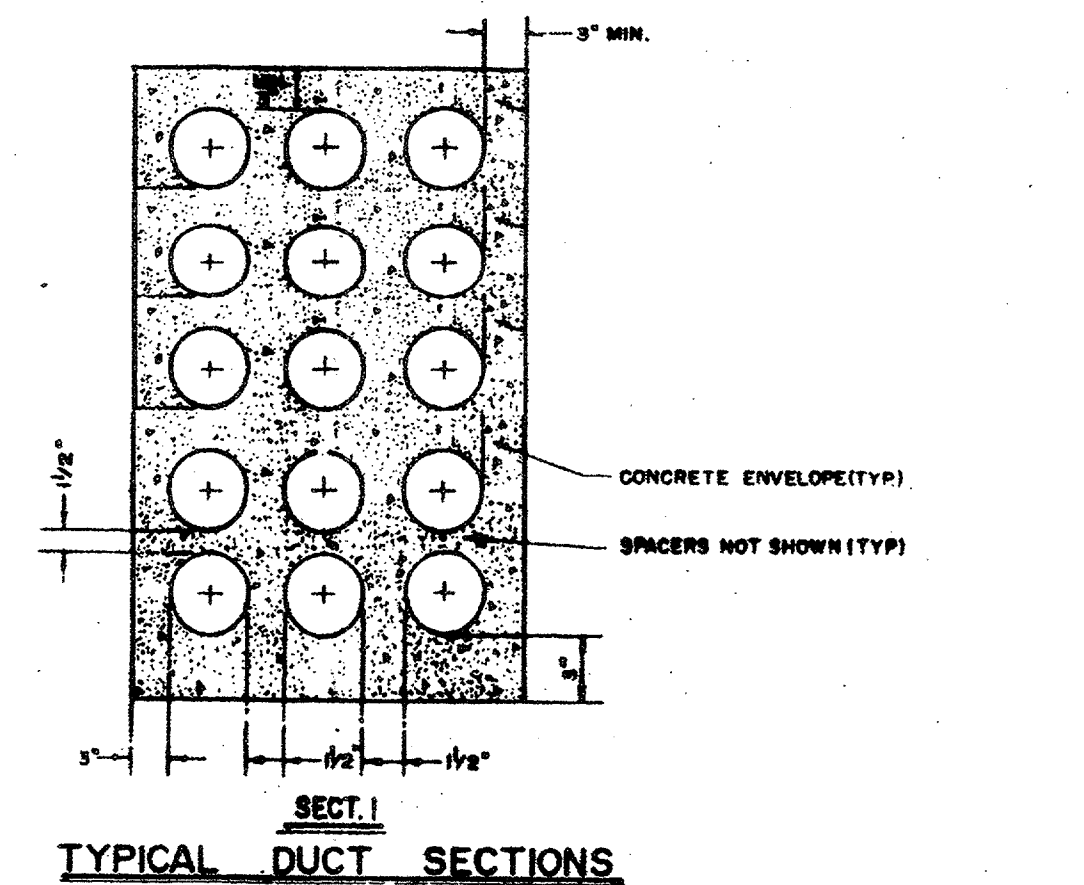
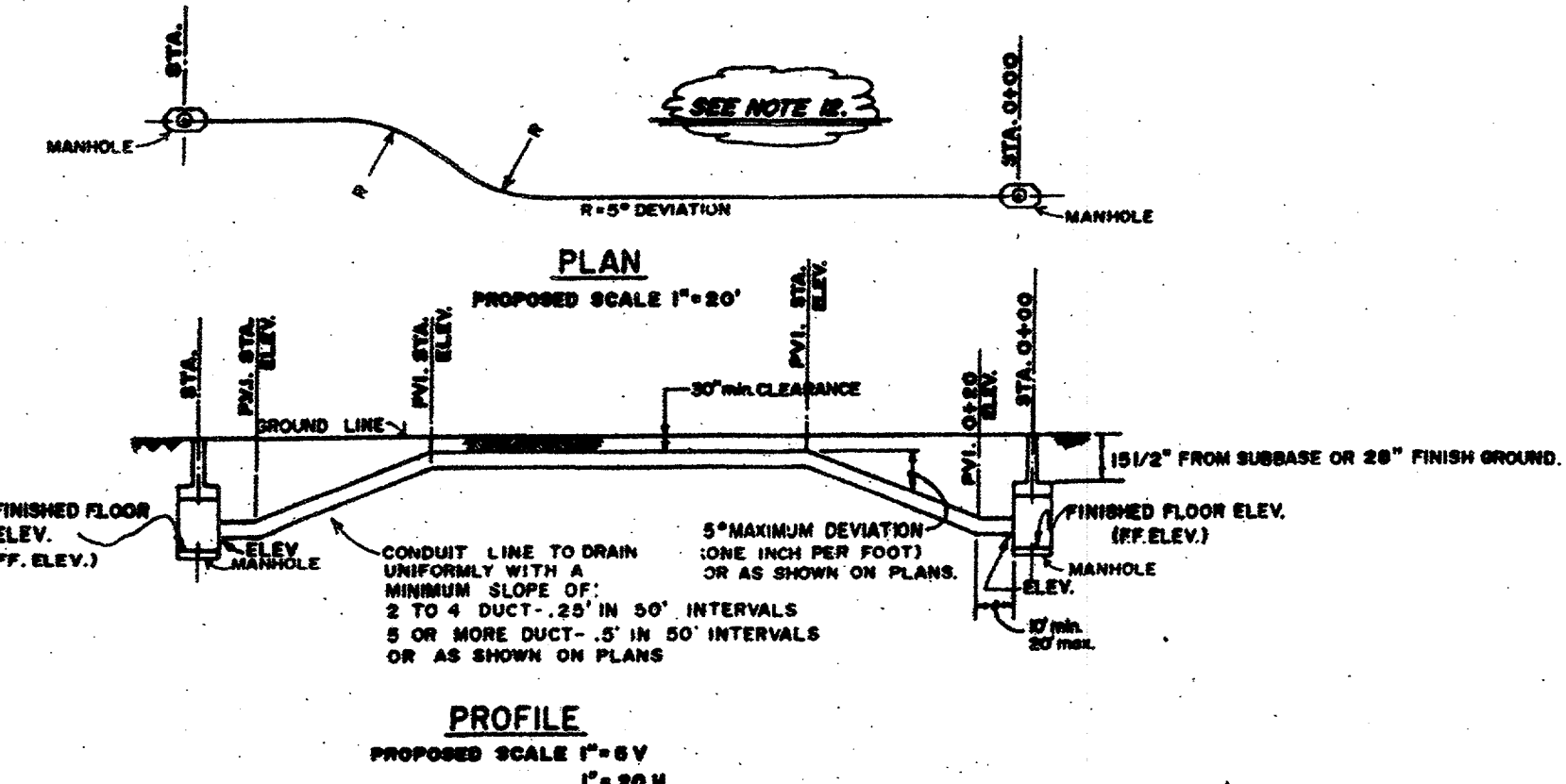


TABLE 2

CONDUIT SIZE	OUTSIDE DIAMETER	TYPE
2"	2.56"	PVC
3"	3.56"	PVC
4"	4.50"	PVC
5"	5.56"	PVC
6"	6.56"	PVC
PVC CEMENT		



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 IN TURN TO ASSURE SMOOTH SPREADING OF CEMENT. NORMAL MIN. COVER TO BE 30".
- WHEN COMPLETE, EACH CONDUIT OF A MAIN DUCT LINE WILL HAVE A MANDREL AND SWAB PULLED THROUGH THE ENTIRE LENGTH OF EACH CONDUIT OF A LATERAL LINE WILL HAVE A SWAB PULLED THROUGH THE ENTIRE LENGTH TO CHECK FOR BLOCKAGES OR OTHER UNDESIRABLE CONDITIONS. SEE TABLE NO. 1 FOR MANDREL AND SWAB SIZE FOR CORRESPONDING CONDUIT SIZE.
- ALL DITCH CUTS WILL BE IN ACCORDANCE WITH EXISTING SAFETY REGULATIONS IN EFFECT.
- ALL CONDUIT RUN ON L.V. & STATE HWY. R.O.W. WILL REQUIRE A MINIMUM OF 6" CONCRETE COVER FROM THE UPPERMOST DUCT, AND MIN. 30" COVER FROM FINISH GRADE.
- SEE PLANS FOR CONDUIT ARRANGEMENT.
- FOR NUMBER, FORMATION, AND SIZE OF CONDUITS SEE JOB PLANS.
- HIGH EARLY STRENGTH CEMENT PROHIBITED.
- SHOW DITCH ELEVATION @ 50' INTERVALS & EACH GRADE CHANGE AND AT MANHOLE ENTRANCE.
- SHOW MANHOLE FINISH FLOOR ELEVATION.
- ALL CONDUIT TO BE TYPE C OR UNLESS OTHERWISE NOTED ON PLANS.
- STATION EVERY 100' IN PLAN VIEW AND EVERY 50' WITH ELEVATION IN PROFILE PLUS STATION AND ELEVATION AT EACH GRADE CHANGE.

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 IN THE DRAWINGS FOR THE TYPE OF WORK UNDER CONSTRUCTION. THE RATIO OF SAND TO CEMENT SHALL BE USED 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 INERT 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, 100% PASSING 48 MESH AND NOT MORE THAN FIFTY-FIVE PER CENT BY WEIGHT UNDER NO. 100 MESH. THREE PER CENT BY WEIGHT OF CLAY OR LOAM, OR A COMBINATION OF THE TWO, WILL BE PERMITTED PROVIDED THEY ARE WELL FULFILLING AND DISTRIBUTED THROUGHOUT THE MIX. THE FINENESS 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, SANDING IN SIZE FROM ONE & ONE HALF INCH DOWN, NOT MORE THAN FIVE PER CENT BY WEIGHT WHEN DRY AND MOIST, PASSING A SCREEN HAVING FOUR MESHES PER LINEAL INCH 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, SANDING IN SIZE FROM ONE-HALF INCH DOWN, NOT MORE THAN FIVE PER CENT BY WEIGHT WHEN DRY AND MOIST, PASSING A SCREEN HAVING FOUR MESHES PER LINEAL INCH AND NO INTERMEDIATE SIZES SHALL BE REMOVED.
- WATER:** THE WATER USED FOR MIXING OR SPRINKLING CONCRETE SHALL BE CLEAN AND FREE FROM EARTH, SALT, ALKALI, OIL, OR OTHER DETRIMENTAL IMPURITIES. WHEN POSSIBLE CITY WATER WILL BE USED.
- STEEL:** METAL REINFORCEMENT BEFORE BEING PLACED SHALL BE FREE FROM LOOSE RUST SCALE, OIL, GREASE, CLAY OR OTHER COATINGS THAT WILL DESTROY OR WEAR THE DOWN. THE STEEL SHALL CONFORM TO THE LATEST EDITION OF "SPECIFICATION FOR DEFORMED BILLET-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

CLASS OF CONCRETE:	A	B	C
2000 psi	2000 psi	2000 psi	2000 psi
WATER CONTENT (INCLUDING FREE SURFACE MOISTURE) RATIO OF WATER TO CEMENT BY WEIGHT	.58	.58	.58
WATER CONTENT RATIO OF WATER TO CEMENT BY WEIGHT PER BAG	7.5	6.5	6.5
MINIMUM CEMENT CONTENT POUNDS PER CUBIC YARD	375	320	320
SACKS PER CUBIC YARD	5	4.5	4.5
TYPE CEMENT	I	I	III (HIGH EARLY)
ALLOWABLE SLUMP	6"-4"	4"-5"	5"-4"
MINIMUM FINE AGGREGATE CONTENT	40%	39%	37%
MINIMUM AGGREGATE SIZE	1/2"	1 1/2"	1 1/2"

NOTE:

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

V. DESIGN AND MIXING OF MORTAR AND CONCRETE MEND 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 MEND MIX DESIGN FOR SMALL JOBS:** THE FOLLOWING NUMBERS REFER TO THE VOLUMES, RESPECTIVELY, OF CEMENT, SAND, AND AGGREGATE TO BE USED FOR EACH MIX.
 - (1:1 1/2:1 1/2) FOR USE WITH MAXIMUM AGGREGATE SIZE OF 1/2".
 - (1:1 1/2:1 1/2) FOR USE WITH MAXIMUM AGGREGATE SIZE OF 1 1/2".
- MIXING OF CONCRETE:** THE CEMENT AND INITIAL MIXED AGGREGATE SHALL BE MEASURED IN SUITABLE CONTAINERS. THE MIXTURES SHALL BE PROPORTIONED BY VOLUME, EACH 17CM BEING MEASURED, LOOSE AND SEPARATELY. IF MACHINE MIXED IN A ROTARY TYPE MIXER, THE SPEED OF THE OUTSIDE EDGE OF THE DRUM SHALL BE ABOUT 120 FEET PER MINUTE. DO NOT MIX THE CEMENT AND AGGREGATES UNTIL OF UNIFORM MIXTURE. WATER SHALL 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 UNTIL OF UNIFORM COLOR. WATER SHOULD THEN BE ADDED AND THE MIXTURE TUNED 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 DRIB A NEW CONDUIT LINE INTO ONE IN WHICH THE CONCRETE HAS SET, THE OLD SURFACE SHALL BE CLEANED, DAMPENED 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 SPREAD TO EXCEL AIR BUBBLES. THE TOP OF THE WALLS SHALL BE WELL CLEARED, MOISTENED AND WETTED IMMEDIATELY BEFORE FINISHING THE ROOF SLAB.
- STREET PAVEMENT:** SEE DETAIL #20

VII. PROTECTION OF FRESH CONCRETE

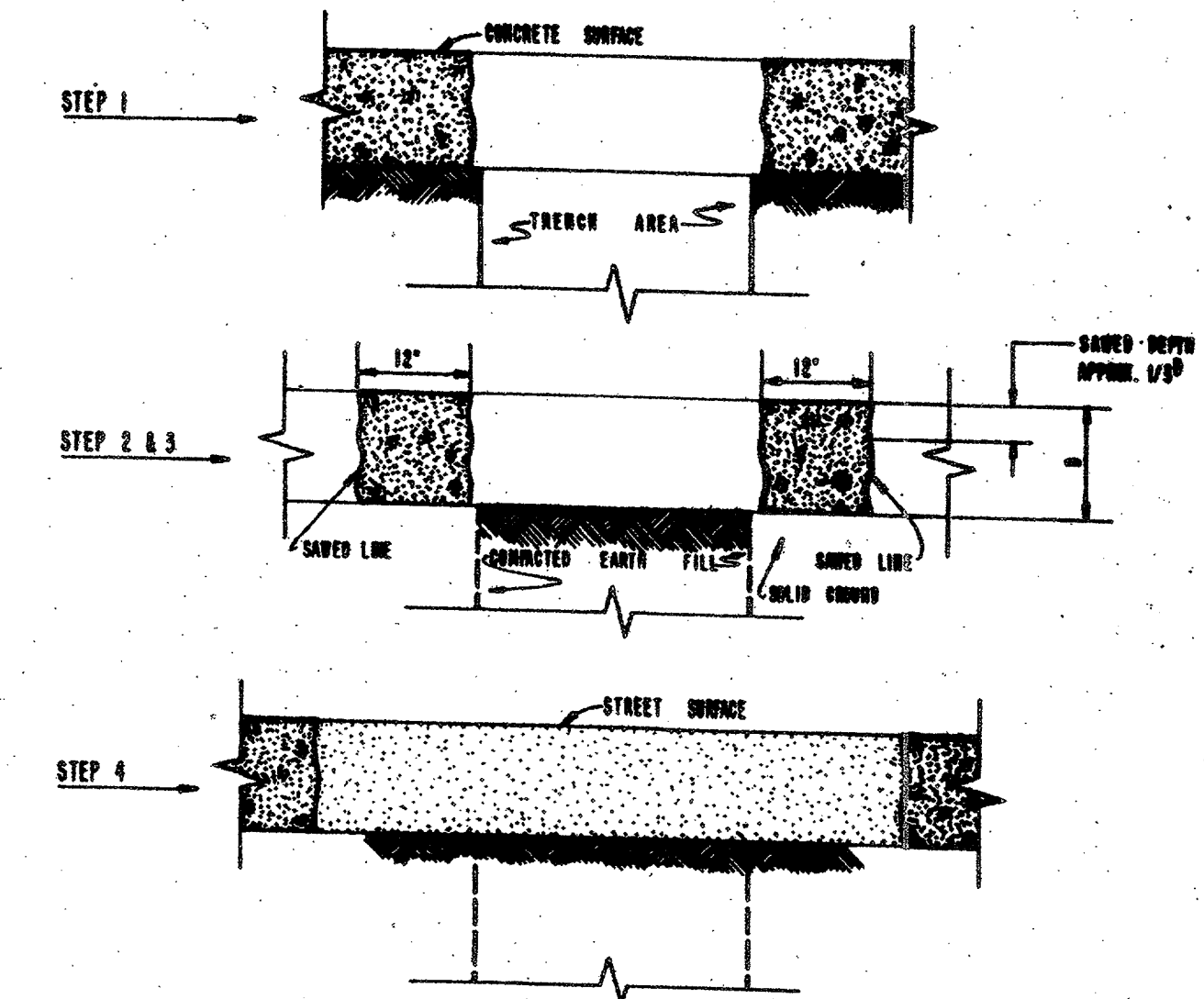
CONCRETE SHALL BE KEPT MOIST BY SPRINKLING WITH WATER FOR A PERIOD SUITABLE TO THE CHARACTER OF THE STRUCTURE. WALKING OR WORKING OVER FINISHED SURFACES SHALL NOT BE PERMITTED UNTIL SOME HAVE SUFFICIENTLY SET. FINISHED STREET SURFACES SHALL BE WELL BARRICADED FOR AT LEAST FORTY-FIVE HOURS AFTER PLACEMENT. FORM AND BRACING FOR WALLS OF MANHOLES AND TRANSFORMER VAULTS SHALL NOT BE DISTURBED DURING THE FIRST THIRTY-SIX HOURS AFTER CONCRETE HAS BEEN PLACED. FORMS AND BRACING 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 FLAWS IN THE CONCRETE SURFACE SHALL BE CHISELED OUT AND FILLER FORMED AND FILLED WITH CEMENT MORTAR IN SUCH A MANNER THAT THE PATCH IS SECURELY KEVED INTO THE CONCRETE SURFACE.

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 DEVICES CAN THEN BE USED TO BREAK THE EXCESS CONCRETE.
- THE EXPOSED EDGES OF THE CONCRETE WILL BE CLEANED SO A GOOD BOARD CAN BE OBTAINED WHEN THE 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 PUT IN A STRAIGHT LINE USING METHODS ACCEPTABLE WITH THE CITY SPECIFICATIONS. SAWING OF THE CONCRETE WILL NOT BE REQUIRED.

STREET BREAKING AND REPLACEMENT DETAILS

1/05/04 ISSUED FOR CONSTRUCTION

CD

TU ELECTRIC

UNIT ID

DWG TYPE

ESTIMATE

W.A.

LIST OF DRAWINGS

SCALE (H=NO SCALE) (V=NO SCALE)

NETWORK UNDERGROUND APPURTENANCE SHEETS MISCELLANEOUS DETAILS

DATE 05-12-92

OWN. MED

CH. JRC

ENG. JRC

APP. JES

APP. PRN

APP. CHL

APP. APP.

REVISION DESCRIPTION

NO.

DATE

E-NUA-1 SHEET NO.