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ARIZONA PUBLIC SERVICE COMPANY
T&D CONSTRUCTION STANDARDS

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**SUBSTRUCTURES
MINIMUM PARALLEL SEPARATION REQUIREMENTS
FOR UNDERGROUND UTILITIES
AND APS MINIMUM COVER REQUIREMENTS**

COVER

8610

SUBSTRUCTURES

MINIMUM PARALLEL SEPARATION REQUIREMENTS

FOR UNDERGROUND UTILITIES

AND APS MINIMUM COVER REQUIREMENTS

LEGEND		MINIMUM PARALLEL SEPARATION REQUIREMENTS FOR UNDERGROUND UTILITIES																MINIMUM COVER								
		MINIMUM HORIZONTAL CLEARANCE								MINIMUM VERTICAL CLEARANCE																
		GAS SERVICE				GAS MAIN				D.B.				CONDUIT												
		PLASTIC	STEEL	PLASTIC	STEEL	ES	EP	EF	ES	EP	EF	ES	EP	EF	ES	EP	EF	TM	TS	CATV						
GS	GAS SERVICE	PLASTIC	NA	NA	12"	12"	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	12"	12"	12"	12"	12"	12"	12"	24"	
			STEEL	NA	NA	12"	12"	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	12"	12"	12"	12"	12"	12"	12"	24"
GM	GAS MAIN	PLASTIC	12"	12"	NA	NA	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	12"	12"	12"	12"	12"	12"	12"	30"	
			STEEL	12"	12"	NA	NA	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	12"	12"	12"	12"	12"	12"	12"	30"
DIRECT-BURIED	ES	ELECTRIC SECONDARY SERVICE AND STREET LIGHT CABLE	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(16) (13)	(15) (13)	(15) (13)	(15) (13)	(15) (13)	(15) (13)	(15) (13)	(15) (13)	(15) (13)	(15) (13)	(15) (13)	(24) (12")	(24) (12")	(15) (6")	(15) (6")	(15) (6")	(32) (15)	(32) (15)	(31) (33) (10)	
	EP	ELECTRIC PRIMARY CABLE	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(24) (12")	(24) (12")	(6") (21) (12")	(6") (21) (12")	(6") (21) (12")	(12") (12")	(12") (12")	(33) (10)	
	EF	ELECTRIC FEEDER CABLE	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(26) (16) (13)	(24) (12")	(24) (12")	(15) (24) (12")	(15) (24) (12")	(15) (24) (12")	(12") (12")	(12") (12")	(33) (10)	
	ES	ELECTRIC SECONDARY SERVICE AND STREET LIGHT CABLE	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(24) (12")	(24) (12")	(15) (24) (12")	(15) (24) (12")	(15) (24) (12")	(6") (20) (15)	(6") (20) (15)	(23) (24) (31) (33) (10)
IN CONDUIT	EP	ELECTRIC PRIMARY CABLE	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(24) (12")	(24) (12")	(21) (6") (11) (20)	(21) (6") (11) (20)	(21) (6") (11) (20)	(20) (12")	(20) (12")	(36) (39) (33) (10)	
	EF	ELECTRIC FEEDER CABLE	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(35) (16) (13)	(24) (12")	(24) (12")	(11) (20) (6") (12")	(11) (20) (6") (12")	(11) (20) (6") (12")	(20) (12")	(20) (12")	(38) (33) (22) (10)	
	TM	TELCO MAIN	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12")	(12")	(6") (12") (12")	(6") (12") (12")	(6") (12") (12")	(12")	(12")	(36) (37)
	TS	TELCO SERVICE	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12) (26)	(12")	(12")	(15) (12") (15)	(15) (12") (15)	(15) (12") (15)	(15) (12") (15)	(15) (12") (15)	(37)
	CATV	CABLE TELEVISION	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(26) (12)	(12")	(12")	(15) (12") (15)	(15) (12") (15)	(15) (12") (15)	(15) (12") (15)	(15) (12") (15)	(24") (37) (9)	
	S	SEWER MAIN AND SERVICE	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	(17)	(17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	VARIES
	W	WATER MAIN AND SERVICE	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	(17)	(17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	VARIES
	IS	APS INTERSTATION COMMUNICATIONS	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"	(40) (6")	(40) (6")	(40) (6")	(40) (6")	(40) (6")	(40) (6")	(40) (6")	(40) (6")	36"
	MH	APS MANHOLE	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(28)	(28)	(28) (28)	(28) (28)	(28) (28)	(28) (28)	(28) (28)	(28) (28)	36"
	PB	APS PULL BOX	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(34) (28)	(28)	(28)	(28) (28)	(28) (28)	(28) (28)	(28) (28)	(28) (28)	(28) (28)	NA
	IRR	IRRIGATION AND STORM DRAINS	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(16) (16)	(17)	(17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	(17) (17)	VARIES

NA - NOT APPLICABLE

TO READ THE CHART ABOVE:

A. LOCATE THE APPLICABLE UTILITY WITHIN THE LEGEND ON THE SIDE OF THE CHART.

B. LOCATE THE UTILITY FROM WHICH HORIZONTAL OR VERTICAL SEPARATION IS REQUIRED. WITHIN THE LEGEND ACROSS THE TOP OF THE CHART.

C. READ THE APPROPRIATE COLUMNS DOWN AND ACROSS UNTIL THEY INTERSECT.

D. THE DIMENSION PRINTED WITHIN THE INTERSECTION OF THE TWO COLUMNS IS THE REQUIRED SEPARATION.

E. ANY CIRCLED NUMBER ON THIS CHART IS REFERENCE TO AN INSTALLATION NOTE WHICH IS LOCATED ON THE FOLLOWING PAGES.

**MINIMUM PARALLEL SEPARATION REQUIREMENTS FOR UNDERGROUND UTILITIES
AND APS MINIMUM COVER REQUIREMENTS**

① **GENERAL REQUIREMENTS**

EDCS 8610 LISTS THE JOINTLY USED TRENCH SEPARATION REQUIREMENTS FOR ALL TYPES OF UNDERGROUND UTILITIES THAT WILL NORMALLY BE ENCOUNTERED. THE HORIZONTAL AND VERTICAL SEPARATIONS APPLY PRIMARILY TO NEW CONSTRUCTION OF UTILITIES WHERE TRENCHES ARE BEING JOINTLY USED. **THE SEPARATION DISTANCES DO NOT APPLY TO CROSSING OF UNDERGROUND OBSTRUCTIONS, SEE 8601, 4.5 AND 12.1.** THE SEPARATIONS SPECIFIED ARE MINIMUM REQUIREMENTS BASED ON NORMAL FIELD CONDITIONS. DEPENDENT UPON THE FIELD CONDITIONS, GREATER SEPARATIONS MAY BE NEEDED TO FACILITATE CONSTRUCTION MAINTENANCE AND ENSURE A SAFE RELIABLE INSTALLATION. WHERE NEW FACILITIES ARE BEING CONSTRUCTED PARALLEL TO EXISTING FACILITIES, THE NEW FACILITIES WILL BE INSTALLED IN A SEPARATE TRENCH. WHERE CONFLICTS EXIST BETWEEN THESE SPECIFICATIONS AND OTHER SPECIFICATIONS OF THE CITY, COUNTY OR STATE, THE MORE STRINGENT SHALL APPLY.

② **EXCEPTIONS TO 8610**

THIS STANDARD IS PRIMARILY DEFINED FOR ADEQUATE SEPARATION FOR LINE SIZES NORMALLY ENCOUNTERED WHEN EXTENDING ELECTRIC FACILITIES AND IS NOT ADEQUATE SEPARATION FOR LARGE DIAMETER RE-WORK OF AREAS. SUCH AS STORM DRAIN IMPROVEMENTS SEWER TRUNK LINES, UNDERGROUND ELECTRIC TRANSMISSION LINES, PARALLELED PRIMARY FEEDERS, CANAL CROSSING, BRIDGE CROSSINGS AND OTHER IMPROVEMENTS WHICH MAY BE ENCOUNTERED. CONSULT T&D ENGINEERING AND SUPPORT FOR SPECIAL REQUIREMENTS WHEN THESE TYPES OF INSTALLATIONS ARE ENCOUNTERED.

③ ALL MINIMUM COVER DIMENSIONS ARE MEASURED FROM FINAL GRADE TO TOP OF CABLE, CONDUIT OR FACILITY.

④ ALL DIMENSIONS FOR HORIZONTAL OR VERTICAL SEPARATIONS ARE MEASURED TO OUTSIDE SURFACES OF CABLE OR CONDUIT.

⑤ SEE 8606 FOR MINIMUM COVER OVER APS FACILITIES WITHIN THE CITY OF PHOENIX. WHERE MINIMUM COVER REQUIREMENTS LISTED ON 8606 CONFLICT WITH 8610, THE MORE STRINGENT SHALL APPLY.

⑥ SEE 8601, 4.5 FOR EXCEPTIONS TO MINIMUM COVER REQUIREMENTS WHEN CROSSING UNDERGROUND OBSTRUCTIONS.

⑦ THE MINIMUM COVER OVER A GAS FEEDER MAIN IS TYPICALLY 30 INCHES UNLESS MORE STRINGENT REQUIREMENTS PREVAIL AS DICTATED BY SOUTHWEST GAS, LOCAL GOVERNMENTAL AGENCIES OR OTHER PUBLIC REGULATORY AGENCIES.

⑧ STEEL GAS MAINS (EXCLUDING FEEDER MAINS) LOCATED IN NON-TRAFFIC BEARING AREAS MAYBE TYPICALLY REDUCED TO 24 INCHES MINIMUM OVER DUE TO ROCK TRENCH CONDITIONS ONLY, FOR ADDITIONAL INFORMATION CONTACT SOUTHWEST GAS.

⑨ CATV IS RANDOM LAID WITH TELCO FACILITIES.

⑩ THE MINIMUM COVER OVER ELECTRIC FACILITIES IN ROCK TRENCHES LOCATED OUTSIDE OF PUBLIC RIGHTS-OF-WAY MAY BE REDUCED TO :

- A. TWELVE INCHES FOR PRIMARY, FEEDERS AND/OR SECONDARY/SERVICE IN PLASTIC CONDUIT WITH A 4-INCH MINIMUM CONCRETE CAP.
- B. ELEVEN INCHES FOR ELECTRICAL CABLES(S) INSTALLED IN CONCRETE-ENCASED DUCT BANKS.

⑪ ALL 750 KCMIL FEEDERS SHALL BE INSTALLED IN CONDUIT. WHERE THERE ARE MORE THAN TWO 5-INCH DIAMETER FEEDER CONDUITS IN THE SAME TRENCH, THEY SHALL BE INSTALLED AND CONCRETE ENCASED PER 8601, 8625 AND 8750.

⑫ TELCO SERVICE IS DEFINED AS A FIVE-PAIR CABLE OR LESS. TELCO MAIN IS DEFINED AS MORE THAN FIVE-PAIR CABLE.

⑬ THIS HORIZONTAL SEPARATION MAY BE REDUCED TO 12 INCHES IN ROCK TRENCH CONDITIONS ONLY.

⑭ A. WITHIN THE STREET R/W OF THE CITY OF PHOENIX A 6-FOOT MINIMUM HORIZONTAL SEPARATION IS REQUIRED BETWEEN UNDERGROUND ELECTRICAL FACILITIES (DIRECT-BURIED, CONDUIT, ENCASED CONDUIT, MANHOLES AND PULL BOXES, ETC.) AND WATER OR SEWER. WHERE THIS REQUIREMENT CREATES A HARDSHIP, CONTACT THE APPROPRIATE MUNICIPAL AUTHORITIES REGARDING A POSSIBLE VARIANCE.

B. WITHIN THE STREET R/W OF THE CITY OF SCOTTSDALE, THE FOLLOWING HORIZONTAL SEPARATIONS FROM UNDERGROUND ELECTRIC FACILITIES (DIRECT-BURIED, CONDUIT, ENCASED CONDUIT, MANHOLES AND PULL BOXES, ETC.) ARE ALLOWED:

- 1. THE MINIMUM HORIZONTAL SEPARATION FROM WATER IS 2 FEET. IF THE HORIZONTAL SEPARATION FROM WATER IS 2 FEET BUT LESS THAN 3 FEET, THERE MUST ALSO BE 1 FOOT VERTICAL SEPARATION.

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2. IF HORIZONTAL SEPARATION FROM WATER IS 3 FEET OR GREATER, NO VERTICAL SEPARATION IS REQUIRED.
3. THE MINIMUM HORIZONTAL SEPARATION FROM SEWER IS 2 FEET.
4. WHERE THESE REQUIREMENTS CREATE A HARDSHIP, CONTACT THE APPROPRIATE MUNICIPAL AUTHORITY REGARDING A POSSIBLE VARIANCE.

C. IN AREAS OUTSIDE THE STREET R/W OF THE CITY OF PHOENIX ELECTRIC FACILITIES INSTALLED IN A TOTAL CONDUIT SYSTEM, MAY REDUCE THE HORIZONTAL SEPARATION FROM SEWER TO 24 INCHES.

D. IN AREAS OUTSIDE THE STREET R/W'S OF PHOENIX AND SCOTTSDALE, ELECTRIC FACILITIES INSTALLED IN A "TOTAL" CONDUIT SYSTEM MAY REDUCE THE HORIZONTAL SEPARATION FROM WATER AND SEWER TO 12 INCHES WITH THE APPROVAL OF APS ENGINEERING IN ROCK TRENCH CONDITIONS. A ROCK TRENCH IS ONE WHICH REQUIRES BLASTING OR JACKHAMMERING TO DIG. EXCEPTION: IN ROCK TO PAD-MOUNTED EQUIPMENT MAY BE INSTALLED IN CONDUIT (THROUGHOUT THE TOTAL LENGTH OF THE SLOT-TRENCH) IN ORDER TO REDUCE THE REQUIRED HORIZONTAL SEPARATION FROM WATER AND SEWER TO 12 INCHES.

- 15) THESE FACILITIES MAYBE INSTALLED WITH RANDOM SEPARATION (SEE 8601, 17.0) NOTE: RANDOM SEPARATION BETWEEN ELECTRIC SERVICE OR SECONDARY, AND TELCO SERVICE/CATV MAYBE SPECIFIED ONLY WHERE THE 12-INCH REQUIRED SEPARATION BETWEEN TELCO SERVICE/CATV AND ELECTRIC PRIMARY OR FEEDER IS NOT IN CONFLICT. TELCO SERVICE (ONLY) DOES NOT DISTINGUISH BETWEEN ELECTRIC SECONDARY AND SERVICE, AND WILL ACCEPT RANDOM LAY WITH THESE ELECTRIC FACILITIES WHETHER THEY ARE DIRECT BURIED, ARMORED, IN CONDUIT OR CABLE-IN-CONDUIT (CIC). APS OWNED DIRECT-BURIED PARALLELED SERVICES AND SECONDARY MAY BE RANDOM LAID. RANDOM SEPARATION BETWEEN LOW-VOLTAGE ELECTRIC AND COMMUNICATION FACILITIES APPLIES ONLY WHERE THE ELECTRIC IS LESS THAN 300 VOLTS. LOW VOLTAGES OVER 300 VOLTS SHALL MEET THE SEPARATION REQUIREMENTS SPECIFIED BETWEEN PRIMARY AND COMMUNICATION FACILITIES.
- 16) A MINIMUM 24-INCH HORIZONTAL SEPARATION IS REQUIRED WHEN THE SPECIFIED VERTICAL SEPARATION CAN NOT BE ATTAINED.
- 17) ONLY THE SPECIFIED HORIZONTAL SEPARATION IS ACCEPTABLE. VERTICAL SEPARATION IS NOT AN ACCEPTABLE ALTERNATIVE.
- 18) VARIES BY LOCALITY OR BY LOCAL GOVERNMENTAL AGENCIES OR OTHER PUBLIC REGULATORY AGENCIES.
- 19) A MINIMUM 1/2-INCH HORIZONTAL SEPARATION IS REQUIRED BETWEEN ANY COMBINATION OF APS CIRCUITS INSTALLED IN DIRECT-BURIED CONDUIT. FEEDERS, PRIMARY AND/OR LOW-VOLTAGE CIRCUITS MAY BE LOCATED ADJACENT TO EACH OTHER IN ANY ARRANGEMENT (E.G., FEEDERS MAY BE ADJACENT TO SERVICES).
- 20) A MINIMUM 6-INCH VERTICAL SEPARATION IS REQUIRED BETWEEN ANY COMBINATION OF APS CIRCUITS WHEN INSTALLED IN DIRECT-BURIED CONDUIT AND THE BACKFILL MATERIAL REQUIRES BEING MECHANICALLY COMPACTED TO ENSURE A MINIMUM OF 85 PERCENT COMPACTION. THE VERTICAL CONDUIT SEPARATION BETWEEN ANY COMBINATION OF APS CIRCUITS (NON-DUCTBANK) MAY BE REDUCED TO 2-INCHES WHEN INSTALLED IN DIRECT-BURIED CONDUIT AND WHEN CONDUIT SPACERS ARE UTILIZED IN CONJUNCTION WITH 1-SACK, 3/4 INCH ABC SLURRY OR 1-SACK SAND SLURRY ENCASEMENT WHICH ENSURES 100 PERCENT COMPACTION.
- 21) SEPARATE THE SINGLE-PHASE, DIRECT-BURIED CABLES INTO GROUPS OF THREE MAXIMUM, EACH GROUP SHALL HAVE 6 INCHES HORIZONTAL OR VERTICAL SEPARATION FROM OTHER GROUPS AND/OR FROM A THREE-PHASE ELECTRIC PRIMARY CIRCUIT. THIS IS A REQUIREMENT FOR ALL TRENCH RUNS AS WELL AS ALL APPROACHES (SLOT TRENCHES) TO PAD-MOUNTED EQUIPMENT.
- 22) CONCRETE-ENCASED DUCT BANKS REQUIRE A MINIMUM OF 36 INCHES COVER IN DEVELOPED AREAS. A MINIMUM OF 42 INCHES COVER IS REQUIRED IN UNDEVELOPED AREAS WITHOUT PRIOR APPROVAL FROM THE LOCAL GOVERNMENTAL AGENCY, AND/OR OTHER PUBLIC REGULATORY AGENCY. SEE 8606 FOR DEFINITION OF DEVELOPED AND UNDEVELOPED AREAS. CONCRETE-ENCASED DUCT BANKS INSTALLED IN A ROCK TRENCH MAY BE AN EXCEPTION IN PRIVATE EASEMENTS WHEN APPROVED BY APS ENGINEERING (SEE 8625).
- 23) SERVICE TRENCH DEPTH IS IMPACTED BY THE SWEEP RADIUS USED (SEE 8601, 16.4 AND 1288).
- 24) VERTICAL SEPARATION IS PREFERABLE WITH GAS PIPE INSTALLED ABOVE APS ELECTRIC CONDUIT/CABLES. WHEN VERTICAL SEPARATION CANNOT BE ATTAINED THE MINIMUM HORIZONTAL SEPARATION IS REQUIRED.
- 25) DIRECT-BURIED CONDUIT FOR PARALLEL-CONNECTED SERVICE RUNS SHALL MAINTAIN A MINIMUM 1/2-INCH HORIZONTAL SEPARATION. FOR VERTICAL SEPARATION SEE NOTE 20.
- 26) JOINTLY USED TRENCHES FOR APS CONCRETE-ENCASED DUCT BANKS CAN PRESENT SPECIAL PHYSICAL AND/OR COORDINATION PROBLEMS. WHERE THESE PROBLEMS ARE ENCOUNTERED, JOINT USE OF THE TRENCH BY OTHERS SHALL BE CONSIDERED AND/OR NEGOTIATED ON AN INDIVIDUAL BASIS. TELCO PREFERS TO INSTALL THEIR FACILITIES AROUND THE PERIMETER OF AN APS MANHOLE RATHER THAN ACROSS THE ROOF. TELCO SHALL MAINTAIN A MINIMUM 12-INCH HORIZONTAL SEPARATION FROM THE MANHOLE RISER. SEE 8601, 27.0 FOR ADDITIONAL LIMITATIONS REGARDING MANHOLE OBSTRUCTIONS.
- 27) HORIZONTAL SEPARATION IS ACCEPTABLE ONLY FOR ROCK TRENCH CONDITIONS, OTHERWISE THE VERTICAL SEPARATION IS REQUIRED.



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- 28 WHEREVER POSSIBLE, MANHOLES AND PULL BOXES SHALL BE LOCATED WITH A MINIMUM 24-INCH FREE HORIZONTAL SEPARATION AROUND THE PERIMETER OF THE MANHOLE OR PULL BOX FROM EXISTING OBSTRUCTIONS. AFTER THE MANHOLE OR PULL BOX HAS BEEN INSTALLED, BACKFILLED AND COMPACTED, THE MINIMUM SEPARATION REQUIREMENTS FROM FUTURE OBSTRUCTIONS MAY BE REDUCED TO ALLOW CONTACT BETWEEN THE OUTSIDE MANHOLE OR PULL BOX WALLS AND THE OUTSIDE WALL OF THE PROPOSED FACILITY (EXCEPT FOR GAS FACILITIES WHICH SHALL MAINTAIN 12" OF SEPARATION). OBSTRUCTIONS WHICH PREVENT THE FUTURE USE OF MANHOLE ENTRIES SHALL BE AVOIDED. SEE NOTE NUMBER 34.
- 29 AFTER THE MANHOLE HAS BEEN INSTALLED, FOREIGN FACILITIES MAY BE INSTALLED DIRECTLY ABOVE THE MANHOLE PROVIDED THE FACILITIES ARE SUITABLY SUPPORTED TO PREVENT TRANSFER OF ANY LOAD ONTO THE MANHOLE ROOF. GAS PIPELINES SHALL NEVER BE PLACED BENEATH MANHOLES.
- 30 APS OCTAGON AND RECTANGULAR MANHOLES ARE DESIGNED FOR AASHTO H 20 LOADING WITH ZERO SOIL COVER. THEY CAN HAVE A MAXIMUM OF 11-FEET OF COVER OVER THE ROOF. APS RECTANGULAR MANHOLES PRIOR TO NOVEMBER 2010 WERE DESIGNED FOR ONLY A MAXIMUM OF 5 FEET OF COVER OVER THE ROOF. MANHOLES SHALL BE INSTALLED WITH THE FOLLOWING MINIMUM COVER UNLESS APPROVED BY APS ENGINEERING:
- 30.1 DEVELOPED AREAS (FINAL GRADE HAS BEEN ESTABLISHED), WITHIN A PUBLIC RIGHT-OF-WAY--36 INCHES.
 - 30.2 UNDEVELOPED AREAS (FINAL GRADE HAS NOT BEEN ESTABLISHED), WITHIN A PUBLIC RIGHT-OF-WAY--42 INCHES.
 - 30.3 FIRST UTILITY BACK OF SIDEWALK ON MAJOR AND COLLECTOR STREETS, WITHIN A PUBLIC RIGHT-OF-WAY--48 INCHES.
 - 30.4 PRIVATE PROPERTY--24 INCHES.
- 31 A 24-INCH MINIMUM VERTICAL SEPARATION IS REQUIRED BETWEEN CUSTOMER-OWNED ELECTRIC FACILITIES AND APS-OWNED FACILITIES WHERE INSTALLED IN THE SAME TRENCH. THE MINIMUM COVER REQUIREMENTS OVER THE CUSTOMER'S FACILITIES ARE AN ADDITIONAL CONSIDERATION. THESE MINIMUM COVER REQUIREMENTS MAY NECESSITATE THE INSTALLATION OF APS FACILITIES AT A GREATER THAN STANDARD DEPTH IN MOST PORTIONS OF THE TRENCH. THE MINIMUM COVER REQUIREMENTS OVER CUSTOMER-OWNED FACILITIES ARE AS FOLLOWS:
- 24-INCH COVER OVER DIRECT-BURIED CABLE.
 - 18-INCH COVER OVER NON-METALLIC CONDUIT.
 - 6-INCH COVER OVER STEEL CONDUIT.
- 32 WHERE PRIMARY AND LOW-VOLTAGE FACILITIES ARE IN DIRECT-BURIED CONDUIT, THEY SHOULD BE INSTALLED AT THE SAME TRENCH LEVEL (DEPTH) WHEREVER PRACTICAL.
- 33 THE MINIMUM COVER OVER FEEDER FACILITIES FOR STREET CROSSINGS SHALL BE 36 INCHES UNLESS APPROVED BY APS ENGINEERING. THE MINIMUM COVER OVER PRIMARY AND SECONDARY/SERVICE FACILITIES FOR STREET CROSSINGS SHALL BE 36 INCHES UNLESS APPROVED BY APS ENGINEERING. WHERE CONDUIT IS TO BE INSTALLED SHALLOWER THAN 36 INCHES, THE CONDUIT SHALL BE PARTIALLY ENCASED WITH A MINIMUM 4-INCH CONCRETE CAP ON TOP AND 2 INCHES ON THE SIDES. PARTIAL CONCRETE ENCASEMENT SHALL INCLUDE TOP AND SIDES OF CONDUIT, BUT NOT THE BOTTOM (SEE 8601, 20.0). THE CONDUIT SHALL HAVE A MINIMUM COVER OF 24 INCHES FROM FINAL GRADE. THIS ENCASEMENT RULE SHALL BE APPLIED TO DIRECT-BURIED FEEDER CABLE. RIGID OR INTERMEDIATE STEEL CONDUIT DOES NOT REQUIRE A CONCRETE CAP. LOW-VOLTAGE SECONDARY AND SERVICE CABLE INSTALLED IN PLASTIC CONDUIT WITH A MINIMUM 24-INCH COVER, DOES NOT REQUIRE A CONCRETE CAP FOR SHALLOW STREET CROSSINGS.
- 34 TO AVOID THE NECESSITY FOR ADDITIONAL CONDUIT BENDS, PULL BOXES, PAD VAULTS, AND MANHOLES SHALL BE LOCATED IN-LINE WITH ELECTRIC ONLY TRENCHES. ALL APS EQUIPMENT, EXCEPT PAD-MOUNTED TRANSFORMERS AND MANHOLE ENTRANCES SHALL BE OFFSET FROM JOINTLY USED TRENCHES. A MINIMUM 6-INCH CLEAR HORIZONTAL TRENCH SPACE SHOULD BE PROVIDED WHICH WILL ALLOW COMMUNICATION FACILITIES TO BYPASS THE APS EQUIPMENT. SEE 8646 FOR TYPICAL TRENCH OFFSETS.
- 35 THE SEPARATION REQUIREMENTS SPECIFIED ARE EQUALLY APPLICABLE TO CONCRETE-ENCASED DUCT BANKS. APS-OWNED FACILITIES (DIRECT-BURIED OR IN CONDUIT) MAY BE INSTALLED (ON TOP OF) IN DIRECT CONTACT WITH AND APS-OWNED CONCRETE-ENCASED DUCT BANK COMMUNICATION FACILITIES (DIRECT-BURIED OR IN CONDUIT) MAY BE INSTALLED WITH A MINIMUM OF 3 INCHES VERTICAL SEPARATION ABOVE AN APS-OWNED CONCRETE-ENCASED DUCT BANK. NOTE THAT US WEST REQUIRES A MINIMUM OF 12 INCHES VERTICAL SEPARATION FROM APS CONCRETE-ENCASED DUCT BANKS.
- 36 THE MINIMUM COVER OVER GAS MAINS LOCATED WITHIN THE RIGHT-OF-WAY OF MAJOR STREETS (PARTICULARLY THOSE CONTROLLED BY ADOT) MAY BE 36 INCHES. CONTACT THE APPLICABLE GAS COMPANY TO DETERMINE ACTUAL MINIMUM COVER REQUIREMENTS.
- 37 THIS STANDARD SPECIFIES THE MINIMUM COVER OVER TELCO. TELCO MAY SPECIFY INCREASED COVER WHERE PERSISTENT PROBLEMS OCCUR. VERIFY DEPTH REQUIREMENTS WITH TELCO AND CATV.
- 38 THE PREFERRED MINIMUM COVER OVER A CONCRETE-ENCASED DUCT BANK LOCATED WITHIN THE BOUNDARIES OF A SUBSTATION IS 36 INCHES. MEASURED TO THE TOP OF THE CONCRETE ENCASEMENT. REFER TO 8601, 21.0 FOR CONCRETE ENCASEMENT AND DEPTH REQUIREMENTS.
- 39 CABLE REPLACEMENT WORK MAY SPECIFY 30-INCHES COVER IN ALL DEVELOPED STREETS. ADDITIONAL COVER SHOULD BE SPECIFIED WHERE FUTURE GRADE CHANGES ARE ANTICIPATED.
- 40 HORIZONTAL SEPARATION IS PREFERABLE WITH OTHER COMMUNICATION LINES. WHEN HORIZONTAL SEPARATION CANNOT BE ATTAINED, THE MINIMUM VERTICAL SEPARATION IS REQUIRED.

 ARIZONA PUBLIC SERVICE COMPANY T&D CONSTRUCTION STANDARDS					SUBSTRUCTURES MINIMUM PARALLEL SEPARATION REQUIREMENTS FOR UNDERGROUND UTILITIES AND APS MINIMUM COVER REQUIREMENTS		SH 4 OF 4
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