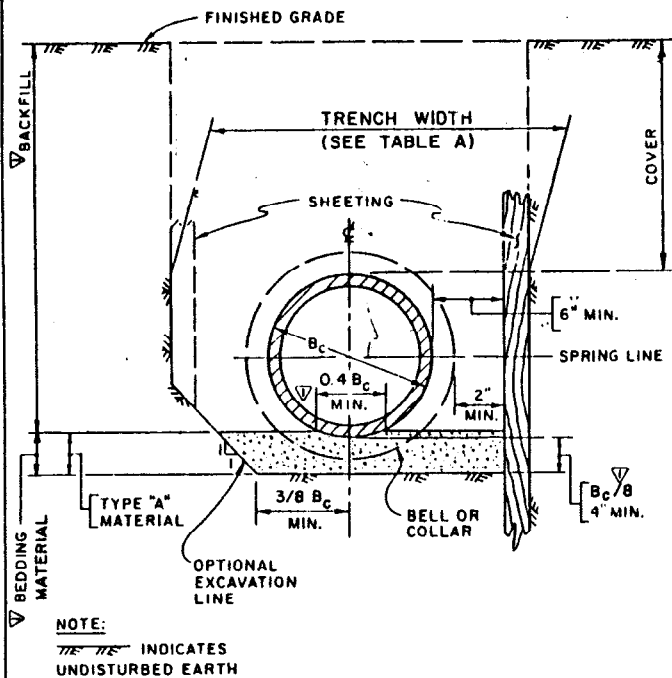
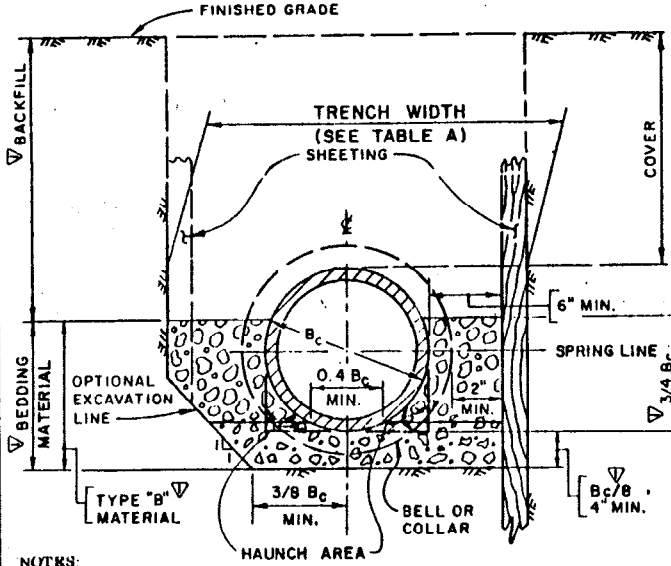


**CASE 1 BEDDING INSTALLATION**  
LOAD FACTOR = 1.4



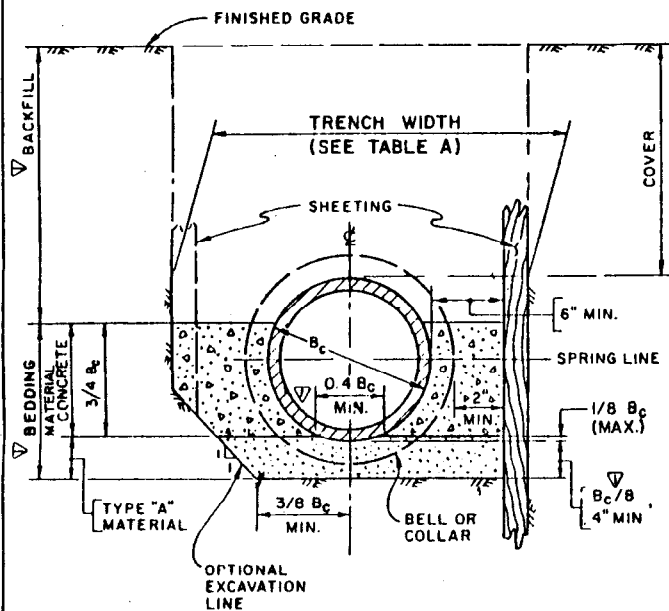
NOTE:  
--- --- INDICATES UNDISTURBED EARTH

**CASE 2 BEDDING INSTALLATION**  
LOAD FACTOR = 1.8



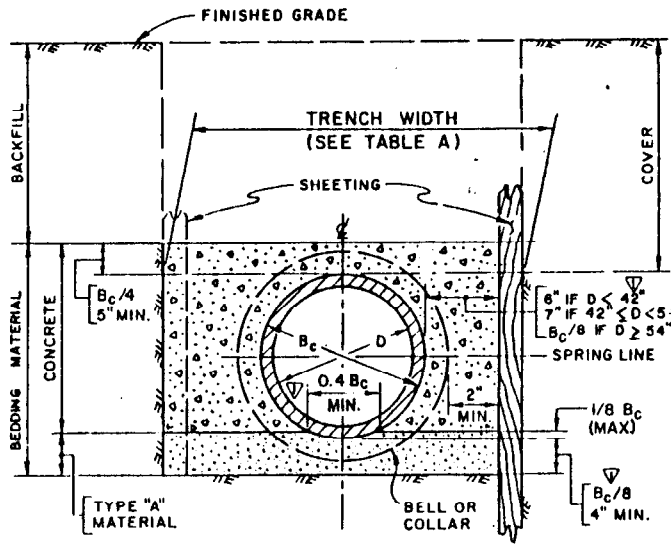
NOTES:  
A. --- --- INDICATES UNDISTURBED EARTH.  
B. TYPE "B" MATERIAL SHALL BE PLACED IN A MANNER SUCH AS SLICING, SHOVEL-SPADING, OR SHOVEL RODDING TO INSURE COMPLETE FILLING OF THE "HAUNCH AREAS" BELOW THE PIPE. (JETTING OF TYPE "B" MATERIAL IS NOT REQUIRED).

**CASE 3 BEDDING INSTALLATION**  
LOAD FACTOR = 2.7



NOTES:  
A. --- --- INDICATES UNDISTURBED EARTH  
B. SEE NOTE 5.

**CASE 4 BEDDING INSTALLATION**  
LOAD FACTOR = 3.2



NOTES:  
A. --- --- INDICATES UNDISTURBED EARTH.  
B. < INDICATES "LESS THAN", ≤ INDICATES "LESS THAN OR EQUAL TO", ≥ INDICATES "GREATER THAN OR EQUAL TO".

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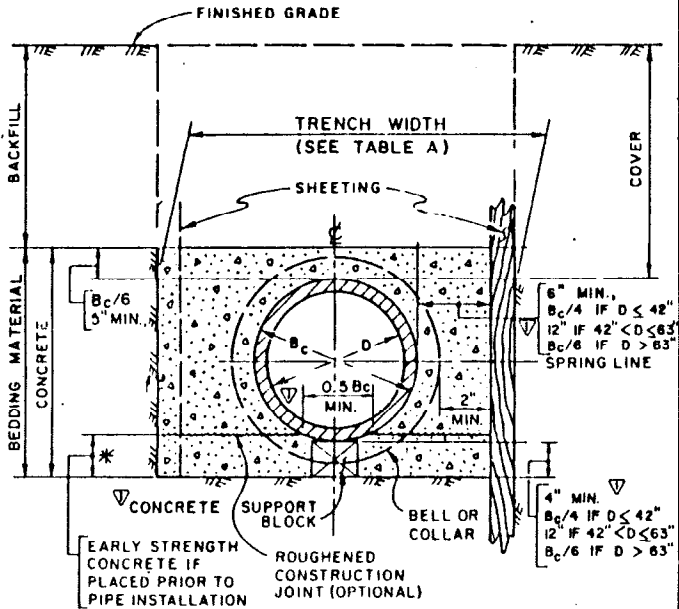
CITY OF LOS ANGELES

**PIPE LAYING IN TRENCHES**

**STANDARD PLAN  
S-251-1**

SUBMIT ED Dec. 25, 1973 <i>Philip H. Martin</i> DIVISION ENGINEER <i>Fredrick S. ...</i> DEPUTY ENGINEER	REVISIONS				SUPERSEDES	REFERENCES
	NO	DATE	DESCRIPTION	DIV ENGR	CITY ENGR	B-3816
	1	2-7-77	BEDDING, BACKFILL LIMITS & DIMENSIONS, CASE 1 & 2 MATERIALS; CASE 2 CONSTRUCTION PROCEDURES; CASE DESIGNATIONS; USE OF CASE 2 IN TABLE B; GENERAL NOTES; LOAD FACTORS.	<i>Philip H. Martin</i>	<i>D.C. ...</i>	
APPROVED <i>Donald C. ...</i> CITY ENGINEER						
DESIGNED BY	DRAWN BY	CHECKED BY				Vault Index Number B-3893
A. MAGANA	R. FAGNAN	G. K. TAKAKI				SHEET 1 OF 2 SHEETS

**CASE 5 BEDDING INSTALLATION**  
LOAD FACTOR = 4.5



- NOTES:**
- A.  $\overline{11E}$   $\overline{11E}$  INDICATES UNDISTURBED EARTH.
  - B. TREATED PINE SHIMS MAY BE USED FOR GRADE ADJUSTMENT.
  - C. < INDICATES "LESS THAN"; ≤ INDICATES "LESS THAN OR EQUAL TO"; > INDICATES "GREATER THAN".
  - D. \* INDICATES AREA REFERRED TO IN NOTE 12.D.(2).

**TABLE A**

MAXIMUM ALLOWABLE TRENCH WIDTH			
NOTES: A. IF COVER LESS THAN 8'-0" UNLIMITED WIDTH			
B. IF MAXIMUM ALLOWABLE IS EXCEEDED, PROVIDE SUBSTITUTE INSTALLATION PER TABLE B.			
INSIDE DIAMETER	PLASTIC, CLAY & CAST IRON	RCP WITH BELLS OR COLLARS	ACP & RCP WITHOUT BELLS OR COLLARS
6" - 15"	B <sub>c</sub> + 18"	B <sub>c</sub> + 32"	B <sub>c</sub> + 20"
16" - 21"	B <sub>c</sub> + 24"		
22" - 42"	B <sub>c</sub> + 30"		
43" - 90"	-----	B <sub>c</sub> + 32"	B <sub>c</sub> + 24"
OVER 96"	-----		

**TABLE B**

SUBSTITUTE INSTALLATIONS (APPLICABLE TO ALL PIPE SIZES)

CASE <sup>B</sup>	COVER <sup>C</sup> (Feet)	RATIO - MAXIMUM ALLOWABLE TRENCH WIDTH											NO. LIMIT					
		1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50		1.55	1.60	1.65	1.70	1.75
1	8.1-15.0																	
	15.1-20.0		2 <sup>A</sup>															
	20.1-30.0						3 <sup>A</sup>											
2	8.1-15.0																	
	15.1-20.0		3 <sup>A</sup>															
	20.1-30.0						4											SPECIAL
3	8.1-15.0																	
	15.1-30.0						4											SPECIAL
4	8.1-30.0																	
	15.1-30.0																	SPECIAL

**NOTES:**

- A. SEE NOTE 2.
- B. CASE - INSTALLATION CASE SPECIFIED ON THE PLANS.
- C. COVER - IF COVER EXCEEDS 30 FEET SUBSTITUTE SHALL BE AS ORDERED BY THE ENGINEER.
- D. SPECIAL - CONTRACTOR SHALL CONSTRUCT SPECIAL AS ORDERED BY THE ENGINEER.

**GENERAL NOTES**

1. CASE 1 BEDDING INSTALLATION SHALL BE USED FOR ALL PIPE LAYING UNLESS OTHERWISE SPECIFIED ON THE PLANS OR NOTED HEREON.
2. IF THE ACTUAL TRENCH WIDTH EXCEEDS THE MAXIMUM INDICATED IN TABLE A, THE CONTRACTOR IS REQUIRED TO PROVIDE A SUBSTITUTE INSTALLATION PER TABLE B. HOWEVER, IF RUNNING, CAVING OR SQUEEZING SOILS ARE PRESENT, CASE 2 OR 3 SHALL NOT BE USED AS A SUBSTITUTE. CASE 4 SHALL BE THE MINIMUM SUBSTITUTE.
3. IF THE COVER ON CLAY PIPE IS LESS THAN 42 INCHES MEASURED FROM THE FINISHED GRADE OR INTERIOR CONSTRUCTION GRADE, CASE 5 BEDDING INSTALLATION SHALL BE USED.
4. UNLESS OTHERWISE SPECIFIED ON THE PLANS, THE BEDDING INSTALLATION CASE FOR SEWER HOUSE CONNECTIONS SHALL BE THE SAME AS THAT USED FOR THE MAIN LINE.
5. LOAD FACTORS INDICATED FOR EACH BEDDING INSTALLATION CASE ARE BASED ON THE 3-EDGE BEARING TEST WITH A 1.0 LOAD FACTOR. LOAD FACTORS APPLY IN THE DESIGN OF RCP, VCP AND ACP.
6. IF RUNNING, CAVING OR SQUEEZING SOILS ARE ENCOUNTERED WITH CASE 2 OR 3 BEDDING INSTALLATION IS SPECIFIED ON THE PLANS, THE ENGINEER SHALL BE IMMEDIATELY NOTIFIED IN ORDER THAT HE CAN DETERMINE WHAT CORRECTIVE MEASURES SHALL BE TAKEN.
7. ALL COSTS ARISING FROM THE CONTRACTOR'S CHOICE OF OPTIONAL CONSTRUCTION DETAILS INCLUDING SUBSTITUTE BEDDING INSTALLATIONS WHEN THE MAXIMUM TRENCH WIDTH IS EXCEEDED, SHALL BE CONSIDERED INCLUDED IN THE BID PRICE FOR PIPE IN PLACE.
8. PIPE BELLS AND COUPLINGS OUTSIDE OF THE PIPE BARREL SHALL BE PREVENTED FROM BEARING UPON BEDDING MATERIAL BY SUITABLE EXCAVATION DURING THE PIPE LAYING OPERATIONS.
9. IF A CHANGE IN BEDDING INSTALLATION CASE OCCURS BETWEEN THE JOINTS OF A LENGTH OF PIPE, THE CONTRACTOR SHALL CONSTRUCT THE HIGHER CASE BEDDING INSTALLATION FOR THE ENTIRE LENGTH OF THAT PIPE.
10. THE HEIGHT OF BEDDING MATERIALS AS DESCRIBED IN SUBSECTION 306-1.3.2 OF THE STANDARD SPECIFICATIONS IS MODIFIED AS ILLUSTRATED IN BEDDING CASES 1 THROUGH 5.
11. BEDDING
  - A. TYPE "A" MATERIAL:
    - (1) TYPE "A" MATERIAL SHALL BE ONE OF THE FOLLOWING:
      - a. SAND
      - b. NO. 3 OR NO. 4 AGGREGATE OR 1/2" OR 3/4" CRUSHED ROCK FOR PIPES LARGER THAN 24 INCHES IN DIAMETER.
      - c. NO. 4 AGGREGATE OR 1/2" CRUSHED ROCK FOR PIPES 24 INCHES OR SMALLER IN DIAMETER.
      - d. UNDISTURBED NATIVE FREE DRAINING MATERIAL HAVING A MINIMUM SAND EQUIVALENT OF 30 AND SHAPED TO FULLY SUPPORT THE PIPE.
    - (2) IF ANY TYPE "A" MATERIAL DIRECTLY SUPPORTING THE PIPE IS REMOVED OR DISLOADED IN THE PROCESS OF REMOVING A PIPELAYING SLING, THAT MATERIAL SHALL BE CAREFULLY REPLACED BY HAND-SHOVELING.
  - B. TYPE "B" MATERIAL SHALL BE NO. 4 AGGREGATE OR 1/2" CRUSHED ROCK.
  - C. CONCRETE BEDDINGS:
    - (1) AT LEAST 50% OF CONCRETE BEDDING WITHIN ANY 5-FOOT LENGTH SHALL BE PLACED AGAINST UNDISTURBED EARTH OR AGAINST TIMBER SHEETING WHICH IS PLACED AGAINST UNDISTURBED EARTH AND LEFT IN PLACE. ALL SHEETING ABOVE THE TOP OF BEDDING SHALL BE REMOVED. THE CONTRACTOR MAY REMOVE ALL STEEL SHEETING HAVING WEB THICKNESS OF 1/2" OR LESS. (MODIFIES STANDARD SPECIFICATIONS SUBSECTION 306-1.1.1.)
    - (2) IF BACKFILL IS PLACED IMMEDIATELY AFTER PLACING CONCRETE BEDDING, SEE NOTE 12D.
    - (3) TRANSVERSE CONSTRUCTION JOINTS SHALL BE PROVIDED AS FOLLOWS:
      - a. MAXIMUM SPACING SHALL BE 30 FEET FOR CLAY PIPE AND 40 FEET FOR CAST IRON, REINFORCED CONCRETE AND ASBESTOS CEMENT PIPES.
      - b. JOINTS SHALL BE LOCATED AT THE END OF PIPE BELLS.
      - c. JOINTS SHALL BE PLACED AT ALL CHANGES BETWEEN ANY TWO BEDDING INSTALLATION CASES.
    - (4) NO CONSTRUCTION JOINTS OTHER THAN THOSE REQUIRED BY NOTE 11.C.(3) SHALL BE LOCATED ABOVE THE SPRING LINE OF THE PIPE UNLESS AUTHORIZED BY THE ENGINEER OR SPECIFIED ON THE PLANS.

12. BACKFILLING: (MODIFIES STANDARD SPECIFICATIONS SUBSECTION 306-1.3)
  - A. BACKFILL MAY CONSIST OF THE EXCAVATED SOIL EXCEPT THAT BACKFILL SHALL NOT CONTAIN ROCKS GREATER THAN 2 INCHES TO A DISTANCE OF 1 FOOT OVER THE TOP OF THE PIPE. THERE WILL BE NO SAND EQUIVALENT REQUIREMENT. IMPORTED COBLES/LESS SAND SHALL NOT BE USED AS A BACKFILL EXCEPT AS PROVIDED FOR IN NOTE 12C.
  - B. EXCEPT WHERE MECHANICAL COMPACTION IS REQUIRED BY THE PLANS OR SPECIAL PROVISIONS, TRENCH BACKFILL SHALL BE JETTED. FLOODING OR PONDING IS PROHIBITED. THE UPPER 3 FEET OF BACKFILL IN STREETS SHALL EITHER BE JETTED AND ALLOWED TO DRAIN TO PROVIDE A FIRM AND UNYIELDING SUBGRADE OR SHALL BE MECHANICALLY COMPACTED.
  - C. WHERE MECHANICAL COMPACTION IS SPECIFIED, DAMPENED SAND SHALL BE USED AS BACKFILL TO ONE FOOT OVER THE TOP OF THE PIPE. AFTER DENSIFYING THE SAND BY JETTING, THE REMAINDER OF THE BACKFILL SHALL BE MECHANICALLY COMPACTED. ALL MECHANICALLY COMPACTED BACKFILL SHALL BE COMPACTED TO 90% RELATIVE COMPACTION.
 

SUBSECTION 306-1.3.2 OF THE STANDARD SPECIFICATIONS IS MODIFIED AS FOLLOWS:

MAXIMUM COMPACTIVE EFFORT (FT-LB PER BLOW)	MINIMUM THICKNESS COMPACTED MATERIAL ABOVE BELLS OR CONCRETE EMBASEMENT (FT)	MINIMUM AREA OF COMPACTING FOOT (SQ IN)
200	1.5	16
400	2.0	25
625	2.5	36
900	3.0	48
1,225	3.5	49
1,600	4.0	64
2,025	4.5	64
2,500	5.0	64
3,600	6.0	81
4,900	7.0	101
6,400	8.0	100
8,100	9.0	100
10,000	10.0	144
12,100	11.0	144
14,400	12.0	144
16,900	13.0	144
19,600	14.0	144
22,500	15.0	144
100 x (FT COVER) <sup>2</sup>	OVER 15	196
  - D. BACKFILLING OVER CONCRETE BEDDING (MODIFIES STANDARD SPECIFICATIONS SUBSECTION 306-1.3.1):
 

BACKFILL MAY BE PLACED IMMEDIATELY AFTER PLACEMENT OF CONCRETE BEDDING, SUBJECT TO THE FOLLOWING CONDITIONS AND RESTRAINTS:

    - (1) BACKFILL SHALL BE PLACED WITHIN 1 HOUR OF PLACING THE CONCRETE BEDDING AND IS LIMITED TO 10 FEET ABOVE THE TOP OF THE PIPE. WATER DENSIFICATION OF THE INITIAL 10 FEET OF BACKFILL SHALL NOT BE PERMITTED SOONER THAN 12 HOURS FOLLOWING CONCRETE PLACEMENT. ADDITIONAL BACKFILL SHALL NOT BE PLACED UNTIL THE MINIMUM ELAPSED TIME INDICATED IN THE "CONCRETE CLASS USE TABLE", STANDARD SPECIFICATIONS SUBSECTION 201-1.1.3.
    - (2) EXCEPT FOR THE AREA BELOW THE PIPE INDICATED ON CASE 5 BEDDING INSTALLATION, THE CONCRETE SHALL NOT CONTAIN ACCELERATING ADMIXTURE.
    - (3) THE CONCRETE BEDDING SHALL BE COVERED WITH A MINIMUM 4 MIL PLASTIC MEMBRANE TO PREVENT CONTAMINATION BY THE BACKFILL.
    - (4) THE CONCRETE BEDDING SHALL BE INCREASED AT LEAST AN ADDITIONAL 2 INCHES IN DEPTH.
    - (5) BACKFILL SHALL BE PLACED IN A MANNER WHICH WILL NOT DISTURB OR DISPLACE THE CONCRETE (SUCH AS "TUMBLING" IT DOWN THE SLOPE OF THE MATERIAL ALREADY IN PLACE IN THE TRENCH).