CHAPTER 9

TRENCH BACKFILL/COMPACTION

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INDEX

CHAPTER 9 - BACKFILL/COMPACTION

9.1 GENERAL

No pavement cuts will be permitted for any County roadway granted probationary acceptance or overlayed within the previous 5 years. Emergency repairs for broken pipes, cables etc. will be allowed according to the requirements of Chapter 10. If a contractor makes a cut into new pavement as defined in this paragraph which is not an emergency cut, the contractor or owner of the infrastructure shall be liable for additional costs as defined in Chapter 10.

NOTE: All road surface street cuts shall require the use of C.L.S.M. (Controlled Low Strength Material) for backfill, or an alternative approved by the County Engineer prior to issuance of R.O.W. use permit. Variances from this requirement shall be on a case-by-case basis.

9.1.1 Existing pavement shall be cut so the joint line between existing and replacement pavement is straight and neat -- i.e. within 5° of vertical and free from horizontal irregularities. All cuts shall be by saw or blade. The cut depth shall be full depth to permit pavement removal without damage to remaining pavement. In the case of concrete removal, it shall be by full panel only per existing control joints.

9.1.2 Removed pavement shall be hauled away and disposed of in a proper manner (recycle or waste facility).

9.1.3 Base course material should be removed and stockpiled off of the road surface area for reuse during backfilling if it meets specifications. If not, it is to be hauled away from the R.O.W. and disposed of in a proper manner.

9.1.4 Sub-base material is to be stockpiled parallel to the trench alignment, in such a manner that encroachment upon the non-disturbed portion of the roadway and/or pedestrian walkways is kept to a minimum.

9.1.5 Safety standards relating to the shoring and stabilization of trench sidewalls should be maintained as prescribed by appropriate safety regulatory agencies (OSHA, State of Colorado). No open holes may be left overnight or unattended. All areas must be backfilled if unattended. Type III barricades will be required if construction area is in or within 10 feet of the roadway.

9.1.6 The trench for such construction shall not be opened for a distance of more than three hundred (300) feet at any one time, unless specifically authorized by the County Engineer or his designated representative.

9.1.7 The trench width shall be confined to those minimum dimensions, which will permit proper installation and acceptable pipe loading, as established by current acceptable engineering practices and all OSHA requirements.

9.1.8 No street cuts should be left in an open condition overnight, except for the portion necessary to commence work the following morning. Warning signs, barricades and lights, all in conformance with the Manual of Uniform Traffic Control Devices (MUTCD), shall be used in areas where trenching operations are in public roadways. All work shall have flashing lights used with warning signs and barricades. All such barricades, signs and warning devices shall be installed in accordance with the M.U.T.C.D. Type IV barricades will be required in or within 10 feet of the traffic area.

9.1.9 In trenching across the road, no more than one-half (1/2) of the traveled way is to be closed to traffic at one time, which requires the use of a traffic signal or flaggers. The trenched roadway shall be completely backfilled and a suitable driving surface restored before trenching the other half of the road. Final pavement restoration can be accomplished at one time when the utility installation or repair work is complete within a maximum of five working days for the permanent surface replacement.

9.1.10 Closure of any street (only by approval of the Douglas County Board of Commissioners), road approaches, or other access points will not normally be permitted. Upon trenching across such facilities, steel running plates, planks or other safe methods shall be used to provide for traffic to enter or leave the road or adjacent property. Refer also to Section 10.6.1 and 10.6.2.

9.1.11 Access to private driveways shall be provided at all times except during working hours when construction operations prohibit provision of such access.

9.1.12 Free access must be provided at all times to fire hydrants.

9.1.13 When, during the progress of the work, any excavation is to be made in County easements through private property, the contractor shall notify the property owners at least 24 hours in advance of beginning work or in accordance with right-of-way easements which set forth ingress/egress requirements.

The Contractor shall take precautions to limit the removal of or damage to existing pavements, sidewalks, curbs, lawns, shrubbery, trees, hedges, walls, fences, buildings or other existing improvements to the least practicable amounts and shall replace or restore such improvements to their original location and condition after the excavation has been backfilled and compacted.

9.1.14 It shall be the responsibility of the contractor to appraise himself of all specific conditions contained in private easements. He shall perform all of his work in accordance with the stipulations contained therein.

9.1.15 Where trenching excavation occurs within the roadway surface, the minimum allowable remaining pavement sections shall not be less than four feet (4') (not including the curb and gutter or concrete pavement) unless it is part of a monolithic concrete pavement section which shall be full panel or stone.

9.1.16 All road surface cuts, if granted by special permission by the County, shall be a minimum of five feet (5') in width on all asphalt cuts and full panel (or stone) replacement on all concrete or curb and gutter cuts.

9.1.17 All scheduled road closures must be approved by the Board of County Commissioners. All emergency road closures shall be per Chapter 10 of this manual.

9.2 BACKFILLING

9.2.1 The permittee shall advise the Engineering Division of the trench backfill date at the time the Engineering Division is notified that construction will take place. A minimum of 24 hours advance notification is required. Normally, backfill will take place on the same day of trenching; if this is not the case, the Engineering Division must be given the same prior notice as required for the initial trenching.

9.2.2 The bottom of the trench shall be prepared to provide a firm foundation for the pipe or facility in accordance with the bedding conditions specified by the geotechnical engineer or Special District for the type of pipe or facility to be installed. The subgrade of the trench shall be kept free of standing water. Where the trench subgrade material is found to be unsuitable and does not afford a solid foundation, the contractor shall excavate to such depth as necessary to construct a stable foundation. A stable foundation shall be constructed by placing crushed rock or other approved granular material under the pipe.

9.2.3 Backfilling shall be so placed that the pipe will not be displaced or damaged. Backfilling to a depth of one foot maximum over the crown of the pipe shall be made with granular soil or sand as required by the Douglas County Engineer or his field representative.

9.2.4 Immediately after the facility authorized by the permit has been placed in the trench, the trench shall be backfilled with approved material, which is free of humus, vegetable or other organic matter, frozen material, clods, sticks and debris and contains no stones having a dimension greater than three (3) inches. Said material shall be filled to an elevation which will allow placing the pavement base and wearing surface according to Figure 9.1.

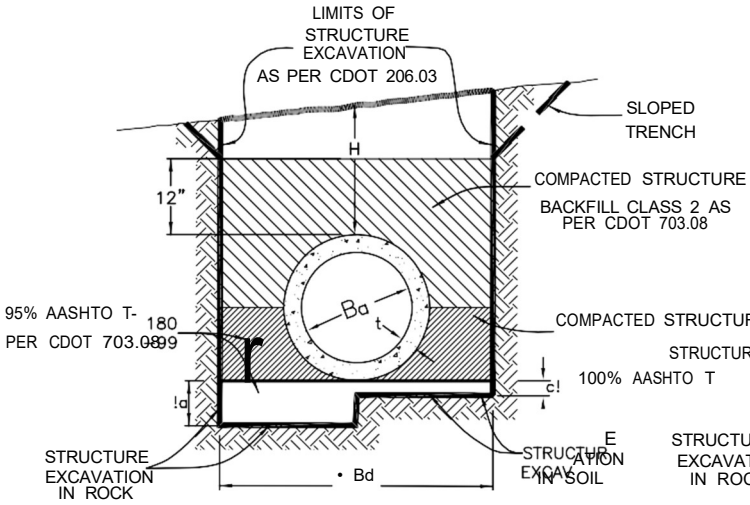
Compaction test reports shall be required daily, and all fill over one foot in elevation shall require a tester on site during backfill operation.

When, in the opinion of the Douglas County Engineer or his representative, the excavated material is unsuitable for backfill, this material shall be hauled away and granular backfill material satisfactory to the Douglas County Engineer shall be used.

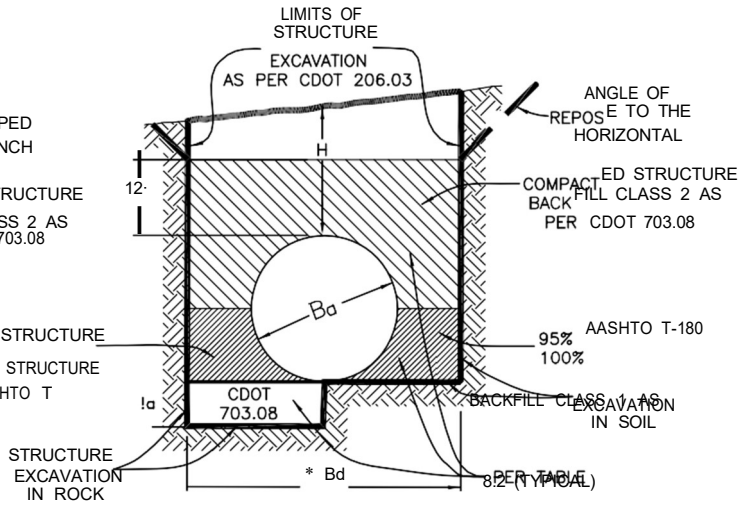
9.2.5 The subgrade shall conform to the lines, grades and cross-sections as shown on the approved plans. The backfill material shall be compacted in successive layers not to exceed eight (8") inches thick and shall be finished and maintained in a smooth compacted condition. The completed surface shall be free from rutting or other objectionable irregularities.

9.2.6 Within the roadway area, trench compaction shall be in accordance with AASHTO T99 or T180 as required in Section 203.11 of the CDOT Standard Specifications. See Table 8.2. Compaction tests must be performed by a Geotechnical Engineer and shall be a minimum of every 250 feet along the trench and every one foot in elevation. Testing intervals may be increased at the discretion of the Chief County Inspector.

RIGID PIPE



FLEXIBLE PIPE



MAXIMUM HEIGHT OF FILL OVER TOP OF PIPE IN FEET

REINFORCED CONCRETE

Ba in.	Min Ed in. **	.01 INCH CRACK D-LOAD 1350	2000	3000
		PIPE CLASS III	IV	V
18	35	19	28	43
24	42	18	28	42
30	50	18	28	42
36	59	18	27	41
42	68	18	27	41
48	78	18	27	41
54	89	17	26	40
60	98	17	26	40
66	108	17	26	40
72	117	17	26	40
78	125	17	26	40
84	135	17	26	40
90	154	17	26	40
96	163	17	26	40
108	173	17	26	40
120	191	17	26	40
132	208	17	26	40
144	224	17	26	40

** Based on Bd=1.33(Ba+2t). Wall thickness can vary **between** manufacturers.

STEEL - 2 2/3• x 1/2• CORRUGATIONS

Ba in.	Ed ft.	H ABOVE TOP OF PIPE IN FEET 1-1s	1s-2o	21-2s	2s-3o	31-3s	3s-4o
		THICKNESS IN INCHES					
18-48	4-7	.064	.064	.064	.064	.064	.064
54	7.50	.079	.079	.079	.079	.079	.079
60	8.00	.079	.079	.079	.079	.109	.109
66	8.50	.079	.079	.109	.109	.138	.138
72	9.00	.079	.109	.109	.138	.168	.168
78	9.50	.109	.138	.138	.168		
84	10.00	.109	.138	.168			

LEGEND

H = Height of fill over top of **pipe**
Ba = inside diameter (I.D.) of pipe
• Bd = Trench Width
t = Wall thickness of pipe
CLSM = Controlled **Low** Strength Material
a = Loose granular bedding, as fallows:
a=O" for Flexible Culverts in Soil.
a=3" for RCP Culvert in Soil.
a=12" for Culvert in Rock.

• TRENCH WIDTHS
RCP: Bd = Min. of 1.33(Ba+2t), or (Ba+2t)+12"
(Per AASHTO Section 17)
CSP: Bd = t.lin. of Ba+4' {Per AASITTO Section 12)

n1 :::;." .rial for SOIL shall be Structural Backfill
n1_ material for ROCK shall be Structural Backfill

GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE **WITH** THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.
2. ALL TRENCH INSTALLATIONS SHALL BE IN ACCORDANCE **WITH** OSHA AND COLORADO DEPARTMENT OF TRANSPORTATION REGULATIONS.
3. THE USE OF NON-REINFORCED CONCRETE PIPE WILL NOT BE ALLOWED IN DOUGLAS COUNTY.

RCP DESIGN CRITERIA

Safety Factor = Per ASTM C76
Soil Weight = 120 lb. per cu. ft.
Bedding = Type 2

ALL UTILITY REPAIRS MUST BE BACKFILLED WITH CLSM. SEE DOUGLAS COUNTY ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL FOR SPECIFIC DETAILS.

CSP DESIGN CRITERIA

3 • x 1 CORRUGATIONS: 60 TO 84 Pipe)
(shall be .06•4 thick (16 gauge) to H=40 ft.

Soil Weight = 120 lb. per cu. ft.
Safety Factor for Seam Strength = 2.00
Bucking Stress Level = 1/2 Yield Strength
Load Factor {Backfill) = 95% Standard Density, AASHTO-T 99 (K=0.86)

NOTE: All trenching shall comply with all State, Federal and O.S.H.A. safety requirements. It will be the responsibility of the Contractor to meet all safety requirements.

TO BE USED IN OPEN FIELDS OR PRIOR TO PAVING ROADS

PIPE INSTALLATION IN TRENCH

DOUGLAS COUNTY
COLORADO

Issued: 05/2013
Revised:

Drawing No.
SP.46a

NOTES:

1. This trench backfill detail specifies requirements in addition to those specified in the latest edition of the Colorado Deportment of Transportation's Standard Specifications for Rood and Bridge Construction.

2. A construction traffic control pion shall be submitted to and approved by Douglas County prior to issuance of construction permits in the County right-of-way.

3. Trench shall be braced or shored as necessary for the safety of the workers and protection of other utilities or structures in accordance with applicable local, state and federal safety regulations.

4. The trench width shall be confined to those minimum dimensions, which will permit proper installation and acceptable pipe loading, as established by current local, state and federal Safety regulations.

5. Backfill compaction requirements: Minimum density will be determined in accordance with AASHTO T 99 or T 180 as defined by COOT Standard Specifications Section 203.07 and COOT 703.03. Except for CLSM.

6. Full depth asphalt con be used as on alternative to base course.

7. Pavement edges shall be sow-cut. Edges shall be tock coated prior to patching.

8. All storm sewers shall be constructed so that a minimum cover is maintained to withstand AASHTO HS-20 loading on the pipe. The minimum cover to withstand live loading depends upon the pipe size, type and class, and soil bedding condition, but shall be not less than 1-foot at any point along the pipe. Other factors that affect the depth of the pipe ore hydraulic grade line elevations, inlet depths, adjacent utilities or utility crossings, including water and sewer services lines along residential streets, and connections to existing storm sewer systems. The roadway subgrade, which supports the pavement section is typically plowed to a certain depth, moisture treated and compacted prior to the placement of the sub-base, base course, and surfacing. There ore also instances where the subgrode material must be excavated and replaced or treated to a certain depth to mitigate swelling soils. These efforts con impact the storm sewer system if it hos not been designed with adequate depth. The design engineer shall use the best information available, including pavement design or soils reports (if available) to ensure that storm sewer pipes hove adequate depth.

9. Changes in design criteria will require compensating change in pipe design.

10. When pipe sewer is to be extended or replaced with pipe of different material, the connections shall conform to the detail shown on plans or be approved through Douglas County Engineering.

11. When two or more conduits ore laid side-by-side, they shall be placed so that they ore ½ outside diameter, or ½ outside span, or 3' apart, whichever is less. However, if end sections ore used, the minimum spacing shall be 1' between the outside edge of end sections.

12. TRENCH INSTALLATION (per OSHA Standards):

    a. Trenches over 5 feet in depth shall be either shored or the trench walls shall be sloped no steeper than 3:1 to the angle of repose. If sloped, the bottom of the slope shall be a minimum of 1 foot above the top of the pipe.

    b. Shoring will be required when the bottom of the slope is more than 3 feet above the bottom of the trench.

    c. All sheeting or shoring to be removed.

13. CLSM may be used in place of Structural Backfill.

14. CLSM shall not exceed a strength over 1000 p.s.i.

REFERENCE: Douglas County Drainage Manual and Colorado Deportment of Transportation "M" Standards.

TO BE USED IN OPEN FIELDS OR PRIOR TO PAVING ROADS

PIPE INSTALLATION IN TRENCH NOTES

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

Drawing No.
SP.46b

9.2.7 Use of an approved controlled low slump material (flowfill, shrinkcrete, flashfill or equivalent) for backfill of trenches may be allowed with prior approval of the County Engineer. All controlled low slump material (CLSM) must have a 28-day strength of 60 - 100 psi, and a maximum slump of three and one-half inches (3.5").

9.3 SUBBASE

The term "subbase", for the purpose of trench backfill discussion shall refer to the CDOT Class 1 or Class 2 material that is part of a structural pavement design. There may or may not be a subbase in the pavement section. If there is none, the base course is all CDOT Class 6 aggregate base course.

9.3.1 Subbase material shall conform to the lines, grades, cross-sections and thickness shown on the approved plans and shall be finished and maintained in an acceptable condition at least one day's progress in advance of base construction.

9.3.2 Subbase material shall be well mixed, free of organic matter and lumps or balls of clay, and shall consist of sound aggregate particles and suitable filler or binding materials which when placed and compacted will result in a firm, dense, unyielding foundation. Subbase material need not be crushed but may be of the pit run variety providing it is graded within the following limits:

TABLE 9.1
GRADATION OF SUBBASE MATERIAL

Standard Size of Sieve	Percentage of Weight Passing Sieve
2 1/2 inch	100
2 inch	95 - 100
#4	30 - 60
#200	5 - 15
Liquid Limit	35 maximum
Plastic Limit	6 maximum

9.3.3 Deviations from the gradation limits above will be permitted on approval by the County Engineer or his representative for unpaved roads where it can be adequately demonstrated that the proposed subbase material can fulfill the intent of these specifications.

9.3.4 Subbase shall be deposited and spread, without particle segregation in loose layers not to exceed 6 inches in depth. Each layer shall be thoroughly and individually compacted to 95% proctor (AASHTO T 99) density. Wetting or aerating and rolling of the material shall be required when ordered by the Douglas County Engineer or his

representative. Subbase shall not be placed on soft, spongy, or frozen subgrade or other subgrade, the stability of which, in the opinion of the Douglas County Engineer or his representative, is unsuitable.

9.4 FOUNDATION FOR BASE COURSE

9.4.1 Base material shall conform to the lines, grades, cross-sections, and thickness shown on the approved plans and shall be finished and maintained in an acceptable condition at least one day's progress in advance of placing prime coat.

9.4.2 Base material shall consist of hard, durable particles or fragments of stone or gravel crushed to the required size and a AP-filler of sand or other finely divided mineral matter. When produced from gravel, not less than 60% by weight of the aggregate retained on a No. 4 sieve shall consist of particles having at least one fractured face. Base material shall be free from vegetable matter and lumps or balls of clay and which when placed and compacted will result in a firm, dense, unyielding foundation. Base material shall meet the following grading requirements:

TABLE 9.2
GRADATION OF LIMITS OF BASE MATERIAL

Standard Size of Sieve	Percentage of Weight Passing Sieve
3/4 inch	100
#4	30 - 65
#10	25 - 55
#200	3 - 12
Liquid Limit	25 maximum
Plastic Limit	6 maximum

9.4.3 Base material shall be deposited and spread without particle segregation in loose layers not to exceed six inches in depth. Each layer shall be thoroughly and individually compacted to 95% proctor (AASHTO T 180) density. Wetting or aerating and rolling of the material shall be required as ordered by the County Engineer or his representative following review of all field test results. No base course shall be placed upon a soft, spongy or frozen subgrade or subbase or other subgrade, the stability of which, in the opinion of the Douglas County Engineer, is unsuitable.

9.4.4 Deviation from the gradation limits may be permitted by the Douglas County Engineer on unpaved roads provided it can be unequivocally demonstrated that the subbase material is not conducive to rutting, raveling or forming a soft yielding surface in the presence of moisture. Compaction equipment must be on the job site before excavation is started. Compaction equipment must be capable of compacting within the trench width limits to avoid bridging the ditch.

9.4.5 If the existing base course is untreated, it shall normally be replaced with CDOT Class 6 aggregate base material and compacted in layers not to exceed six inches. The resulting total compacted base thickness shall be eight inches or to the thickness of the removed base plus two inches. If the existing base material is asphalt treated aggregate it shall be replaced by a minimum of 3" of acceptable asphalt base or the existing base thickness plus 1", whichever is greater. A replacement 2" thick asphalt surface wearing course shall also be used when replacing asphalt treated aggregate.

Note: For the purpose of replacing a full depth asphalt pavement section, the top 2" may be considered the wearing course, with the remainder being the base course.

9.5 TRENCH COVER -- SUBGRADE

9.5.1 After the backfill has been made and compacted as specified, it shall be cut and trimmed to the required depth and cross section. Trench cover subgrade shall be free of all rock over 2 1/2 inches in size. It shall have a compaction of 95 percent or more, by standard tests, see Table 8.2, at the time of constructing curb, gutter, sidewalk, pavement and/or other permanent trench cover structure.

9.5.2 All excess excavated material shall be removed and disposed of outside the legal limits of the R.O.W. as the work progresses, unless the approval of the Douglas County Engineer is obtained for disposal of the material within the legal limits of the R.O.W. All parts of the roadway and various structures disturbed shall be restored to a condition equal to that which existed before starting the work.

9.6 TRENCH COVER -- ASPHALT

9.6.1 Temporary

9.6.1.1 Temporary Trench Cover
All trenches across traffic lanes, where it becomes necessary to remove any existing surfacing or pavement, shall be provided with temporary trench cover.

9.6.1.2 A temporary patch of cold-mix shall be placed on all pavement surface cuts immediately after backfilling has been completed and shall be removed at the time a permanent patch is made.

9.6.1.3 Minimum requirements for temporary trench cover shall be well compacted surfacing material conforming to "Road Mixed Asphalt Surfacing Material" of the CDOT Standard Specifications and shall match the existing asphalt or concrete thickness, but shall not be less than four inches (4") thick. The mineral aggregate shall, with a tolerance of 5 percent, conform to the grading specified for 3/8 inch maximum aggregate. Bituminous binder to be mixed with the mineral aggregate shall be liquid asphalt, Grade MC-3000 and shall be between 5 1/2 percent and 6 percent by weight of the dry mineral aggregate.

9.6.1.4 Temporary trench cover surfacing material shall be stockpiled on the job site and shall be placed within six hours after completion of trench backfill and compaction.

9.6.1.5 Temporary trench cover shall be properly maintained until permanent trench cover is placed.

9.6.1.5 Trench covered with temporary surfacing will be considered as open to traffic.

9.6.1.7 The surface of the temporary repaving shall be smooth and at the same level as the adjacent undisturbed paved area.

9.6.2 Permanent

Unless otherwise specified, the replacement of pavement shall be as follows:

9.6.2.1 In the areas where the wearing surface is asphalt concrete, replace the pavement with a Full Depth asphalt paving of a minimum thickness of four (4") inches but in all cases to a thickness of the old surface plus base course plus one (1") inch.

9.6.2.2 In areas where the wearing surface is Portland cement concrete, replace the pavement with concrete pavement conforming to the requirements of the governing authority. Said concrete pavement replacement shall be of the same depth as the original pavement, but not less than six inches thick on alleys or residential streets, nor less than eight inches on major or secondary streets and highways.

9.6.2.3 In areas where the wearing surface is other than asphalt concrete or Portland cement concrete, replace the pavement and base in kind. Said surface replacement shall be of materials and thickness conforming to the requirements of the governing authority.

9.7 PERMANENT ALTERNATIVE

9.7.1 Where original surface was Portland cement concrete; Portland cement concrete shall be placed to a thickness of six inches or the thickness of the removed pavement, whichever is greater.

9.7.2 Where original surface was asphalt concrete, bituminous treatment or mix, or oil mat; Asphalt concrete shall be compacted in layers not to exceed three (3") inches to a total compacted thickness of four (4") inches or the thickness of the removed pavement plus 1". whichever is greater. On oil mat surfaces or substandard asphalt surfaces, an overlay of Class "EX" asphalt pavement 1 1/2 inches thick shall be placed across the entire traffic lane disturbed by the trench and shall be finished as set forth below.

9.7.2.1 Immediately prior to placing the wearing surface, the abutting pavement edges shall be neatly cut (See Section 8.11).

9.7.2.2 The existing pavement shall be cleaned, removing all loose material and coated with hot liquid asphalt (Grade AC-10) or asphalt emulsion applied cold (Grade CSS-1h) to ensure a bond with the new asphalt surfacing.

9.7.2.3 The restored pavement shall be finished to a smooth riding surface and to the grade of the surrounding undisturbed pavement.

9.7.2.4 Pavement replacement shall commence not more than seven (7) working days after backfilling, unless the Douglas County Engineer permits otherwise.

9.7.3 In the event the trench edges fall in the wheel traveling portion of a traffic lane, existing or proposed, the applicant shall extend the finish surface paving to a point deemed satisfactory by the County Engineer, or his field representative. Finish surface paving shall be performed in such a manner as to provide a crown slope equal to that existing prior to excavation, with no ponding of run-off surface water either over the trench or at the joints between the new and original surfaces.

9.7.4 When road surface damage involves more than one traffic lane, a full width paving lift may be required. Individual jobs may require negotiations with the Division of Road and Bridge, at the discretion of the Director of Public Works, for partial participation in the cost of a full width overlay.

9.7.5 See Figure 9.1 for details of trench backfill and asphalt surface repair.

9.8 REPAIR TO GRAVEL ROADS AND SHOULDERS

9.8.1 Restoration of Unpaved Areas

9.8.1.1 Where the original surface was crushed rock or gravel for the wearing surface and foundation material, Class 6 aggregate base course shall be used as replacement material. It shall be placed to a compacted thickness minimum of eight (8) inches or the thickness of the removed material plus two (2) inches, whichever is greater. See Table 8.2.

9.8.1.2 **Compaction**
In the area from the R.O.W. line (fence line/property line) to a point five (5) feet outside of the roadside ditch flowline, all trenches shall be backfilled with excavated material and compacted to 90% standard compaction, or to the density of the existing ground, whichever is greater.

9.8.1.3 In all other areas not referred to in Section 9.8.1.2 above, including the gravel road, the shoulders and the roadside ditch to a point five (5) feet outside of the flowline; all trench compaction shall be in conformance with Figure 9.1 of these standards.

9.8.1.4 Erosion Control

During construction and after the trench is backfilled and compacted, erosion protection shall be provided per the Douglas County Storm Drainage Design and Technical Criteria Manual.

9.9 MAINTENANCE PERIOD

9.9.1 For a period of one year following the backfilling of any trench in the County R.O.W. and/or the permanent patching of the paved surface, the applicant shall be responsible for the condition of said trench backfill and pavement patches. During that time the applicant shall, at his own cost, upon request from the Douglas County Engineer, repair to the County Engineer's satisfaction any of the said patches which become settled, cracked, broken, or otherwise faulty. Settlement of the replaced road surface of one-half (1/2") inch or more within a six (6') foot straight edge shall constitute evidence of improperly compacted backfill material. If test results do not meet the standards for compaction as set forth in Sections 8.2 thru 8.5, the contractor shall be responsible for repairs or replacement to meet these standards. Settlement of 3/8 inch or greater with a six (6') foot straight edge will be cause for repair in the case of settlement or replacement in the case of unsatisfactory workmanship.

9.9.2 All inspection costs shall be borne by the permittee. Such costs shall be based on a schedule of charges on file in the office of the Douglas County Engineer.

9.9.3 The permittee shall notify the Douglas County Engineer in writing upon completion of work accomplished under the provisions of the permit.