

RESOLUTION NO. 1985-99

A RESOLUTION CONCERNED WITH THE ADOPTION OF THE
PUBLIC IMPROVEMENT INSPECTION MANUAL
FOR THE LA PLATA COUNTY ROAD AND BRIDGE DEPARTMENT

WHEREAS, pursuant to the provisions of Title 43, Article 2, Part 1 and Part 2, C.R.S., as Amended, La Plata County is charged with the responsibility for the construction and maintenance of the County's Primary and Secondary Road System within La Plata County; and

WHEREAS, the La Plata County Road and Bridge Superintendent has recommended to the Board of County Commissioners that a Public Improvement Inspection Manual for the La Plata County Road and Bridge Department setting forth standards, specifications, and regulations concerned with construction activities within the County Road rights-of-way should be adopted. This Manual for Public Improvement and Inspection within the County Road rights-of-way includes specific provisions for the issuance of permits, the charging of fees, the posting of bonds as security for all work within the County Road rights-of-way, the mandating of specifications for all construction activity within the County Road rights-of-way, as well as provisions for the closing of roads when necessary and in the public interest, the issuance of "stop work" orders for unauthorized and unpermitted activities within the County Road rights-of-way and procedures with regard to installation of utility facilities within the County Road rights-of-way which are in the best interest and for the welfare of the citizens and residents within La Plata County; and

WHEREAS, it is the intent of this Board, by adoption of the Public Improvement Inspection Manual for the La Plata County Road and Bridge Department, that no construction or other types of activities affecting County Roads shall occur within the County Road rights-of-way except as authorized and in accordance with the provisions of the Public Improvement Inspection Manual.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF LA PLATA COUNTY, COLORADO, AS FOLLOWS:

1. The Public Improvement Inspection Manual for the La Plata County Road and Bridge Department attached hereto and incorporated herein by reference as Exhibit "A" is hereby adopted and the provisions of said Manual shall be applicable to all persons, corporations, or entities engaged in any construction or other activities within the rights-of-way of the La Plata County Road System.
2. Copies of the Public Improvement Inspection Manual for the La Plata County Road and Bridge Department, set forth as Exhibit "A", shall be available to the public at the La Plata County Road and Bridge Department, the La Plata County Clerk and Recorder's office, and the office of the Board of County Commissioners of La Plata County at a price to be set by this Board.

3. The power and responsibility for enforcement of the provisions of the Public Improvement Inspection Manual for the La Plata County Road and Bridge Department is hereby delegated to the La Plata County Road and Bridge Superintendent and his authorized designees, including, but not limited to, any appointed La Plata County construction inspector.
4. To the extent referenced and the Public Improvement Inspection Manual for the La Plata County Road and Bridge Department, the following publications are hereby adopted, as applicable, to the enforcement of the provisions of the Manual:
 - a. Public Works Inspector's Manual (latest edition blue book).
 - b. Standard specifications for Road and Bridge Construction, Colorado Division of Highways (latest edition silver book).
 - c. Manual on Uniform Traffic Control Devices (latest edition white book).
 - d. Standards of American Association of State Highway and Transportation Officials (latest editions).

All of these required by the Public Improvement Inspection Manual for inspections or permits shall be made payable to La Plata County.

APPROVED AND ADOPTED in Durango, Colorado this 27th day of August, 1985.



ATTEST:

Linn Johnson
Deputy Clerk to the Board

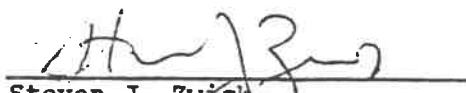
BOARD OF COUNTY COMMISSIONERS
LA PLATA COUNTY, COLORADO

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R. T. Scott, Commissioner

APPROVAL BY COUNTY ATTORNEY:


Steven J. Zwick

Distribution:

INITIALS	NAME	DATE
	Road & Bridge Superintendent	
	County Engineering Department	
	County Attorney	
	County Building Department	
	Central Files	

Encl.
SJZ:clb

2-3.1 A non-cancellable permit bond in the amount of \$5,000.00 or an amount equal to that required to restore the right-of-way, as determined by the La Plata County Road and Bridge Department, whichever is greater, payable to La Plata County, shall be required in the name of the permittee prior to issuance of any permit. Said bond shall assure that the permittee will comply with all County standards and specifications and shall assure recovery by the County of any expense incurred, within a period of 365 days, following the expiration date of a permit, to the amount of said bond, due to failure of the permittee to comply with the provisions of this resolution, or to otherwise cause expense to the County as a result of the work performed.

2-3.2 Municipalities, quasi-municipal agencies, mutual companies, electric, gas and communications utilities may provide a Letter of Responsibility in lieu of posting the required bond. Subject Letter of Responsibility shall be in the following format:

PUBLIC IMPROVEMENT INSPECTION

MANUAL

LA PLATA COUNTY

ROAD AND BRIDGE DEPARTMENT

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SECTION 1

INTRODUCTION TO PUBLIC WORKS CONSTRUCTION INSPECTION

1-1 GENERAL

Information in this part of the Manual is designed as an introduction to public works construction inspection, and the technical information is contained in Section 3 and 4. This is intended to provide the Construction Inspector with a general overview of the policies and procedures of construction inspection and to orient the Inspector to his duties and responsibilities. Specific detailed information not covered in this Manual shall be provided to the Inspector through the following references:

- A. Public Works Inspectors' Manual (Blue Book)
- B. Standard Specifications for Road and Bridge Construction, Colorado Division of Highways (Silver Book)
- C. Manual on Uniform Traffic Control Devices (White Book)

Construction Inspector must work constantly to achieve a high standard of excellence in the administration and quality control inspection of public works improvement projects. The Inspector must have the perspective of knowing the role or function and purposes of other organization elements and groups of the County and the relationship they have to his own immediate area of participation and responsibility. With such understanding the Inspector can utilize their support in the process of accomplishing the work. He has to have a thorough knowledge of the project or phase of work to which he is assigned. He must know sound construction methods and the latest techniques for their implementation. He has to be experienced in all standard inspection procedures and coordinate his work with the contractor or his representative so that the combined effort will produce the specified quantity and quality required by the specifications. He must be timely, but not hasty to condemn. However, once he is aware of work that endangers the quality, he is to be firm in his insistence on corrective action. He must keep in mind that an order to "tear it out" is sometimes necessary, but realizes that such action often is of questionable benefit to the public, which very often pays the cost in delay, inconvenience and eventually in money represented by rising construction costs or future work.

1-1.1 LEGAL ASPECTS OF CONSTRUCTION

La Plata County requires detailed and continuous inspection of all work paid for with public funds or which is performed in the public right-of-way. The Construction Inspector is the representative of the County at the site of the work who is empowered to enforce the

provisions of the contract or permit. He is authorized to reject materials and workmanship not in conformity with the contract or permit requirements.

1-1.2 CITIZEN CONCERNS/PUBLIC RELATIONS

These concerns occur before, during and after construction. The Inspector shall be courteous when responding to the public citizens regarding their concerns. A Citizen Concern form shall be filled out following each public inquiry. The Inspector shall then investigate the case and inform the citizens of his findings by either the phone or a letter.

1-1.3 CHARACTERISTICS AND TRAINING OF THE INSPECTOR

To be successful, the Inspector must have a character and personality of such strength as to merit the respect of those with whom he works. He must be firm but fair in his decisions and follow through to insure that he obtains compliance with his instructions. He should be understanding of the contractor's problems and willing to cooperate at all times to secure acceptable work at the least cost without compromise of the plans and specifications.

The Inspector must be alert and observant. He must maintain a spotless service record and conduct himself in such a manner that it will reflect credit upon the County. A proper sense of proportion will enable him to give greater attention to the more important matters.

He is NOT a designer, although by using plans and specifications, he must know what the designer is trying to do. Approved plans are furnished to the Inspector by the Engineering Supervisor. Familiarization with the plans is essential to prepare the Inspector for a background in the work to be performed. He shall:

A. Identify work requiring construction permits. The quality of work will be checked later against the permit as issued.

B. Identify unique work or special structures. The Inspector should be familiar with any special inspection requirements or receive advice and training before work begins.

C. Check plans for design requirements that may not be practical during construction or for missing details necessary to control the work. Bring these items to the attention of the Engineering Supervisor. However, any design change in a previously approved set of construction plans has to be approved and authorized in writing by the Road and Bridge Department Director or Engineering Supervisor.

D. Review specifications as called out on the plans. Variances from County specifications must be revised or accepted as adequate to meet County requirements. Coordinate revisions through the Road and Bridge Director or Engineering Supervisor.

In summary, the fundamental requirements for a good Inspector are:

- A. Knowledge: It is of paramount importance that the Inspector has a knowledge of the work he is inspecting.
- B. Common Sense: An important commodity that is valuable to a good Inspector in order to achieve completion of project work with minimum friction and maximum speed.
- C. Observation: The Inspector must perform his function by observation of what is going on about him. "Seeing" in this context includes observation with the eyes as well as considered thought about the image observed.
- D. Tools: There are tools the Inspector must use to perform his function. This includes the general run of measuring devices. Perhaps the most important tools are a notebook and pencil.

SECTION 2

STREET/ROAD CUT PERMITS AND REQUIRED BONDS

2-1 PERMITS

2-1.1 All work performed in a public right-of-way shall require the issuance of a street/road cut permit. Permits shall be obtained at the Road and Bridge Department, 26616 Highway 160 South, Durango, Colorado.

2-1.2 Those agencies set forth in paragraph 2-3.2 may obtain a permit under their Letter of Responsibility or follow the procedure set forth in paragraph 2-1.5 thereby assuming full responsibility for the work performed or, at their option, require the contractor actually performing the work to obtain a permit in which event the contractor would be required to furnish a bond as set forth in paragraph 2-3.1 thereby assuming full responsibility for the work performed. Except as set forth therein the contractor performing the work shall be the permittee.

2-1.3 The work of installing range boxes, surveying monuments adjusting manhole rings and service boxes, or any similar work undertaken solely for the convenience of and at the order of La Plata County shall require a permit; however, the permit will be issued at a "no fee" basis.

2-1.4 Permits shall apply to emergency repairs; however, a delay of 48 hours is granted, excluding weekends and holidays, following the beginning of such repair before the permit for same shall become a penalty permit.

2-1.5 A utility may issue their own work or job order and proceed with the job. A copy of the work or job order shall be on the job site. In event this procedure is utilized, the utility shall notify the La Plata County Road and Bridge Departments Engineering Division by telephone prior to the commencing of the work (does not apply to emergency repairs). The location and estimated time of starting the job shall be provided. The utility shall provide a monthly listing and copies of each job or work order, of all jobs started, to include lineal footage of trenches or number of cuts, and job location, as applicable. Monthly permits will be issued and billings will be made by the Road and Bridge Department.

2-1.6 No permits shall be issued to any person or corporation except as set forth in paragraph 2-3.

2-1.7 Any permit issued shall pertain only to making an opening within the County owned right-of-way and it in no way to be considered a permit to enter on any private property adjacent to such right-of-way nor to alter or disturb any facilities or installation existing within the right-of-way and which may have been installed, and are owned, by others.

2-1.8 Permits, when issued shall be valid for a period of ninety calendar days, and may be renewed for one (1) additional ninety calendar day period, provided the renewal is obtained by written request prior to the expiration date of the permit. Failure to obtain a renewal as stated herein will require the obtaining of a new permit and payment of applicable fees.

2-1.9 Any permit determined to be without an adequate bond as required in paragraph 2-3 shall be subject to immediate revocation by the La Plata County Road and Bridge Department.

FEES

Fees shall be assessed for permits and inspection at the time of issuance of the permit in accordance with the following schedule:

PERMIT FEE SCHEDULE

<u>UTILITIES</u>	<u>INSPECTION FEE</u>	<u>PERMIT FEE</u>
Service Cuts (partial or full width)	\$ 7.00 each	\$3.00
Manhole or Drop Inlet	7.00 each	3.00
Adjustment to Manhole	---	---
Longitudinal Cuts	.06/L.F.	3.00
0 - 600 L.F.	36.00 Flat Fee	3.00
Difference between 600 and 1200 L.F.	.05/L.F. + \$36.00	3.00
Difference between 1200 and 1800 L.F.	.04/L.F. + \$66.00	3.00
Difference between 1800 and 2400 L.F.	.03/L.F. + \$90.00	3.00
Difference between 2400 and over	.02/L.F. + \$108.00	3.00
Utility Exploration (Intersection)	7.00 each	3.00
<u>STREET/ROAD CONSTRUCTION</u>		
Subgrade Preparation	.03/L.F.	3.00
Aggregate Base Course	.03/L.F.	3.00
Asphalt Surfacing (Paving)	.03/L.F.	3.00
*Curb & Gutter**	.06/L.F.	3.00
Driveways	7.00 each	3.00
*Sidewalk**	.04/L.F.	3.00
*(When placed monolithically, either combination or 6" vertical)**	.07/L.F.	3.00
**MINIMUM CHARGE	7.00	3.00
<u>BRIDGES</u>		
Bridges to include concrete box culverts	300.00	3.00

The following construction work will require a permit:

- A. Meandering Sidewalk
 - 1. All sidewalks or portions of sidewalk in the right-of-way
 - 2. All sidewalks not in County right-of-way but on public lands
 - 3. All sidewalks where the County may be charged with maintenance
 - 4. Rates will be according to the fee schedule for sidewalks
- B. Replacement of Curb and Gutter and/or Sidewalk
 - 1. Replacement within one year from the original permit by the original contractor will require a "no fee" permit
 - 2. Replacement after one year by the original contractor
 - 3. Any replacement by a contractor other than the original permit holder
 - 4. The rate for (2) or (3) will be according to the fee schedule for curb and gutter and/or sidewalk
- C. Sprinkler System
 - 1. Sprinkler system in all cases except along frontage of single family or duplex residences
 - 2. The rate will be according to the fee schedule for service cuts and main extensions
- D. Road Work
 - 1. Any excavation or embankment within County right-of-way
 - 2. Any subgrade, base course, and/or paving on public property unless specifically exempted by contract
 - 3. Rates will be according to the fee schedule
- E. Drop Inlets
 - 1. Inlets will require a separate entry on the permit when installed by the storm sewer contractor
 - 2. Inlets will require a permit when installed by a separate contractor
 - 3. The rate for each inlet will be assessed the same as a service cut
- F. Manholes
 - 1. Manholes will require a separate entry on the permit when installed by the sewer contractor
 - 2. Manholes will require a permit when installed by a separate contractor
 - 3. The rate for each manhole will be assessed the same as a service cut

G. Raising Manholes and Water Valves

1. Adjustments done by the paving company, as requested by the County, will not require a permit
2. Adjustments done by a utility company will require a "no fee" permit
3. Adjustments by contractor other than above will require a permit
4. The rate will be assessed the same as a service cut
5. Concrete collars will not be allowed. All castings will be 1/2" below finish asphalt grade. In a gravel road, gravel shoulder or roadside ditch castings will be at least 6" below finished grade

H. Street Cuts (Special)

1. Installation of storm sewers
2. Installation of meter pits by other than the contractor holding the original tap permit within one year of the permit
3. Attaching to a previously installed water or sewer tap when excavating on the right-of-way line
4. Rates will be according to the fee schedule for service cuts and main extensions

I. Utilities Through County-owned Property

1. Installation of a storm sewer, water, sewer, or any other utility crossing County lands not designated as right-of-way
2. The rates will be according to the fee schedule for utility mains

2.2.1 Any person or corporation commencing any work without prior valid written authorization shall be required to pay a penalty fee. The penalty fee shall be \$50.00 for each occurrence.

2-2.2 Exploratory test holes made to determine location of existing utilities in an intersection shall be charged the fee as set forth in the fee schedule. A maximum of five (5) test holes, not to exceed two (2) feet square each per intersection, shall be permitted by a single fee.

2-2.3 REFUNDS

Inspection fees may, at the discretion of the Road and Bridge Department, be refunded to a contractor in those instances where the proposed work is not accomplished through no fault of the contractor. The permit fee itself is not subject to refund.

2-3.1 A non-cancellable permit bond in the amount of \$5,000.00 or an amount equal to that required to restore the right-of-way, as determined by the La Plata County Road and Bridge Department, whichever is greater, payable to La Plata County, shall be required in the name of the permittee prior to issuance of any permit. Said bond shall assure that the permittee will comply with all County standards and specifications and shall assure recovery by the County of any expnese incurred, within a period of 365 days, following the expiration date of a permit, to the amount of said bond, due to failure of the permittee to comply with the provisions of this resolution, or to otherwise cause expense to the County as a result of the work performed.

2-3.2 Municipalities, quasi-municipal agencies, mutual companies, electric, gas and communications utilities may provide a Letter of Responsibility in lieu of posting the required bond. Subject Letter of Responsibility shall be in the following format:

La Plata County
Board of County Commissioners
1060 E. Second Avenue
Durango, Colorado 81301

LETTER OF RESPONSIBILITY

THIS IS TO CERTIFY THAT _____,
Does agree that, in lieu of posting the required performance bonds, the
following practices will be adhered to:

1. That no road cuts, in any La Plata County road, street, highway
or other right-of-way, for any purposes, will be made without having
secured the proper road cut permit.

2. That any road cut made by the above will be backfilled and
compacted in accordance with the current requirements of La Plata
County, and the surface restored to a condition equal to or better than
that condition which existed prior to the making of the cut.

3. The responsibility for the maintenance of the restored cuts
shall rest with the above for a period of one year after the cut has
been filled and resurfaced.

4. That, in the event repairs are not made or maintained, to the
satisfaction of the La Plata County Road and Bridge Department,
necessary repairs may be made by the County at the expense of the above
named organization.

Subscribed to this _____ day of _____, 19__.

By: _____
Signature of Authorized Agent

Title

NOTE: This document is to be filed in the office of the Road and Bridge
Department's Engineering Division.

2-3.4 It shall not be acceptable to the County to receive cash deposits, certified checks or similar security in lieu of a bond. Bonds and Letters of Responsibility shall be filed in the office of the Road and Bridge Department's Engineering Division.

SPECIFICATIONS

2-4.1 Any work done under this item shall result in a repair being made to the street or other County property involved, said repair causing the street or other property to be returned to a condition equal to or better than original, within the limits of careful, diligent workmanship, good planning, and quality materials, said repair being accomplished in the least possible time and with the least disturbance to the normal functioning of the street or other property.

2-4.2 All backfill material, compaction, and resurfacing of any excavation made in the County property will be done in accordance with specifications and standards approved by and on file with the office of the Road and Bridge Department.

Normally, only one side of the street may be blocked at any given time. Should operating conditions require closing, advance approval of the closing must be obtained from the County Road and Bridge Department. The permittee will notify the appropriate fire protection district, the La Plata County Sheriff's Office, the Colorado State Patrol and the appropriate school district concerning exact location of street barricades and dates traffic will be impeded. Barricades shall be maintained by the responsible contractor.

Any person, municipality, quasi-municipality agencies, mutual companies, electric, gas or communication utility corporation, to include cable T.V., who without first having obtained a permit and/or who having made a cut in a public right-of-way which has settled, has failed, or which has not been repaired in conformance with established County standards, shall be subject to a "Stop Work Order" issued by the County Road and Bridge Department Office, whereupon the person, municipality, or utility shall, except for emergency repair work, discontinue all work within public right-of-way within La Plata County until such time as the required repair has been satisfactorily completed, and no further permits will be issued until the repair has been made or the County reimbursed for their expenses. La Plata County may, on its own initiative, make required repairs and bill the responsible contractor. Minimum charge shall be \$150.00 administrative charge, plus costs for labor, materials and equipment on a portal to portal basis.

2-7 UTILITY INSTALLATIONS

2-7.1 UNDERGROUND

All utility lines, including cable T.V., shall be installed a minimum of two (2) feet below ground surface, or proposed roadway elevation, whichever is lower. This requirement is applicable through the right-of-way, including ditch lines and/or borrow pits. Exceptions may be granted by the Road and Bridge Department where warranted and upon prior written request and approval.

2-7.2 OVERHEAD

A minimum ground clearance of 18 feet 0 inches shall be provided where overhead utility lines cross public roads and streets. The clearance shall be measured at the lowest point where the line crosses the traveled portion of the road and/or street.

2-7.3 INSPECTIONS

The County Road and Bridge Department shall be notified prior to the commencement of all jobs. An inspection will be made by the County Road and Bridge Department of all work covered by permits and/or work orders within the limits of the available personnel. To the maximum extent possible, the inspections will be performed prior to the backfilling of trenches; however, backfilling operators are not to be delayed pending actual inspection. The inspection performed will be at the discretion of the Road and Bridge Department and will include, but not limited to, densities, moisture content, resurfacing and cleanup activities. In instances where there is a question as to the acceptability of the materials to be used for backfilling, advance request for an inspection in these instances shall be made.

This regulation shall apply to any person, corporation, municipality, quasi-municipality agencies, mutual companies, electric, gas or communication utility, to include cable T.V., who for any reason cuts, disturbs, or otherwise defaces any County property being a public road for the purposes of installing or repairing, or for any reason pertaining to the presence of, an underground utility or structure.

SECTION 3

INSPECTION POLICIES AND PROCEDURES

3-1 GENERAL

The policies and procedures set forth in this Section and in Section 1 apply generally to all classes of work. Procedures, information and inspection responsibilities concerning construction materials and materials control are contained in Section 4.

Inspection of public works construction is a control exercised by La Plata County Road and Bridge Department over the materials, methods, and workmanship used by contractors in the performance of their work. The purpose of inspection is to ensure compliance with the plans, specifications, and other requirements of contracts, purchase orders, and permits for public works construction.

Inspectors shall not prescribe or interfere with the contractor's methods of performing work. However, if, in the opinion of the Inspector, the methods of the contractor will not meet the requirements of the contract, purchase order, or permit, the contractor shall be warned and, if the contractor's methods will produce a hazard to life, health, or property, or will result in defective work which would be impracticable to correct or replace subsequently, the Inspector shall stop the portion of the work involved and immediately notify his Supervisor.

The La Plata County Road and Bridge Department provides construction inspection for the following public improvement projects:

- 3-2 Road Construction
- 3-3 Concrete Curb, Gutter and Sidewalk
- 3-4 Drainage Systems
- 3-5 Utility Trenches and Street Cuts
- 3-6 Structures

GENERAL

The street roadbed structural section includes the pavement, base courses and subbase, if required. Inspection of preparing each layer of a roadbed structural section is absolutely essential to the full extent. Consequently, the Inspector shall organize his inspection activities in such a manner as to allow himself more time and effort to spend on this phase of the project.

DEFINITIONS AND USES OF MATERIALS

BASE -- The layer immediately below the pavement used in a pavement system to reinforce and protect the subgrade or subbase.

SUBBASE -- The layer used in the pavement system between the subgrade and the base course.

SUBGRADE -- The prepared and compacted existing material below the pavement.

STRUCTURAL SECTION -- The pavement and base, subbase and processed layer of existing material below the pavement.

The process of building up the structural section requires some processing of the subgrade material. This processing usually provides for ripping and discing the material to the specified depth, removing large rocks; bringing the material to optimum moisture by aerating the material if it is too wet or adding moisture if it is too dry; and recompacting the material to the uniform density required by the specifications.

When subbase and/or base course is involved, less processing of the subgrade is required. Conversely, if the native material is to be the subgrade for pavement, more processing is required to prepare it to receive the pavement.

Subbase and base courses are composed of selected or treated materials and aggregate mixtures. Properly installed, these materials increase the strength of the structural section and its ability to support the traffic loads. How well this is done also affects the long term economy and length of service.

3-2.1 SUBGRADE PREPARATION FOR PAVEMENTS

Subgrade is the surface upon which a pavement, base or subbase is to be placed. The type of subgrade is designated as "subgrade for base", "pavement subgrade", or similar terms.

Compaction of a subgrade increases its strength properties and, as a result, less strength is required in the pavement. Almost invariably the cost of achieving this additional strength by compaction is materially less than the cost of added pavement thickness. Higher subgrade density also means higher bearing values and less probability of settlement. Compaction procedures and equipments are discussed in Section 3-2.2.

Another important factor in subgrade preparation is the smoothness of the completed surface. If the subgrade surface is not constructed to plan elevations, true cross-section, and within the specification tolerances for smoothness, the surface of the pavement will usually be adversely affected. In particular, bituminous pavement laid by a mechanical paver operating on the subgrade will tend to reproduce the irregularities of the subgrade in the finished surface of the pavement.

Dry rough-grade surfaces should be watered prior to processing. Scarifying is required to a depth of six inches, with all rocks over three inches in diameter removed from the loosened material. Such rocks, if left in the top six inches of subgrade would introduce problems later in obtaining uniform compaction and in maintaining the pavement, since these hard spots tend to "pierce" flexible pavements under heavy traffic loads and vibrations. Sand or gravel does not require this scarifying operation unless the presence of such rocks is known to be in the top six inches of the subgrade.

After rolling, the Inspector should not permit low areas to be filled with loose material and rerolled unless the smooth rolled surface of the low area has been scarified to a depth of at least two inches and watered (if necessary). The scarifying operation helps to prevent laminations in the soil.

Grade stakes will be set by survey crews in accordance with project construction plans approved by the La Plata County Road and Bridge Department. All checking of line, elevation, and cross-sections will be accomplished by the Inspector from these stakes, blue tops, or hubs referenced from blue tops. Most grade checking by the Inspector is done with an inclinometer or standard level and rod reading. By the time any significant amount of grade is checked, the contractor's representative is made aware of the quality or lack of quality in a prepared subgrade and he can then take the necessary action to correct any deficiencies.

Rolling of subgrade is normally accomplished with a roller weighing not less than ten tons. Pneumatic-tired rollers may be used to produce the required densities but steel-tired rollers are usually required to smooth the surface to the cross-section configuration required. Soft spots discovered during rolling necessitate some removals and refilling with suitable material. Areas inaccessible to rollers must be tamped to acceptable densities and shaped to the proper section by hand methods.

3-2.2 COMPACTION, PROCEDURES AND EQUIPMENT

GENERAL

The method used for obtaining compaction in fills and backfill is usually controlled by the specifications. The Inspector should familiarize himself with the Special Provisions and Standard Specifications for the project with respect to limitations and special conditions.

The principal factors involved in compaction operations are: the type of material to be compacted, the type of equipment used, the amount of moisture present during compaction, the thickness of the lift being compacted, and the number of passes of the equipment of each lift. Earth embankment materials shall be deposited in layers not exceeding eight inches in thickness before compaction.

Each layer of embankment material shall be compacted by routing construction equipment, compactors, or both, uniformly over the entire surface of each layer before the next layer is placed. At least one compactor shall be in simultaneous operation with each separate embankment placement operation.

A lift shall not be covered by another lift until compaction complying with the above requirements is obtained. Sufficient compaction tests are arranged as subgrade is completed to insure that the specified densities are attained. Compaction tests are provided either by the La Plata County Road and Bridge Department Engineering Inspector or by a private consultant hired by the contractor. After the proper tests are performed, the results of such tests shall be conveyed to the contractor in writing from the Inspector. Depending upon the results of the compaction tests, the contractor shall be directed to proceed with the next phase of construction or take the necessary action to correct any deficiencies.

PROOF ROLLING

Proof rolling shall be done after specified compaction has been obtained. This process is generally accomplished by using a full water truck moving at a very low speed over the finished subgrade. Areas found to be weak and those areas which failed shall be ripped, scarified, wetted if necessary and recompacted to the requirements for density and moisture at the contractor's expense.

After subgrade is accepted, the contractor must protect it from damage until it is covered with a base or pavement. Subgrade which has been prepared too far in advance of the subsequent paving operations is likely to be damaged by traffic or rain and may require rerolling and rechecking.

COMPACTION EQUIPMENT

Common types of compaction equipment are listed in the following table:

Roller Type	Weight In Tons	Recommended Lift Thickness (Loose In.) for 8 Passes		Operating Speed (M.P.H.)	Most Suitable Soil Type
		Lighter Units	Heavier Units		
Pneumatic Figure 1	3-12	4- 6	6- 8	1-15	Sandy, sandy clay, silts
Vibratory Roller Figure 2	20-50	12-18	12-24	5-10	All types
Tamping (sheepsfoot) Figure 3	2-20	6- 8	8-12	5-10	Clay and silty clay
Tandem (2-axel) Figure 4	3-16	4- 6	6- 8	1- 5	Granular
Three Wheel Figure 5	5-20	4- 6	6- 8	1- 5	Granular

The following table summarizes the types and uses of compaction equipment.

COMPACTION EQUIPMENT TYPES & USES

<u>Materials</u>	<u>Type of Compaction Equipment</u>
A. Fine grained embankment and subgrade soils	Sheepsfoot rollers Segmented steel-wheeled rollers Pneumatic-tired rollers Vibratory steel-wheeled rollers
B. Granular base, subbase, and improved subgrade courses	Pneumatic-tired rollers Vibratory compactors (both shoe and and steel-wheeled type) Segmented steel-wheeled rollers
C. Coarse aggregate base courses	Shoe-type vibratory compactors Steel-wheeled vibratory rollers Steel-wheeled rollers Pneumatic-tired rollers
D. Plant-mix base, leveling or surface courses	Breakdown rolling: Steel-wheeled three-wheel rollers Steel-wheeled rollers (two-axel tandem rollers) Intermediate rolling: Pneumatic-tired rollers (self-propelled) Two- and three-axel tandem rollers Final rolling: Steel-wheeled rollers (two- or three-axel tandem rollers)

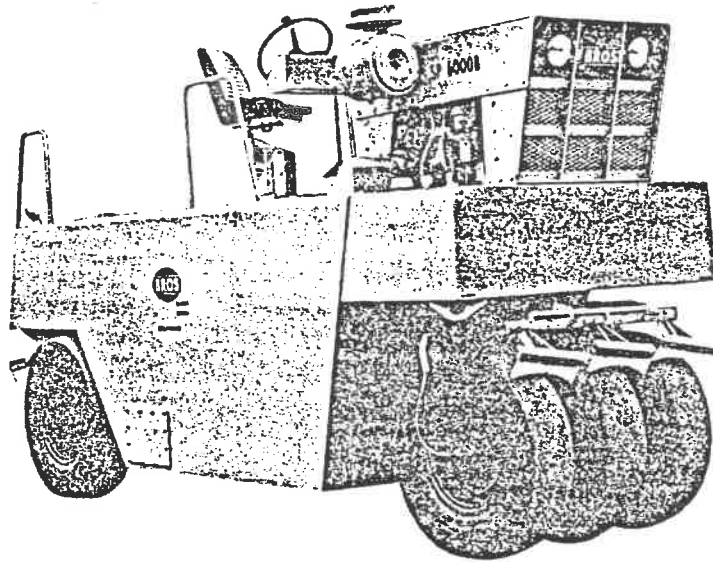


Figure 1. TYPICAL PNEUMATIC-TIRED ROLLER

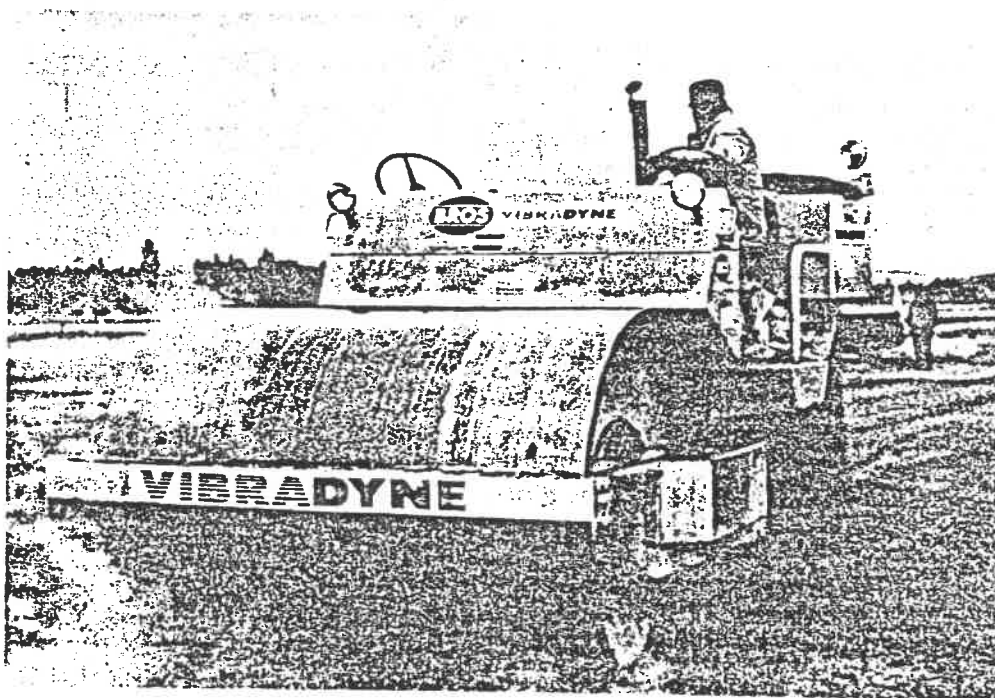


Figure 2-A. SINGLE DRUM VIBRATORY ROLLER

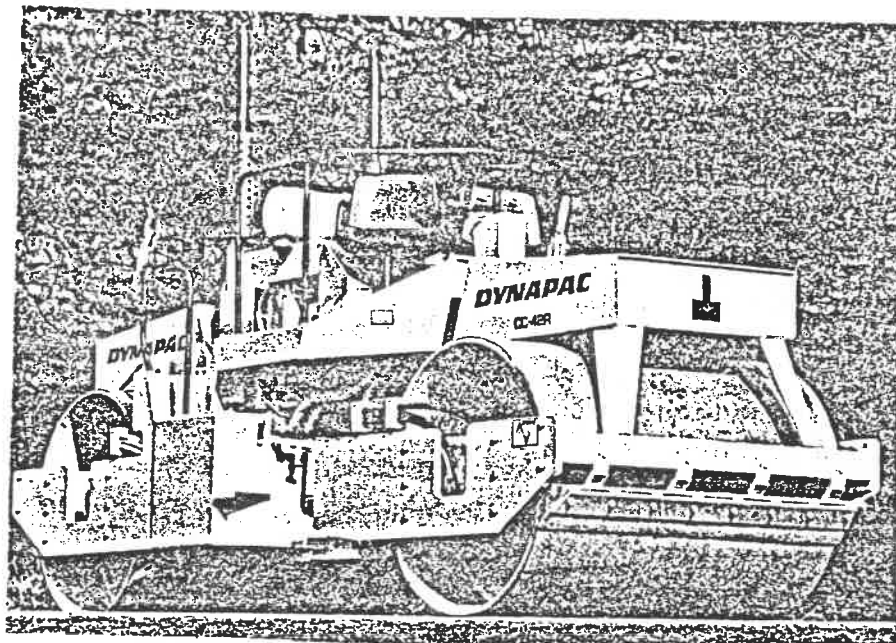


Figure 2-B. DOUBLE-DRUM VIBRATORY ROLLER

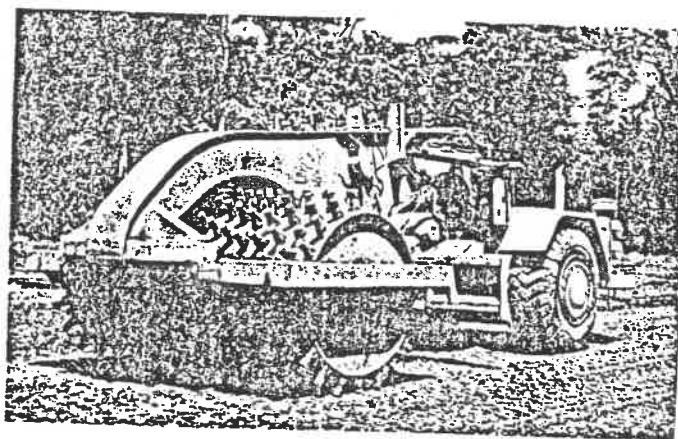


Figure 3. SELF-PROPELLED, DUAL DRUM
SHEEPSFOOT ROLLER

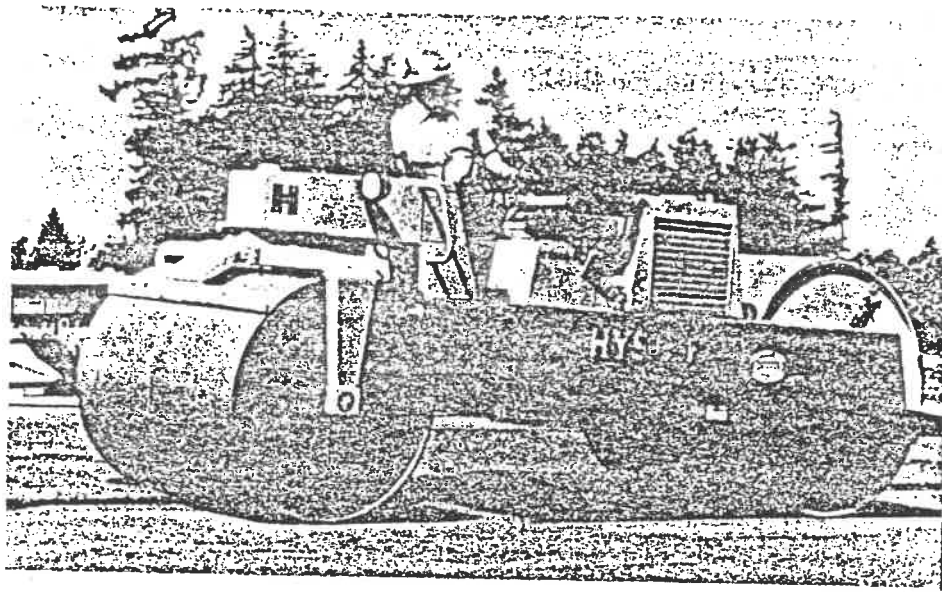


Figure 4. STEEL-WHEEL TANDEM ROLLER

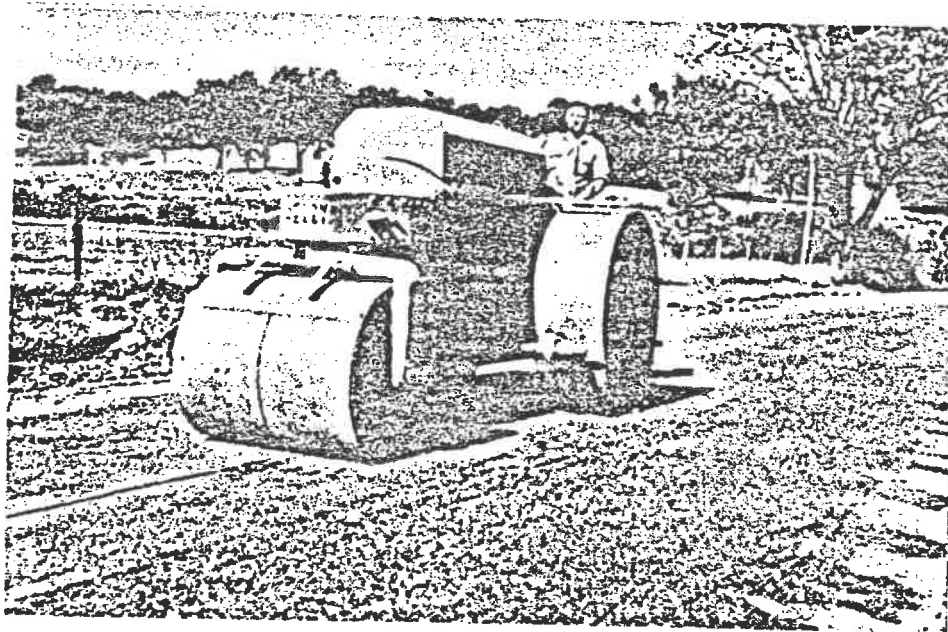


Figure 5. FLAT THREE WHEEL ROLLER

The Standard Specifications control the method of spreading and compacting untreated base material. When the thickness of the untreated base material is more than six inches, it is to be placed in multiple layers of equal thickness, none of which exceed six inches. Any faulty method used by the contractor to deposit and spread the material on the subgrade, which tends to leave a non-uniform quality of material or cause segregation, is to be corrected before further spreading of the base is permitted. Blading of crushed aggregate or crushed slag, especially when the material is on the dry side, tends to segregate the material resulting in the fines gravitating to the bottom and the larger particles rising to the top. This undesirable condition is minimized by a delivered material that is pre-mixed and wet and by spreading the loads by tailgating and using a motor grader for the minimum number of passes needed to level the course before rolling operations. Compacting this material by rolling densifies the course and tends to lock the particles together so that subsequent passes with a motor grader over the material to shape its surface to plan section do not result in serious segregation.

Large clods, rocks, and other foreign material adversely affecting the quality of the base must be removed. Hard lumps or rocks, which do not crush under the roller, will cause the roller to bridge adjacent areas and result in non-uniformity and possibly low densities.

Watering of untreated base material is too frequently considered of little importance, yet all successive operations may depend indirectly on the amount of water used. Over watering may cause segregation of the base material or soften the subgrade to the extent that it may become plastic under the action of the construction equipment and have to be removed. Insufficient watering, on the other hand, may result in unsatisfactory compaction.

Compaction of roadway base material shall follow in the same manner as outlined in Section 3-2.2 - Compaction, Procedures and Equipment.

Research is continuing to improve material properties by the use of minor quantities of selected admixtures. There are four methods commonly used; namely, cement, lime, emulsified asphalt, and mechanical stabilization. Improvement of materials by stabilization requires extensive processing and careful selection of admixture. It is specified where the subgrade will not otherwise support surface improvements and the location and material type is satisfactory. The extensive processing requirement usually precludes its use on city streets where access to property and traffic problems are involved.

Inspection requirements are comparable to those required for normal subgrade construction, and extensive testing is required. The primary construction problems are insuring the proper rate of application of the admixture and obtaining complete mixing in the particularly fine-grained soils that may be involved.

Stabilized soil subbases add strength to subgrades and this added strength in turn permits a reduction in design requirements for pavement structures.

For more detailed information regarding the types, methods and procedures on materials stabilization, the Inspectors' attention is directed to Colorado State Department of Highways Standard Specifications for Road and Bridge Construction: Section 307, Page 212.

3-2.5 ASPHALT PAVEMENT CONSTRUCTION

The durability, smoothness, and general quality of asphalt pavements depend to a great extent upon the experience, knowledge and effective performance of the Inspector assigned to this class of work. Much of the technique of laying bituminous pavements is not contained in specifications or text books, but is learned only from years of experience and observation. The material included in this subsection is intended to supplement the specifications and provide some of the fundamental knowledge required to adequately inspect the placement of bituminous pavements.

The Inspector must take an active part in asphalt paving operations and equip himself with the tools necessary to accomplish his function. A straight-edge and thermometer are essential to his work. He should also have a working knowledge of the construction equipment being used by the contractor and should be capable of determining by visual inspection of equipment performance and the condition of the pavement placed, whether the equipment is in good mechanical condition, properly adjusted and is doing its job.

By checking each detail performed by the crew and the performance of the equipment, the Inspector can often obtain an improvement in workmanship that makes the difference between a good job and a superior job.

During the process of spreading asphalt mixture, the Inspector shall frequently monitor the mixture condition and reject any materials which are observed to be defective. Some of the reasons for rejecting a mix follow:

TOO HOT. Overheated mixes can often be identified from the blue smoke rising from the mix in the truck or when the material is being emptied into the hopper of a paving machine. The temperature should be checked with a thermometer and if it exceeds the maximum placement temperature prescribed by specifications, it must be rejected.

TOO COLD. If the HBP mix is too cold, it will appear to be "stiff", or the larger aggregate particles may be improperly coated. It should be checked with a thermometer and rejected if it is less than the minimum specification requirement.

TOO MUCH ASPHALT. When too much asphalt is incorporated in the mix, the load will tend to slump and level out in the truck. Properly mixed bituminous pavement materials are usually stiff enough to heap or pile up in the truck and resist this slumping. In addition, excess asphalt is easily detected behind a paver by the slick surface appearing on the pavement.

TOO LITTLE ASPHALT. A pavement mixture having a brownish, dull appearance and lacking the shiny black luster typical of an asphalt mixture, generally contains too little asphalt. The lean, granular, brownish appearance results from lack of proper coating of the aggregate. It can be easily detected while the mix is still in the truck and should be promptly rejected. If the mix is erroneously incorporated in the pavement, it will retain its lean appearance and will not satisfactorily compact under the roller. In this case, the unacceptable mix must be removed from the subgrade and disposed of by the contractor.

NON-UNIFORM MIXING. Sometimes an improperly mixed batch can be detected while in the truck. It will display non-uniform, patchy areas of lean, brown, dull appearing material intermixed with areas having a shiny, black appearance and should be rejected.

EXCESS COARSE AGGREGATE. A mix containing too much coarse aggregate will appear to have too much asphalt, displaying a rich, black appearance and having a tendency to slump in the trucks. It can be detected by its coarse texture, particularly when it has been placed on the subgrade.

EXCESS FINE AGGREGATE. Asphalt pavement mixtures having excess fine aggregate will have the total surface of the particles so greatly increased that the proper amount of asphalt will not adequately coat them and the mix will appear to contain insufficient asphalt. It will also appear to be poorly graded with an obvious excess of fines.

EXCESS MOISTURE. Steam will rise from a HBP mix when it is dumped into the hopper of a paver if excess moisture is present in the mix. It may also appear to be rich and dark as if it had too much asphalt.

MISCELLANEOUS. Segregation of the aggregate or contamination of the mix with organic or other debris, trash, or dirt will render the pavement mixture unacceptable. These mixes are usually easily identifiable.

3-2.6 SPREADING (AMBIENT TEMPERATURE)

HBP mixtures should not be placed at ambient temperatures below 40°F. Cold mixes should not be placed at ambient temperatures below 50°F. At the time of delivery to the site of work, the temperature of the paving mixtures should not be less than prescribed for the material in the Standard Specifications.

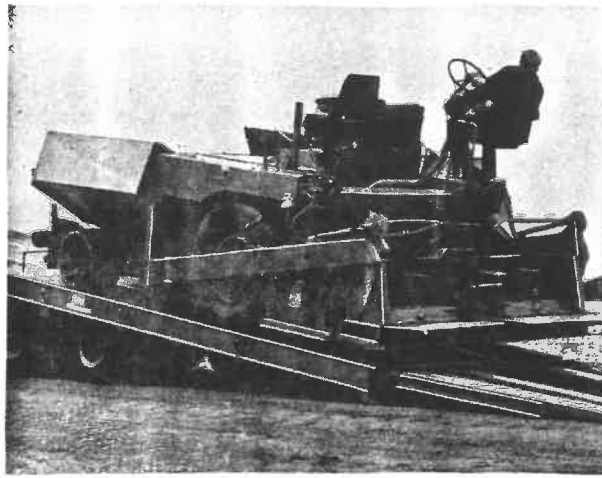


Figure 6. ASPHALT PAVER

3-2.7 ROLLING ASPHALT PAVING MIXTURES

Rolling the asphalt paving mixtures develops its strength and resistance to abrasion; develops cohesion and stability; and reduces voids which would permit air and water intrusion.

There are several critical but fundamental ingredients for the effective rolling of asphalt pavement mixtures; proper temperature and timing; correct roller type; sufficient weight and coverage; and correct operator technique.

The following are typical temperatures for HBP rolling. The oil content and aggregate size will change these values which will range $\pm 15^{\circ}\text{F}$. (8.3°C .) from those given. Atmospheric conditions, mix viscosity and equipment characteristics will have a lesser effect on these temperatures.

- | | | |
|-----------------|------|----------|
| 1. Breakdown | 260° | (127 C.) |
| 2. Intermediate | 200° | (93 C.) |
| 3. Finish | 175° | (79 C.) |

The initial or breakdown pass with the roller should be made as soon as possible after laying the pavement mixture, and yet not crack the mat or pick up the mix on the roller wheels. If the pavement mixture is too hot to roll, traverse cracking or hair checking will result. While this does not seriously affect the structural quality of the pavement, the appearance is unsightly and should be avoided. Pneumatic-tired rollers will heal "heat checks" and "hair checks". The greatest percentage of compaction that is ultimately achieved occurs during the breakdown pass. This usually requires one complete coverage of the mat and steel tired rollers are usually required as provided in the Standard Specifications. Breakdown and subsequent rolling should always be accomplished with the drive wheel forward in the direction of paving. The principal reasons for this are that there is a more direct vertical load applied by these larger wheels than by the smaller tiller wheels, and in addition, a greater proportion of the weight of the roller is on the drive wheel. There is also a tendency for a drive wheel to tuck the pavement material under it as it moves ahead. The tiller wheel tends to shove the pavement material ahead of it when it

is used to lead, but when it is pulled behind the driver wheel, it displays the same tucking characteristics as the driven wheel. When the roller is reversed after a breakdown pass utilizing this rolling technique, the tiller wheel can move on compacted material, and the effect of displacement of the paving mix is minimized. An exception to this rolling technique is sometimes made to roll uphill on steeper grades or in laying "thick-lift" pavements. In this instance, advantage is taken of the partial compaction of the material under the tiller wheel in order to provide a more stable foundation upon which the drive wheel can move the roller along with minimum disturbance of the mat.

The rolling sequence should give top priority to thin edges or "feather edges" after which the order for lane paving should be:

1. Transverse joints
2. Longitudinal joints
3. Outside edge
4. Breakdown of mat. Complete coverage from low side to high side
5. Intermediate rolling. Complete coverage from low side to high side
6. Finish rolling.

Rolling should commence at the gutters, or low side, and progress toward the high side or crown. Asphalt mixtures, when hot, tend to migrate under the action of the roller, and if the rolling is started at the high side, this migration is more pronounced and tends to crowd the paving material toward the edges, often squeezing it over the headers or gutter lips.

When laying a pass adjacent to a previously placed pass or existing pavement, the longitudinal joints should be rolled immediately behind the paver, with a rear wheel of the roller extending across the joint onto the new paving mixture not more than six inches. If the edge has been properly prepared by hand operations to provide a standing edge of uncompacted paving mixture, with the large aggregate either properly imbedded or raked out, the pinching action of the roller will result in a smooth, tight joint.

Finish rolling, to produce a smooth finished surface, should not be started until the material has cooled sufficiently to avoid leaving marks from the roller tires. The proper temperature to accomplish finish rolling is when the bare hand can be placed on the surface of the pavement without experiencing excessive discomfort.

Asphalt pavements can be adversely affected by too much or too little rolling at the wrong time. Care should be exercised to avoid excessive rolling during breakdown or second rolling while the material is still relatively hot. Excessive breakdown and intermediate rolling of thin layers with steel tired rollers tends to break the bond with the underlying layer. Conversely, finish rolling should be extensive and must be performed before the material has cooled to the extent that the rollers would be ineffective. Roller speed should not exceed 3 MPH for steel-tired rollers or 5 MPH for pneumatic-tired rollers.

Failure to observe any of the principles of proper rolling described in this subsection will result in inferior pavements.

3-2.8 ASPHALT PAVEMENT FAILURES

The Inspector should learn to evaluate existing pavements for causes of failures, particularly where new pavement is to be placed against or over the old pavement. Such knowledge may help him to avoid the source of failure in the new work. Some of the common causes of failure in bituminous pavements are listed here:

A. EDGE FAILURE

This is a result of insufficient mat thickness, excessive wheel loads, lack of lateral support, or base saturation resulting from high shoulders which trap water run-off. To prevent edge failure, the contractor should blade down high shoulders adjacent to the pavement to restore run-off.

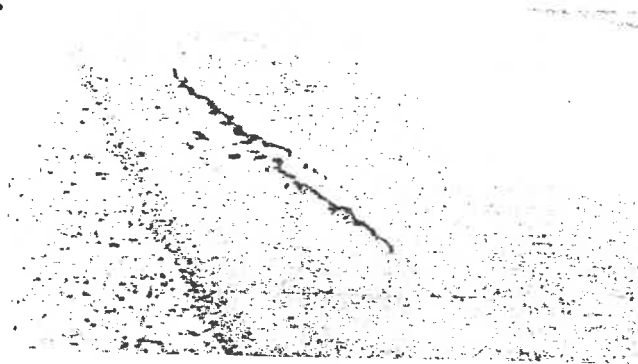


Figure 7. EDGE FAILURE

B. POTHOLES

Nearly every cause of pavement failure will result in potholing. Water infiltration, insufficient asphalt to maintain a bond, open or segregated mix, an unstable base are the most common causes of potholing.

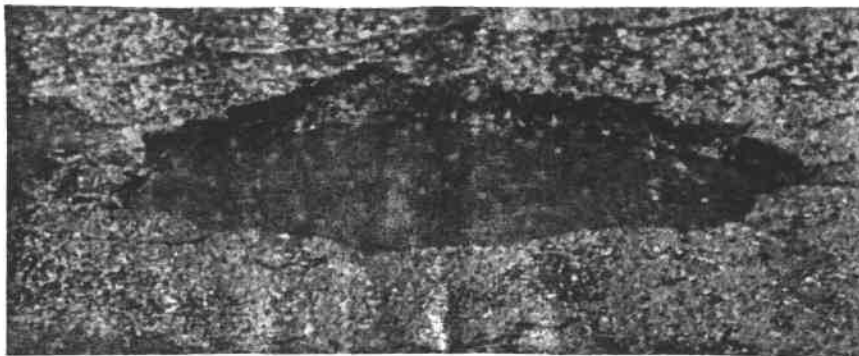


Figure 8. POTHOLE

C. ALLIGATOR CRACKING

Lack of base support, usually from water saturation, is the principal cause of this type of pavement failure. Insufficient pavement thickness, even on a firm base, can also result in alligator cracking. To prevent alligator cracking, the Inspector should insure that the subgrade is firm and well drained and a pavement thickness is provided which will support the anticipated wheel loads.



Figure 9. ALLIGATOR CRACKS

D. BLEEDING AND INSTABILITY

Almost always this type of pavement failure is caused by an excess of asphalt, either in the pavement mixture or from the cumulative effects of the asphalt in the pavement mixture with asphalt in tack coats, seal coats or fog coats. Where bleeding occurs, the excess of asphalt will tend to overfill the voids in the compacted mixture and act as a lubricant. Such pavement will lack stability and have an inclination to creep. Excessive amounts of silt, clay or rounded gravel lacking interlock will also result in an unstable paving mixture, but

will show no indications of bleeding. Moisture accumulating beneath a pavement surface will migrate upwards through the paving material, gradually destroying the bond and permitting traffic to push the pavement into waves or ridges. To prevent bleeding and pavement instability, insure that the proper mixing proportions of asphalt are maintained and do not permit the use of silts, clays, or rounded particles in the mix in excess of the limits set forth in Standard Specifications. Proper drainage of the subgrade is essential.



Figure 10. BLEEDING ASPHALT

E. RAVELING

Raveling is a result of a lean or overheated mix, or may occur where a skin patch is laid over a dirty, wet, or improperly tack-coated area. Proper plant and field procedures will prevent this deficiency. Skin patching should be avoided, but where it is permitted or provided for on the plans, proper tack coating and use of a fine mix to feather the edges will prove to be the most satisfactory method. Care must be exercised during skin patching operations to avoid raveling caused by lack of proper bond due to cold laying or rolling.

In some cases, raveling can be inhibited by seal coating. The Inspector, in the case of removal of raveled pavements, should discuss the problem with his supervision.



Figure 11. RAVELING

F. EROSION OF THE SURFACE

This condition is caused by water running or standing on pavement surfaces for prolonged periods of time while subjected to traffic. Water destroys the bond between the asphalt and the aggregate particles, wheels of traffic displace the particles in the surface, and the area is eroded in a relatively short period of time. Often this condition can be eliminated only by the construction of storm drain systems and concrete cross pans.

Avoid construction of new bituminous pavements which will obviously impound water by providing for run-off, or if it is a design problem, refer it to the Engineer.



Figure 12. SURFACE EROSION BY STANDING WATER

G. LONGITUDINAL AND TRANSVERSE CRACKING

These indications of distress occur as random cracks, seldom close together. They are generally caused by the contraction of the base or subgrade, and almost always correspond to the cracks existing in old pavement which is overlaid with bituminous pavement. It is almost impossible to prevent this type of failure, but it is helpful to clean and reseal cracks in existing base or pavement to be overlaid.



Figure 13. LONGITUDINAL CRACK

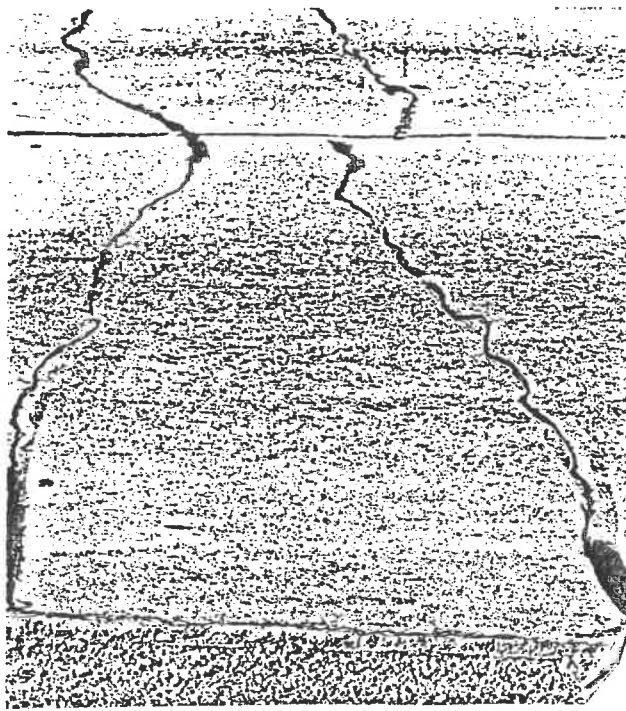


Figure 14. TRANSVERSE CRACKS

H. DISTORTION AND DEPRESSION

These failures result from inadequate compaction of the subgrade or the base. Proper compaction of the base or subgrade will prevent this type of failure.

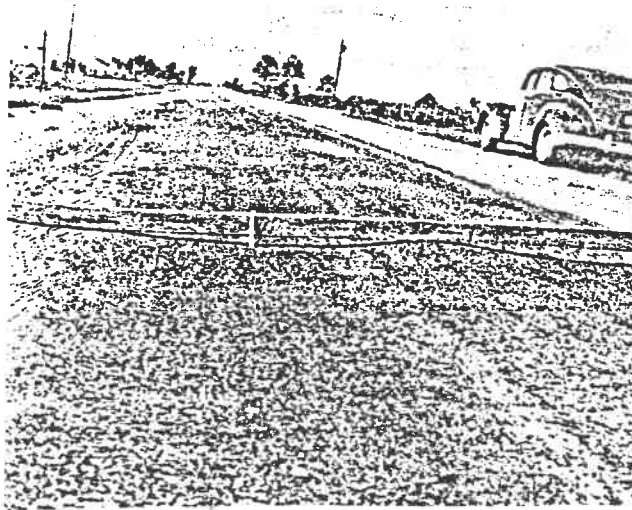


Figure 15. DISTORTION AND DEPRESSION

CONCRETE CURB, GUTTER AND SIDEWALKGENERAL

Concrete curb, gutter and sidewalk are components of many street improvement projects and give definition, permanence and stability to the overall improvement. In sequence, the curb or integral curb and gutter is constructed first and provides the line and grade reference for all other subsequent construction on the project.

Prior to placing concrete, the Inspector shall familiarize himself with the proper type and dimension of the curb and gutter and sidewalk in the approved set of construction plans. In checking the forms the following items shall be inspected:

- A. Thickness of proposed concrete
- B. Cleanness of the forms
- C. Irregularities in the forms (if the forms are meandering, corrective measures shall be taken to remedy the problem)
- D. Compaction of bedding material (see subgrade compaction in Section 2)
- E. Check to see if forms are oiled properly

During the placement process the Inspector shall monitor the fabrication of construction and expansion joints and make sure that their locations are according to plans and specifications. He shall also perform the necessary concrete testing.

After placement is complete, the Inspector shall monitor the finishing procedures and insure that the contractor has taken proper protective measures for the concrete during any inclement weather for the duration of concrete curing. The protective measures are generally stated in the general note of the construction plan; if not, the Inspector shall refer to Section 601, Page 435, of Colorado State Division of Highways Standard Specifications for Road and Bridge Construction (silver book).

DRAINAGE SYSTEMS

La Plata County will provide construction inspection of drainage systems for public improvement projects. Almost all public improvement projects will involve some type of drainage facilities, among them are:

- 3-4.1 Drainage Pipes and Culverts
- 3-4.2 Detention Ponds
- 3-4.3 Catch Basins
- 3-4.4 Drainage Channels
- 3-4.5 Erosion and Sedimentation Controls

DRAINAGE PIPES AND CULVERTS

In inspection of drainage pipe and culverts, the Inspector shall inspect the following items:

- A. The size, type and plan location of the pipe or culvert; what size, what station, etc.
- B. Proper placement and bedding: Prior to installation of the pipe, the Inspector shall inspect the trench and check the size of the trench. He shall also check the bottom of the trench for any sign of irregularities and direct the contractor as to corrective measures. Information regarding bedding material and thickness are usually provided in the general notes of the construction plan; if this information is not available the Inspector shall inform his Supervisor immediately.
- C. Proper grade; i.e. inlet and outlet elevations: A check of the grade of the pipe is necessary to insure that the pipe or culvert will function properly. Check of grade is a simple operation and can easily be done by taking elevation readings of the inlet and outlet of the pipe. The following equation is vastly used and is common procedure for finding the grade in a pipe or culvert:

$$\frac{\text{Difference of Elevation}}{\text{Length of Pipe}} \times 100 = \% \text{ Grade}$$

Example:

Elevation at inlet	=	104.55 Ft.
Elevation at outlet	=	102.75 Ft.
Length of Pipe	=	48 Ft.

$$\% \text{ Grade} = \frac{104.55 - 102.75}{48} \times 100 = \%3.75$$

- D. Backfill: Perhaps the most important part of the inspection of a pipe or culvert installation is the backfill operation. Trench backfill operation is discussed in detail in Section 2-5, Utility Cuts and Trenches.

3-4.2 DETENTION PONDS

In inspection of detention ponds, the Inspector shall inspect the following items:

- A. Size and plan locations. The size is of major importance since the detention pond is designed for a specified volume of water. The Inspector shall check the width, length, and depth of the detention pond; when this information is not included as part of the construction plan, the Engineering Supervisor from the Road and Bridge Department shall be consulted.
- B. Compaction of fill and embankment. Inspection of compaction of side slopes and any embankment in regard to detention ponds shall be in accordance with procedures set forth in this Manual in Section 2, Compaction, Procedures and Equipment.

C. Inlet and outlet structures and restrictive plates. Type, size and location of these structures shall be checked. Restrictive plates are important and the Inspector shall insure their placement whenever the plans call for such plates to be installed.

3-4.3 CATCH BASINS (Standard inlets and manholes)

Information regarding the size, type and location of these facilities is provided in the construction plans and drawings. The Inspector shall monitor the construction of these facilities to insure proper installation. Colorado State Department of Highways Standard M-604-R and La Plata County Standard L-604,B,D and are used in the construction of these facilities.

3-4.4 DRAINAGE CHANNELS (Roadside ditches and open channels)

Grade, size and location of these channels shall be checked by the Inspector during construction. Where protection is required against erosion, the Inspector shall familiarize himself with the type and size of such protection measures, prior to construction, and monitor the fabrication or placement activity during the construction.

3-4.5 EROSION AND SEDIMENTATION CONTROL

Temporary erosion control measures are provided in the construction plan for protecting the public properties during construction in the form of using straw bales. The Inspector shall monitor the function of straw bales during construction and, in the case of any deficiency, direct the contractor to any corrective measures which he deems necessary.

For inspection of permanent erosion control facilities such as riprap, filter mats, and seeding, the Inspector shall monitor the construction activity in accordance with the approved plans and specifications.

3-5 UTILITY TRENCHES AND STREET CUTS

The La Plata County Road and Bridge Department will provide construction inspection on all utility trenches, including pipeline installation, and street cuts within the County dedicated right-of-way easements. A minimum depth of two feet is required by La Plata County for any underground utility installations. In inspection of a trench or street cut, the Inspector shall follow the following requirements and insure proper construction methods and procedures.

3-5.1 BACKFILL MATERIALS

A. Materials acceptable for backfill purposes are divided into two (2) categories as defined below:

1. NATIVE BACKFILL - That material which was originally removed from the excavation, after having had all organic material, frozen material, material with a moisture content that is over optimum, material larger than that which will pass a 3" square opening, or any other elements other than natural materials removed and discarded. In the event that suitable material is not available, the contractor shall procure select backfill material upon direction of the Inspector.

2. SELECT BACKFILL - Granular material meeting the requirements of Colorado Department of Highway Specifications for Class 1 Backfill, or falling within AASHTO Classification A-1-a or A-1-b, except the materials of predominately 1 grain size, such as chips, pea gravel, squeegee or single sized waste from screening plants that are within the A-1-a or A-1-b materials shall contain no particles larger than that which will pass a 3" square opening.

3.5-2 COMPACTION

Either Native Backfill or Select Backfill shall be consolidated or compacted according to the following:

SOIL CLASSIFICATION	STANDARD T-99 Min. RELATIVE COMPACTION	MODIFIED T-180 Min. RELATIVE COMPACTION
M-145 AASHTO		
A-1	100%	95%
A-3	100	95
A-2-4	100	95
A-2-5	100	95
A-2-6	95	90
A-2-7	95	90
A-4	95	90
A-5	95	90
A-6	95	90
A-7	95	90
Class 1 Backfill	100	95
Class 1 Base	100	95
Class 6 Base	100	95

The minimum relative compaction shall apply through the depth of the trench at the time of the backfilling of the trench with moisture density control, except in unimproved areas outside of the road right-of-way. The moisture content of the backfill shall be determined by the Inspector at the time of backfill.

3-5.3 RESURFACING OF BACKFILL

Following backfill procedures in accordance with Paragraph 3-5.1, the backfill shall be surfaced in a manner so as to duplicate the original surface as nearly as careful workmanship and availability of materials permit.

A. GRAVEL SURFACED - Backfill shall be placed to within not less than 8" of the surface and the 8" vacant depth shall be filled with thoroughly tamped granular material meeting the Colorado Department of Highways Specifications for A.B.C. Class 6.

B. ASPHALTIC CONCRETE SURFACED - Backfill shall be placed to within not less than 8 1/2" of the surface and the vacant depth shall then be filled to within not less than 2 1/2" or the bottom of the asphalt of the undisturbed surface with compacted granular material meeting the Colorado Department of Highways Specification for A.B.C. Class 6. The depth of excavation for replacement by A.B.C. Class 6 material shall be placed as conditions require, but in no case less than 6" minimum.

1. In the event that backfill consists of a properly compacted material of AASHTO Classifications A-1, A-3, A-2-4, or A-2-5 and a minimum thickness as listed in 3-5.3A. and 3-5.3B. above, La Plata County may, at the request of the contractor, waive the requirements for Class 6 as stated herein. Such waiver shall be only by written approval from the La Plata County Road and Bridge Department; the Director of Road and Bridge or the Engineering Supervisor shall be the sole judge as to application of this provision.

2. A tack coat shall be applied to the vertical edges of the cut, CSS-1h or approved equivalent.

3. Hot plant-mixed asphalt or approved cold mix Grade E shall be thoroughly compacted into the cut by use of a metal drum roller or other approved means. Asphalt repairs may be placed utilizing an AMZ patching machine and materials approved by the La Plata County Road and Bridge Department.

At the option of the contractor and the approval of the Director of Road and Bridge or the Engineering Supervisor, full depth asphaltic concrete may be used in lieu of the requirements of 3-5.3B.1. Normally, the acceptable ratio is 1" of asphaltic concrete to 3" of A.B.C. Class 1 or Class 6 material.

The maximum compacted depth of asphaltic concrete which may be placed in a single lift shall be 4".

C. ASPHALT PATCH - It shall be the responsibility of the person or corporation which undertakes the work of installing an asphalt patch to re-cut, if necessary, the sides of any asphalt cut. Cuts shall be made with straight line boundaries and all cut faces shall be within 5° of vertical. In cases where caving or slump of a cut face occurs from under any roadway surfacing, slab or bound type base, the dimensions of the cut shall be extended to beyond the occurrence of caving or slump. Patches in an asphaltic concrete surface shall match the plane of the adjacent undisturbed surface, when measured by means of a 6 foot straight edge rule or beam within the following tolerance:

95% of Patch Area ± 1/8"

100% of Patch Area ± 1/4"

"Feathering" of edges is not acceptable

D. TIMING - During certain times of the year when hot plant-mixed asphalt is unavailable, cold plant-mixed asphalt shall be placed in compliance with the provisions of Paragraph 3-5.3.B.3; however, this may not be considered a permanent patch. The responsible contractor shall begin installation of required permanent patches within 10 calendar days following the availability of proper material, and shall proceed with the work without undue delay.

3-5.4 CLEANUP

At the conclusion of any street cut or opening within County owned right-of-way, the entire area shall be left in its original or better condition. All waste construction or excavated materials shall be removed from the site. All ditches, gutters, culverts, storm sewers or drain pipes shall be left open, unblocked, and in proper operating condition.

3-6 STRUCTURES

Construction inspections are provided by the La Plata County Road and Bridge Department for bridges, box culverts, retaining walls, etc.

Since construction of any structure is unique in its form and type, procedures for inspection of any component part of the structure is not covered in this Manual. The following references are made available to the Inspector prior to construction of any structures within the County right-of-way.

- A. Construction plans and specifications
- B. Colorado Department of Highways Standard Specifications for Construction of Roads and Bridges

The Inspector shall familiarize himself with the type of structure and monitor the construction to assure construction is performed to approved construction plans and specifications.

SECTION 4

MATERIAL INSPECTION

4-1 GENERAL

All materials of construction are subject to inspection, testing, and approval by the La Plata County Road and Bridge Department. Inspection is performed on such items as concrete, subgrade, base compaction and asphalt during the course of construction. The materials inspection assures construction to County standards through review and approval of field tests by commercial testers or by in-house testing as construction progresses. Inspection may extend to all or any part of the construction as deemed necessary and to the preparation, fabrication, and manufacture of all materials to be used in the work. Inspection and testing are performed on commercial contractor's work as well as work done by the County.

4-2 OFFICE REVIEW

A. Plans and Specifications

1. Developers submit plans and specifications to the Engineering Division of the Road and Bridge Department prior to construction. These documents are reviewed for materials to be used and for variations from established County standards.

2. When variances to standards are noted, the plans and specifications are returned for coordination and correction by the developer.

B. Soils Report

1. The soils report for site development is submitted by the developer as a part of the development package. The report is normally prepared by a commercial materials investigation company within testing guidelines established by the American Association of Highways and Transportation Officials (AASHTO) and the American Society for Testing and Materials (ASTM).

2. Recommendations in the report deviating from County standards are brought to the attention of the Engineering Supervisor. The deviating recommendations are communicated to the developer by the Engineering Division.

C. Pregualifying Bituminous Mixing Plants

1. Submittal of a design mix is required at the start of the construction season or whenever a design change is made in either oil content or aggregate characteristics.

2. The Inspector reviews and approves or disapproves the bituminous mix design. Mix design follows the guidelines of State Department of Highways Standard Specifications.

3. Companies submitting mix designs are notified in writing of approvals by the Inspector.

4. An approved list of companies is maintained by the Engineering Division.

4-3 FIELD INSPECTION AND TESTING

The Engineering Inspector performs various quality control tests on concrete, roadway structural sections, compaction and asphalt.

4-3.1 STRUCTURAL CONCRETE

Inspector performs on-site inspection on concrete for curb, gutter, sidewalk, and any concrete related structures. This involves making concrete test cylinders for testing by a consulting lab, testing the amount of entrained air, and recording the temperature and the slump of the concrete mixture being used. Tests determining compressive strengths may be required as the structure cures. All tests will follow AASHTO guidelines. The Inspector checks contractor furnished documentation for concrete showing mix design, shipping, and arrival time.

4-3.2 ROADWAY

Roadway inspection involves checking first the subgrade, then the base course on the roadway for compaction, moisture content, contamination, and compliance of materials and construction in accordance with the design submitted and approved in the soils report.

- A. Compaction is tested using a nuclear moisture density gauge.
- B. Moisture content is determined by the use of a nuclear moisture density gauge. Guidelines and procedures for compaction and moisture testing with the nuclear moisture density gauge are outlined in the manufacturer's manual and the State Department of Highways Standard Specifications.
- C. Checking for materials contamination is primarily a visual inspection of the road project during construction. Checking specification compliance of materials may involve taking samples to the laboratory for analysis.
- D. The result of any materials tests performed by the Inspector shall be conveyed to the developer/contractor for further action.
- E. Asphalt Coring: After the completion and prior to acceptance of any pavement, the Inspector shall core drill the pavement to determine the thickness of the structural section. The result of the core drill will be sent to the developer from the office of the Engineering Supervisor for further corrective action, if necessary.

4-4 LAB ACTIVITIES

It is the responsibility of the Inspector to see that job control samples are taken and tested in accordance with the specification requirements. Tests and samples will follow procedures of AASHTO, ASTM, and State Department of Highways Standard Specifications. Typical lab activity includes evaluation of preliminary sampling and testing, soil classification and moisture density relationships, subgrade evaluation, quality of aggregates, and asphalt sampling. Lab work is performed for

control of County work as well as conformance checking for work done by private developers on County easements or rights-of-ways. Tests beyond the capability of the County lab are performed in commercial testing labs as the need arises.

4-4.1 MATERIALS TESTS

A. Subgrade Soils

All projects may be tested for liquid limit and plastic limit for group index classification in accordance with AASHTO soil classification (AASHTO M145)

B. Moisture Density Test

Maximum density and optimum moisture content are determined by AASHTO T99 and T180 procedures. The minimum acceptable density is specified as a percentage of maximum density.

4-4.2 AGGREGATE TESTS

Aggregate for bases shall be crushed stone, crushed gravel, or natural gravel which conforms to the quality requirements of AASHTO M147 and classification table for aggregate base course sieve designation. Maximum density and optimum moisture content will be determined by AASHTO T180. Hardness tests, when required, are performed in a commercial lab.

4-4.3 BITUMINOUS MIX

All bituminous mix samples (grading E or Grading EX) taken from ongoing projects are tested for grading and oil content. Test on sieve designation shall conform with tolerance ranges for the job mix formula. Liquid asphaltic materials shall conform to the requirements for AASHTO M81, M82, and ASTM 0-2026 for the designated types and grades. Testing for oil content is by the asphalt extraction method or by the nuclear method.

4-5 EQUIPMENT MAINTENANCE

A. Lab equipment is cleaned after each use. Adjustments, if necessary, are made in accordance with the manufacturer's recommendations.

B. The core drill is lubricated as required and the cutting edge is kept sharp to obtain maximum cutting efficiency in the field. Maintenance on the generator (used to power the core drill) is performed at the County Central Repair Shop. The operator checks the oil and gas level prior to use.

B. The nuclear gauges are cleaned and tested every six months for radiation leakage. Reports are forwarded to the Colorado Department of Health. Operators are required to wear a radiation monitoring badge that detects the amount of operator exposure. Badge recordings are submitted monthly to a private testing lab for compilation of accumulated exposure.

SECTION 5

PRELIMINARY AND FINAL INSPECTION

5-1 GENERAL

All public improvement projects, once completed, are subject to preliminary and final inspection before acceptance.

Preliminary inspection is performed prior to reduction of the Performance Guarantee and the start of the twelve (12) month warranty period. A checklist is provided to the developer by the Road and Bridge Department informing him of any present deficiencies. When all deficiencies are corrected, the Performance Guarantee will be reduced to ten percent (10%) of the original amount and the twelve (12) month warranty period will begin.

Warranty inspection is performed at the end of the 10th month and is designed to provide the developer sufficient time to correct any deficiency that might develop during the ten (10) month period.

Final inspection is performed at the end of the warranty period. After all deficiencies have been corrected to the satisfaction of La Plata County Road and Bridge Department, the improvements will be accepted by the County and the developer will be relieved of his responsibilities.

PRELIMINARY INSPECTION REPORT

Paved

Street Name _____ From _____ To _____

Subdivision _____ Filing _____

LOCATION

1. As Constructed Profile required
2. Asphalt - bird baths
3. Asphalt - breaking
4. Asphalt - holes or scars
5. Asphalt - not placed
6. Asphalt - settled
7. Asphalt - too narrow
8. Asphalt - too thin
9. Concrete spill - curb, gutter or sidewalk
10. Concrete spill - low asphalt
11. Concrete spill - on right-of-way
12. Culvert - cleaning required
13. Culvert - basin required @ inlet
14. Culvert - extensions required
15. Culvert - FES on inlets in fills required
16. Culvert - repair required
17. Culvert required - cross
18. Culvert required - driveway
19. Curb & gutter - backfill required
20. Curb & gutter - bird baths
21. Curb & gutter - broken
22. Curb & gutter - broken cross pan
23. Curb & gutter - broken square radius
24. Curb & gutter - drop inlet needs repair
25. Curb & gutter - not placed
26. Curb & gutter - settled
27. Ditches - cleaning required
28. Grade exceeds maximum % allowed
29. Horizontal alignment cert. required
30. Manhole - not on proper grade
31. Shoulder - too narrow
32. Shoulder - not properly finished
33. Sidewalk - settled
34. Street name signs required
35. Subdivision monumentation required
36. Street - too dirty to properly inspect
37. Valve box not on proper grade
38. Street not properly crowned or supered

[illegible]

Date inspected ____ / ____ / ____ / / Developer

Date accepted ____ / ____ / ____

[illegible]

PRELIMINARY INSPECTION REPORT
Not Paved

Road Name _____ From _____ To _____

Subdivision _____ Filing _____

LOCATION

1. As Constructed Profile required
2. Backslopes - too steep
3. Cul-de-sac - below 68' min. dia.
4. Culvert - basin required @ inlet
5. Culvert - cleaning required
6. Culvert - extension required
7. Culvert - FES on inlets in fills required
8. Culvert - repair required
9. Culvert required - cross
10. Culvert required - driveway
11. Ditches - cleaning required
12. Driveways - improperly constructed
13. Grade - exceeds maximum % allowed
14. Horizontal alignment cert. required
15. Mailbox - must be moved
16. Rocks in ditch - remove
17. Rocks in road - remove
18. Shoulders - require cleaning
19. Shoulders - remove ridge
20. Shape road for proper crown and super
21. Slash to be removed
22. Street name signs required
23. Subdivision monumentation required
24. Surfacing - inadequate
25. Trees - remove
26. Trees - trim branches
27. Width - below specified minimum

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. A vertical line runs down the left side, creating a narrow margin. The paper appears to be from a notebook or a standard sheet of stationery. There are no markings, text, or drawings on the page.

Date inspected / / / /

Developer _____

Date accepted / /

Permit Number _____

Contractor _____

WARRANTY/FINAL INSPECTION REPORT
Paved

Street Name _____ From _____ To _____

Subdivision _____ Filing _____

LOCATION

1. Asphalt - bird baths
2. Asphalt - breaking
3. Asphalt - holes or scars
4. Asphalt - settled
5. Asphalt - too thin (core report attached)
6. Concrete spill - curb, gutter or sidewalk
7. Concrete spill - asphalt
8. Concrete spill - on right-of-way
9. Culvert - basin required @ inlet
10. Culvert - cleaning required
11. Culvert - extension required
12. Culvert - repair required
13. Curb & gutter - backfill required
14. Curb & gutter - bird baths
15. Curb & gutter - broken
16. Curb & gutter - broken cross pan
17. Curb & gutter - broken square radius
18. Curb & gutter - drop inlet needs repair
19. Curb & gutter - settled
20. Ditches - cleaning required
21. Manhole - not on proper grade
22. Shoulder - not properly finished
23. Sidewalk - settled
24. Street - too dirty to properly inspect
25. Valve box not on proper grade

[illegible]Date inspected / / / /

Developer

Date accepted / /

Permit Number _____

Contractor

WARRANTY/FINAL INSPECTION REPORT
Not Paved

Road Name _____ From _____ To _____

Subdivision _____ Filing _____

LOCATION

1. Culvert - basin required @ inlet
2. Culvert - cleaning required
3. Culvert - extension required
4. Culvert - repair required
5. Culvert required - cross
6. Ditches - cleaning required
7. Rocks in ditch - remove
8. Rocks in road - remove
9. Shape road for proper crown and super
10. Slash to be removed
11. Surfacing - contaminated
12. Surfacing - inadequate
13. Trees - remove
14. Trees - trim branches
15. Width - below specified minimum

[illegible]

Date inspected / / / /

Developer _____

Date accepted / /

Permit Number _____

Contractor

SECTION 6

TRAFFIC CONTROL

6-1 GENERAL

The purpose of this part of the Manual is to set forth the basic principles and standards to be observed by all those who perform work in a public road to provide safe and effective work areas, and to warn, control, protect and expedite vehicular and pedestrian traffic. More detailed information is available from the "Manual of Uniform Traffic Control Devices."

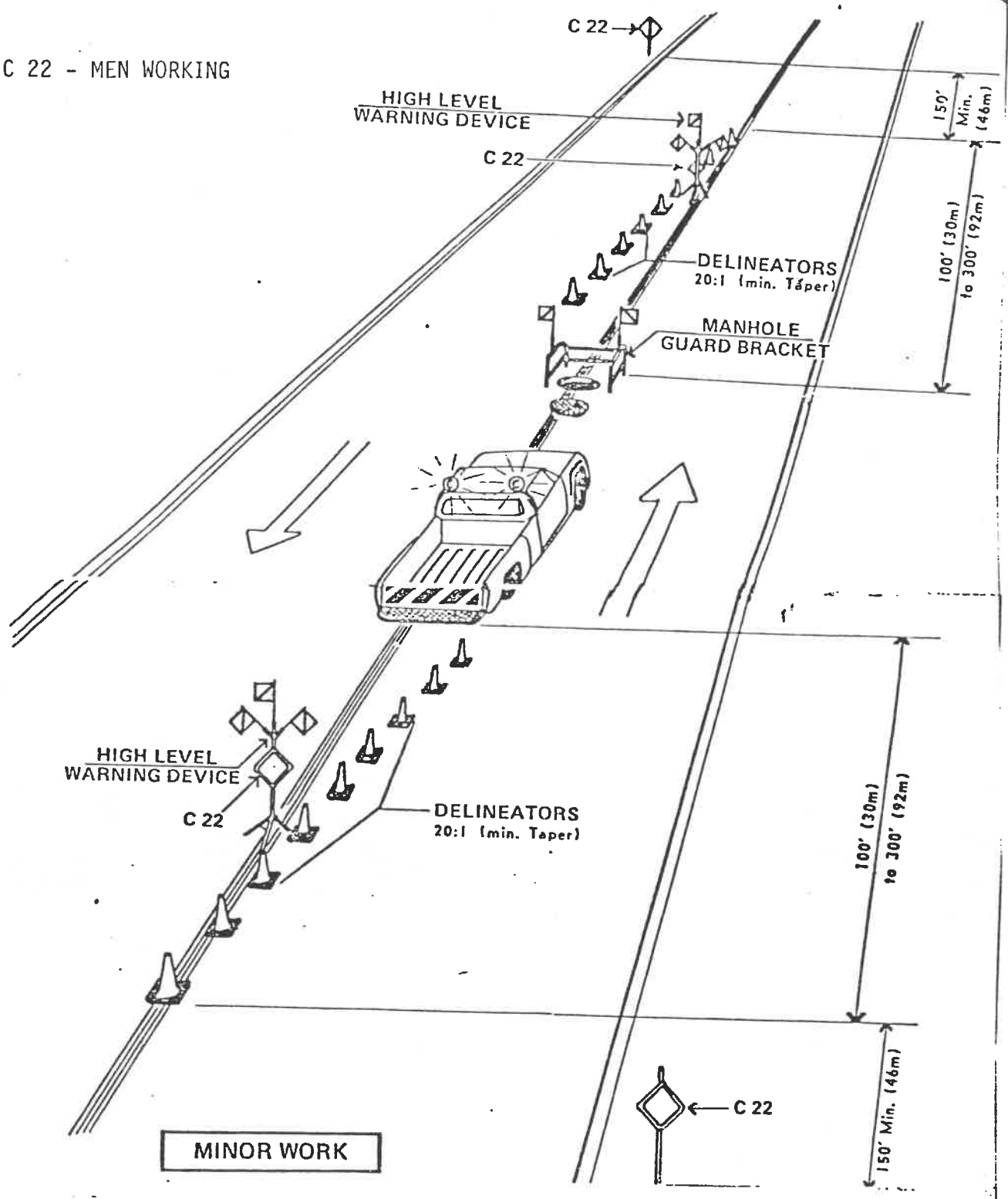
Contractors are responsible for traffic control for any work within the right-of-way, or for off-site work where construction traffic to and from the right-of-way presents a hazard to motorists. The Inspector reviews project control methods for compliance with MUTCD requirements and compliance with the contractor's plan. Non-compliance can result in the Inspector shutting down the work until deficiencies are remedied. The Contractor shall submit a traffic control plan at the time of permit issuance.

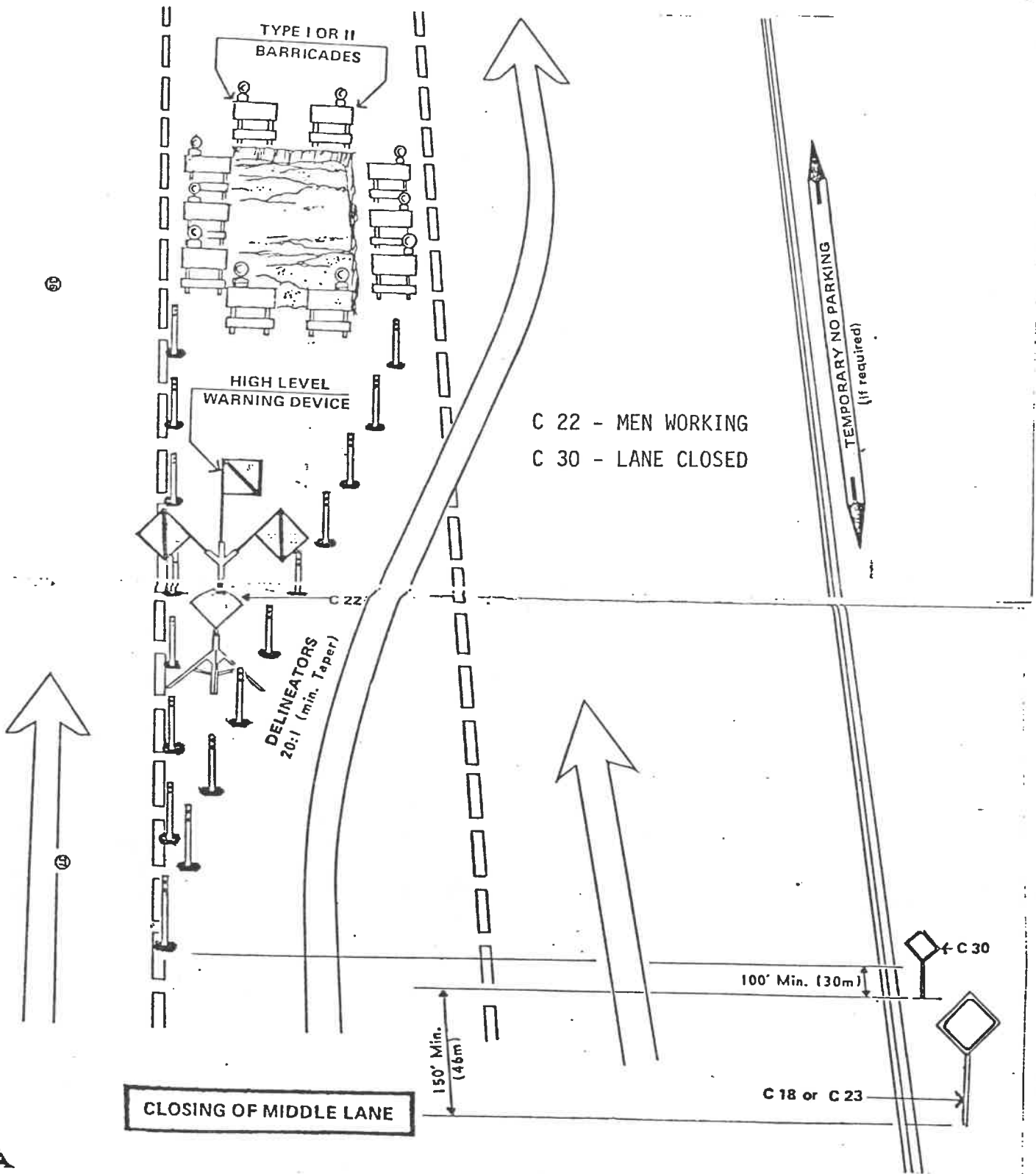
Proper traffic control techniques shall be effectively utilized to:

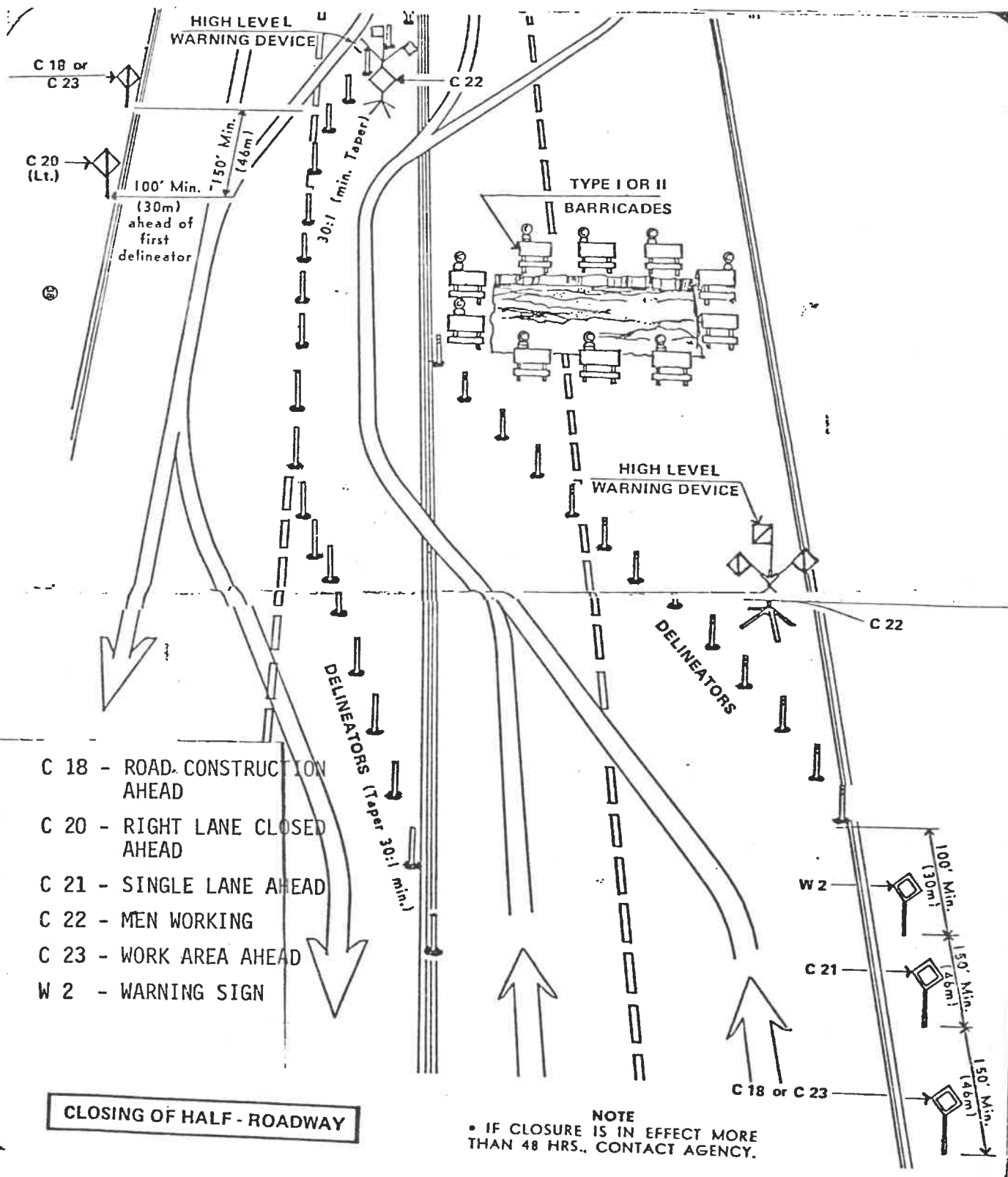
- A. Reduce accidents
- B. Minimize injury to workmen and the public
- C. Reduce damage to private and public property, including damage to the construction project and construction equipment
- D. Minimize the possibility of claims and litigation arising from construction zone accidents
- E. Reduce confusion to motorists
- F. Expedite traffic flow

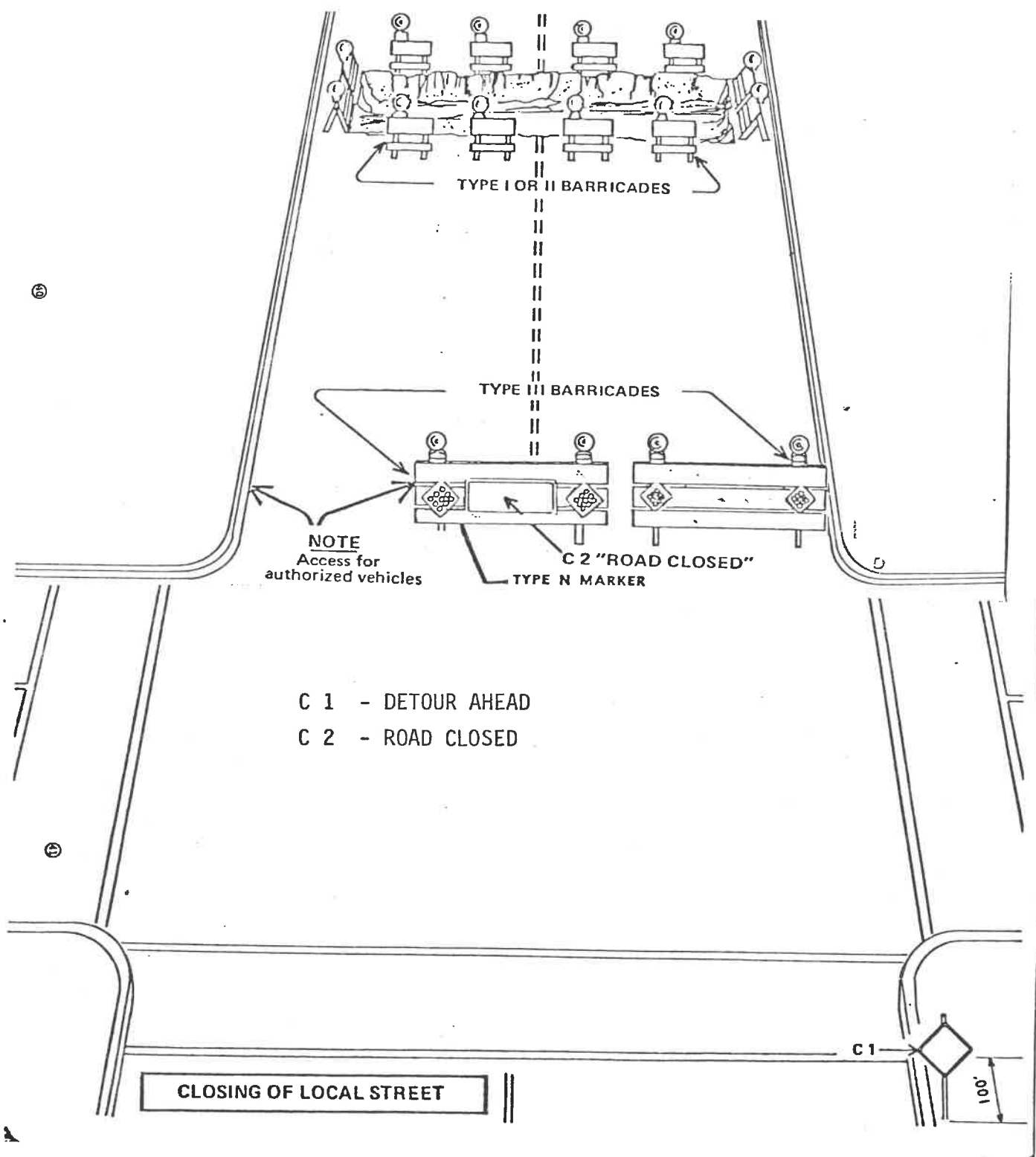
Some typical placements of traffic control devices are illustrated in the following pages and it is intended to provide the Engineering Inspector an insight of what to look for in regard to traffic control.

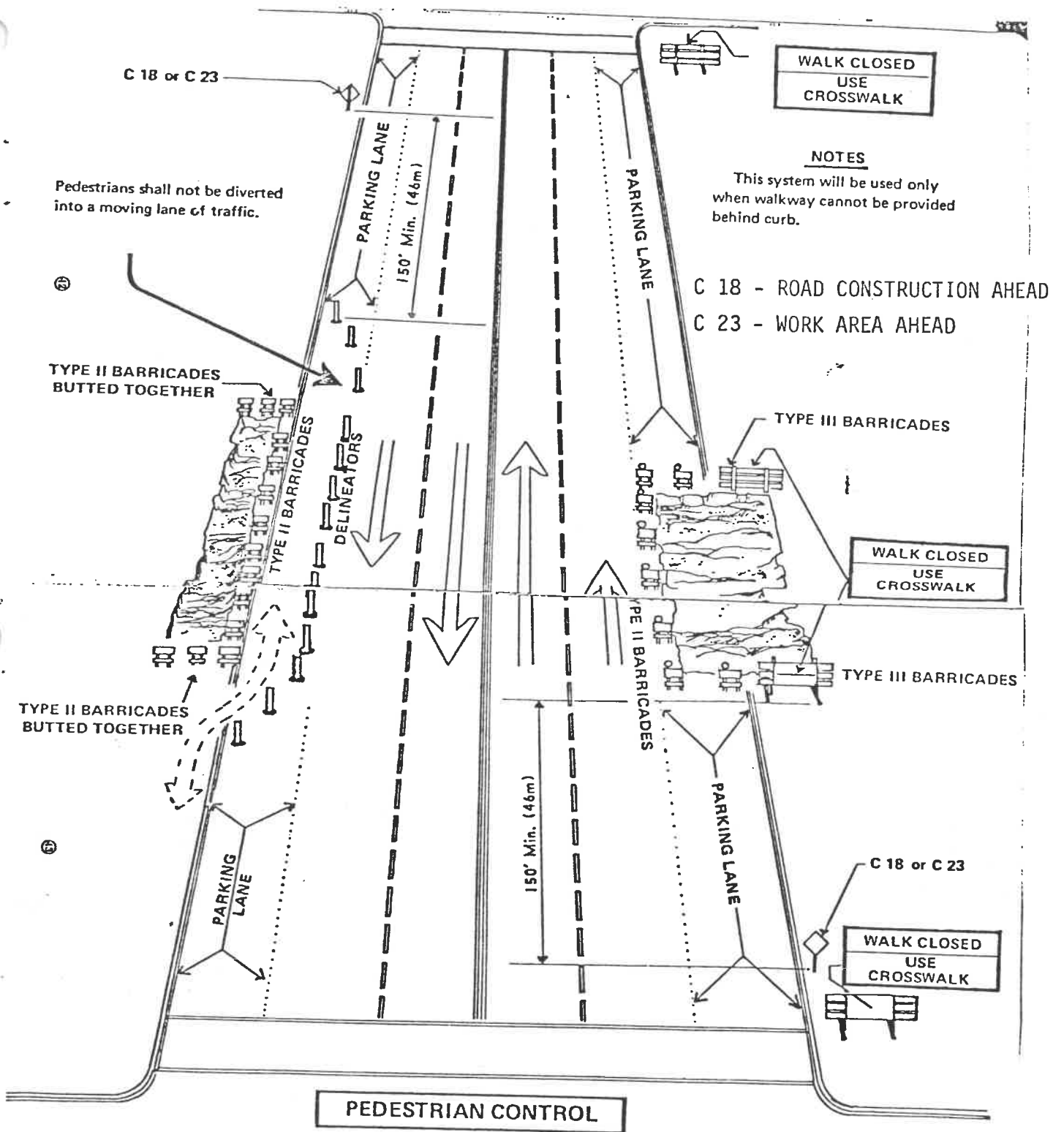
C 22 - MEN WORKING



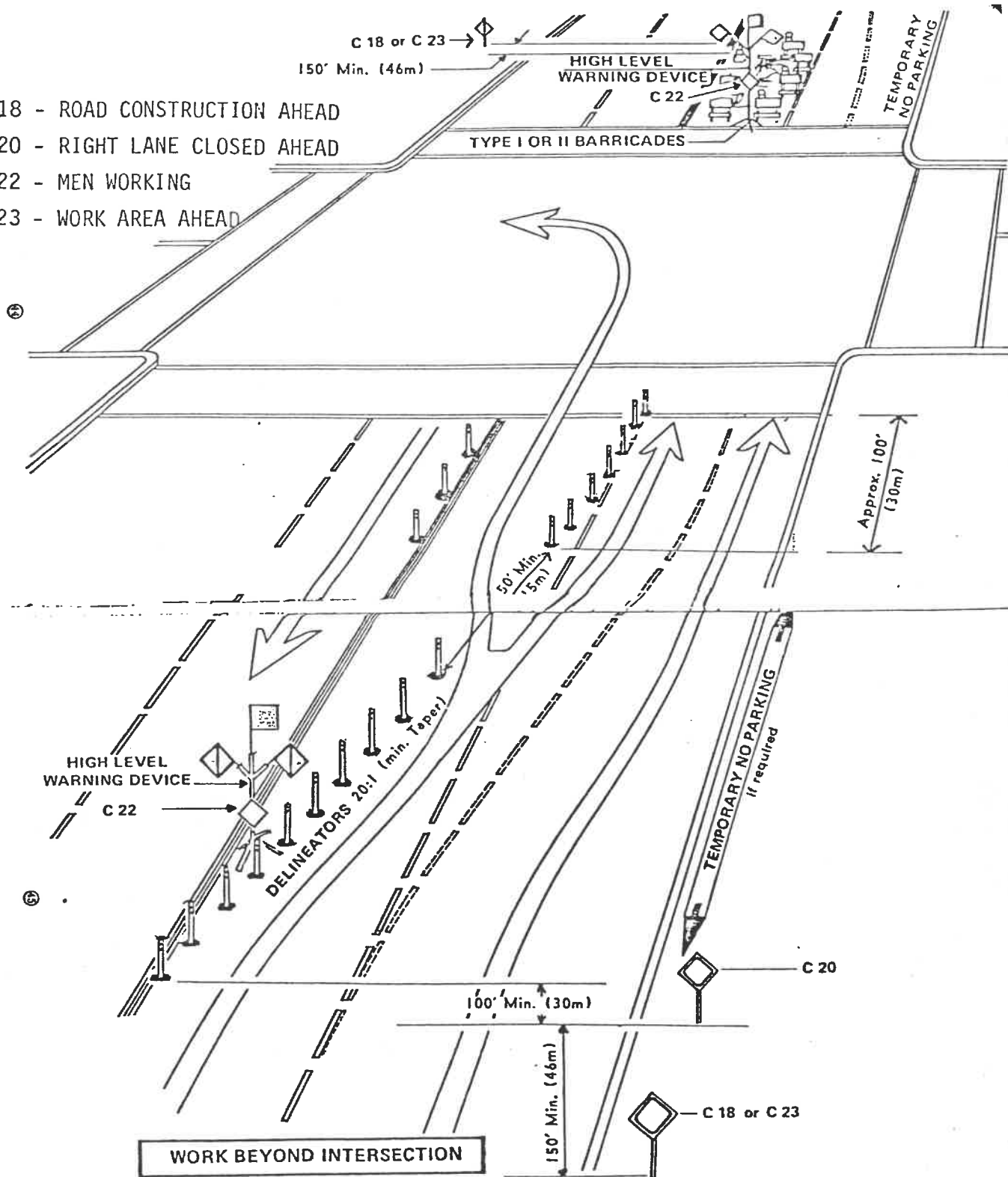


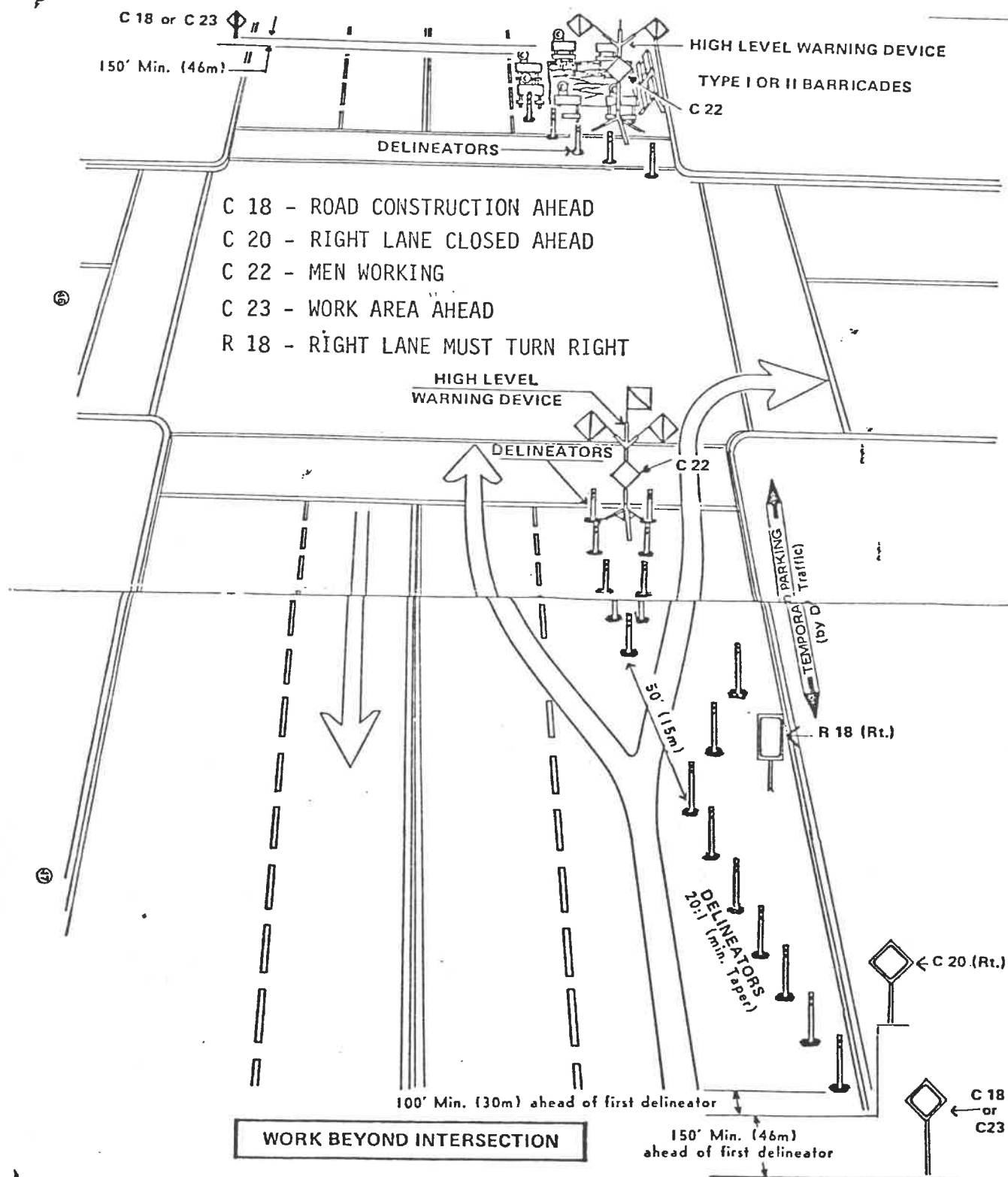






- C 18 - ROAD CONSTRUCTION AHEAD
- C 20 - RIGHT LANE CLOSED AHEAD
- C 22 - MEN WORKING
- C 23 - WORK AREA AHEAD





C 18 - ROAD CONSTRUCTION AHEAD
 C 22 - MEN WORKING
 C 23 - WORK AREA AHEAD
 R 17 - NO LEFT TURN

