# CHEYENNE BIKEWAY SYSTEM

## ALIGNMENT ANALYSIS

Prepared for:

CITY OF CHEYENNE
COMMUNITY DEVELOPMENT DEPARTMENT

Prepared by:

The Association of:
CHRISTIAN, SPRING, SIELBACH
& ASSOCIATES
WIRTH ASSOCIATES, INC.

Cheyenne, Wyoming

FEBRUARY, 1977

# INTRODUCTION

The Association of Christian, Spring, Sielbach & Associates and Wirth Associates has been retained by the city of Cheyenne to review the City-wide Bikeway Plan--"Two Wheeling In Cheyenne" and subsequently prepare construction working drawings for the bikeways. This report describes the initial step in this process and provides recommendations for the final bikeway alignments. The intent of this report is to provide the city with information that can be reviewed, responded to and refined before construction drawings are prepared.

This planning effort has involved a thorough review of the City-wide Bikeway Plan, field checking of alignments with the aid of new 1" to 50' aerial photos prepared by the consultant for each alignment, analysis of alternative alignments with consideration given to functionability, safety, site considerations, environmental characteristics, and construction cost characteristics. Data pertinent to the Bikeways has been analyzed and considered in the final alignment process including the Cheyenne Urban Systems and Roadway Functional Classification Plan, Project Sequence Listing and plans available for projects.

Meetings have been held with various city personnel and the Wyoming Highway Department for general input.

Upon review of this document by the city and final response to the alignments and clarification of any administrative or political complications associated with the Bikeways, the preparation of the working drawings can begin. We respectfully request and advise for an efficient review process so that the project can be completed in a realistic time frame.

# LINK DESCRIPTIONS

# and

# DEVELOPMENT RECOMMENDATIONS

This analysis has considered three basic bikeway alternatives for the Cheyenne system including:

Bike Paths -- Pathway independent of motorized traffic 6' wide minimum one-way, 8' wide two-way minimum.

Bike Lanes -- A demarcated lane on a roadway for the exclusive use of bicycles except for cross-flows. Lanes are usually provided on both sides of a roadway, a minimum of 5' wide and usually located between the outer traffic flow and parking spaces or curb line.

Bike Routes -- Bike Routes are designated streets that the bicyclist and motorist share. Signing or stenciling on the pavement denotes route locations.

There are four categories of Bike Paths shown on the final alignment map:

Proposed Path -- This designates where the development of a bike path can be physically accommodated under existing conditions and is recommended.

Proposed Path In Conjunction With Street Improvements -- This designates where the development of a bike path can be and should be constructed as a part of a major street improvement.

Path Alignment Potential -- This designates where the development of a bike path would be desirable although not originally proposed on the City-wide Bikeway Plan.

Existing Path -- This designates where an existing bike path is located.

There are three categories of Bike Lanes shown on the final alignment map:

Proposed Lane -- This designates where the development of a bike lane (one-way) or lanes (two-way) can be physically accommodated under existing conditions and is recommended.

Lane Alignment Potential -- This designates where the development of a bike lane would be desirable although not originally proposed on the City-wide Bikeway Plan.

Existing Lane -- This designates where an existing bike lane is located.

There are two categories of Bike Routes shown on the final alignment map:

Proposed Route -- This designates where the development of a bike route can be physically accommodated under existing conditions and is recommended.

Route Alignment Potential -- This designates where the development of a bike route would be desirable although not proposed on the City-wide Bikeway Plan.

There are several alignments proposed in the City-wide Bikeway Plan that have severe physical problems associated with them and are shown on the final alignment map: PROBLEM ALIGNMENTS

Bike Path -- Linkage Development Options

1P -- Western Hills Boulevard (Sequence #2 Project)

Options

1) Bike path on school property (recommended)

2) Bike paths on proposed 6' sidewalks (not desirable)

3) Bike route (not recommended)

Special Circumstances

- Approval from School District #1 for bike path on school property

2P -- Airport Golf Course Link

Options

1) Bike path between tees, greens, safe alignment (recommended)

2) Bike path around perimeter of course (undesirable)

Special Circumstances

- Approval from Parks and Recreation Department on alignment across golf course

- Gates for after hour security

3P -- Prairie Avenue (Sequence #10 Project)

Options

1) Bike path on south side of street (recommended)

2) Bike path on north side (not desirable)

Special Circumstances

- Bike path construction will have to be accomplished as a part of proposed street improvements

4P -- Del Range Boulevard (Sequence #7 Project)

Options

1) Bike path on south side of street (recommended)

2) Bike path on north side of street (not as desirable)

Special Circumstances

- Bike path construction will have to be accomplished as a part of proposed street improvements

5P -- Converse Avenue (Sequence #6 Project)

Options

1) Bike path on V.A. land and park land (recommended)

Special Circumstances

- Alignment subject to airport master plan and final layout and design of street improvement project.

6P -- Grove Avenue

Options

1) Bike path through park, along golf course fence and across school property (recommended)

Special Circumstances

- Approval from land administrators

7P -- Lions Park Connection

Options

1) Bike path connector (recommended)

8P -- Cemetery Connection

Options

1) Bike path (recommended)

Special Circumstances

- Approval from land administrators
- Need for gate at west end
- Fencing required along airport

9P -- Pershing Boulevard

Options

1) Bike path on school property, park property, VA property (recommended)

Special Circumstances

- Approval from land administrators

10P -- Ridge/Lincolnway Intersection (under construction)

Options

1) Bike path on both sides of connection running north and south

Special Circumstances

- Approval from Highway Department and immediate action

11P -- Holliday Park Connection

Options

1) Bike path along West edge of park (recommended)

12P -- I-180 Spur (future project)

Options

1) Bike path within green belt on both sides (recommended)

Special Circumstances

- Approval from Highway Department
- Design into current drawings/eliminate proposed 6'sidewalks

13P -- Viaduct

Options

1) Bike path along existing sidewalk and overpass walk (recommended)

Special Circumstances

- Improvements needed at both ends of viaduct -- sidewalk widening

14P -- Deming Way

Options

1) Bikeway from I-180 to 10th Street (recommended)

Bike Lane -- Linkage Development Options

1L -- Education Drive/Carlson Street

Options

1) Bike lanes (recommended)

2L -- Yellowstone Road

Options

1) Bike lanes (recommended) for both sides currently only east lane developed

2) Bike path on west side of street (feasible)

3L -- Randall Avenue

Options

1) Bike lanes (recommended)

4L -- Capitol Avenue

Options

1) Bike lanes from 19th to Pershing (recommended)

Special Circumstances

- Capitol Building grounds access
- 4-lane traffic to be changed back to 2 in CBD

5L -- Logan Avenue

Options

1) Bike lanes (recommended)

6L -- Ridge Road

Options

1) Bike lanes (recommended)

7L -- 12th Street

Options

1) Bike lanes (recommended)

8L
9L -- 20th Street/19th Street

Options

1) Bike lanes (recommended)

Special Circumstances

- One-way couplet system proposed

10L -- Warren/Central

Options

1) Bike lanes (recommended)

Special Circumstances

- Lanes can be provided as a part of the I-180 improvement project

11L -- Holliday Park/Alexander Avenue

Options

1) Bike lanes (recommended)

12L -- Walterschild Boulevard

Options

1) Bike lanes (recommended)

Special Circumstances

- Construction will require some pavement improvements.

Bike Route -- Linkage Development Options

1R -- Capitol Avenue from Pershing to Lion Park

Options

1) Bike route (recommended)

2R -- Third Avenue

Options

1) Bike route (recommended)

3R -- Oxford/2nd Avenue

Options

1) Bike route (recommended)

4R -- Alley

Options

1) Bike route (recommended)

Special Circumstances

- Alley would need to be paved

5R -- Concord

Options

1) Bike route (recommended)

6R -- Alley Connection

Options

1) Bike route (recommended)

Special Circumstances

- Alley would need to be paved

7R -- Nationway Frontage Road/8th Street

Options

1) Bike route (recommended)

8R -- 10th Street

Options

1) Bike route (recommended)

Special Circumstances

- Street needs to be paved

9R -- Fox Farm/Leisher Road

Options

1) Bike route (recommended)

Dave Romero
cc: Dave Romero

THE STATE OF WYOMING

RECEIVED
MAR 17 '76
OFFICE OF THE MAYOR
Cheyenne, Wyoming

Ed Herschler, *Governor*
W. G. Lucas, *Superintendent and Chief Engineer*

# *Wyoming State Highway Department*

P. O. BOX 1708 CHEYENNE, WYOMING 82001

March 16, 1976

copy sent to John Galecto 3-17-76

BIKEWAY DEMONSTRATION
PROGRAM

The Honorable Bill Nation
Mayor of Cheyenne
City and County Building
Cheyenne, Wyoming 82001

Dear Mayor Nation:

Attached for your information you will find a set of instructions for a Bikeway Demonstration Program that was received in this office on March 12, 1976.

I would like to high-light the following comments about this program:

1. There are authorized to be appropriated to the secretary to carry out this section $10,000,000, nationally, for fiscal year 1976. If the application is selected the Federal participation for preliminary engineering, right-of-way construction and evaluation shall be 80 percentum of the total eligible cost of the project. The remaining 20 percentum will be local responsibility.

2. Bikeway Demonstration Projects eligible for funding shall be used for commuter and/or recreational purposes in urban or urbanized areas.

3. Applicants shall submit proposals to the State Highway Department which in turn will review the proposals for content and if satisfactory will submit to the Regional FHWA through the Division office of the FHWA. The FHWA Regional Office shall then review the proposals, together with State and Division office comments, and recommend <u>not more than 10 (ten) proposals for demonstration in the region</u>. This particular region concontains 6 (six) states. The Regional FHWA will then transmit the recommended proposals together with the Region's comments to the FHWA Design Division in Washington D.C. The Washington Office shall then make the final selection on a nationwide basis.

4. All proposals shall be submitted to the Wyoming Highway Department by June 1, 1976. Proposals shall be received in Washington Headquarters by July 15, 1976.

Due to the short period of time allowed for submitting proposals it is our recommendation that you study the instructions thoroughly, particularly as to content and project selection criteria. If you decide that you would like to submit a proposal send it according to paragraph 7. Application Procedures, to this address:

Mr. F.O. Witters, State Planning Engineer
Wyoming Highway Department
P.O. Box 1708
Cheyenne, Wyoming 82001

If we can be of further service please contact me.

Very truly yours,

W.G. Lucas
Superintendent & Chief Engineer

By:
F.O. Witters
State Planning Engineer

WGL/FOW:lt

Encl.

U. S. DEPARTMENT OF TRANSPORTATION

# FEDERAL HIGHWAY ADMINISTRATION

# FEDERAL-AID HIGHWAY PROGRAM MANUAL

| | | |
|---|---|---|
| VOLUME | 6 | ENGINEERING AND TRAFFIC OPERATIONS |
| CHAPTER | 9 | SPECIAL PROGRAMS |
| SECTION | 14 | BIKEWAY DEMONSTRATION PROGRAM |

Transmittal 185
February 27, 1976
HNG-25



## 1. PURPOSE

* *To prescribe the policies and procedures for administering the Bikeway Demonstration Program which is intended to provide additional Federal funds for bikeway projects of national interest and promote bicycling as a safe and viable alternative mode of transportation for commuter and/or recreational use in urban or urbanized areas.*

## 2. AUTHORITY

*Section 119 of the Federal-Aid Highway Amendments of 1974, Public Law 93-643 (see Attachment 1).*

## 3. DEFINITIONS

*As used herein:*

*a. "Bikeway" - a bicycle lane or path, or support facility, a bicycle traffic control device, a shelter, or a parking facility to serve bicycles and persons using bicycles.*

* Regulatory material is italicized

b. *"Urbanized area" - an area (of more than fifty thousand population) so designated by the Bureau of the Census, within boundaries to be fixed by responsible State and local officials in cooperation with each other, subject to approval of the Federal Highway Administrator and Urban Mass Transportation Administrator. Such boundaries shall, as a minimum, encompass the entire urbanized area within a State as designated by the Bureau of the Census.*

c. *"Urban area" - an urbanized area or, in the case of an urbanized area encompassing more than one State, that part of the urbanized areas in each State, or an urban place as designated by the Bureau of the Census having a population of five thousand or more and not within any urbanized area, within boundaries to be fixed by responsible State and local officials in cooperation with each other, subject to approval by the Federal Highway Administrator. Such boundaries shall, as a minimum, encompass the entire urban place designated by the Bureau of the Census.*

d. *"State" - any one of the fifty States, the District of Columbia, or Puerto Rico.*

e. *"Applicant" - a public agency or a nonprofit public service organization.*

f. *"Grantee" - a State, acting for itself, or on behalf of an applicant.*

4. ELIGIBLE PROJECTS

a. *Grants made for projects under this section shall be in addition to, and not in lieu of, funds made available for bicycle projects under the provisions of the Federal-Aid Highway Program Manual (FHPM) Volume 6, Chapter 1, Section 1, Subsection 1, "Bikeways and Pedestrian Walkways in Conjunction with Federal and Federal-aid Highways." The following bikeway projects are not eligible for Bikeway Demonstration funds:*

(1) *bikeway projects currently advanced to the "authorization to proceed" stage for any phase of work (FHPM 6-3-2-2), and*

(2) *bikeway projects which are eligible for funding as incidental features of Federal-aid highway construction projects.*

b. *Bikeway demonstration projects eligible for funding shall be used for commuting and/or recreational purposes, and shall be located in urban or urbanized areas.*

c. *Bikeway demonstration projects in urbanized areas shall be in accordance with the continuing comprehensive transportation planning process carried on cooperatively by States and local communities pursuant to FHPM 4-4-2.*

d. *The provisions of Title 23 U.S.C. apply. Federal-aid procedures established by existing directives are to be followed except where otherwise prescribed. Many bikeway projects will be of such a nature or magnitude that they will not have an effect on decisions or activities of concern to clearinghouse agencies or will not have a significant impact on the environment. Therefore, in accordance with the policy prescribed in 23 U.S.C. 101(e), the timesaving procedures for specific projects outlined in paragraph 7b of FHPM 6-8-2-1 for Highway Safety Improvement Program projects should be utilized to the extent feasible.*

5. CONSTRUCTION STANDARDS

*The American Association of State Highway and Transportation Officials' "Guide for Bicycle Routes" shall be used as a standard for the construction and design of bicycle routes. Reasonable deviations will be permitted in the interest of demonstrating innovations in bikeway design. These deviations should be briefly explained in the proposal.*

6. FEDERAL PARTICIPATION

a. *The Federal share of any demonstration project for the construction of a bikeway shall be 80 per centum of the total eligible cost of such project.*

b. *Federal participation in eligible bikeway demonstration projects may include the costs of preliminary engineering, right-of-way, construction and evaluation.*

7. APPLICATION PROCEDURES

a. *Applicants shall submit eight (8) copies of their proposal to the appropriate State highway agency which will transmit seven (7) copies of the proposal to the Regional Federal Highway Administrator through the FHWA Division Office. When the State highway agency is the applicant, only seven (7) copies need be submitted.*

b. *The FHWA Regional Office shall review the proposals, together with State and Division Office comments, recommend not more than ten (10)*

*proposals for demonstration in the Region, and transmit five (5) copies of each recommended proposal and one copy of all other proposals together with the Region's comments to the FHWA Design Division, HNG-20, Washington Headquarters. The Regional Office shall ensure that the applicants are notified of the Region's action on the proposals.*

*c. The Federal Highway Administration shall make the final selection of projects on a nationwide basis. A committee composed of representatives from appropriate Department of Transportation offices will make the initial project selections and forward their recommendations to the Federal Highway Administrator for final project selection.*

*d. The State highway agency will be responsible for:*

*(1) certifying the proposed project(s) as being in accordance with Section 134 of Title 23 U.S.C.,*

*(2) making the program funds available to the selected applicants,*

*(3) overseeing project evaluation and the preparation of a final evaluation report, and*

*(4) ensuring that projects are completed in substantial conformance with the details outlined in the applicants proposal.*

8. CONTENT OF PROPOSALS

*Each proposal should include as appropriate:*

*a. a statement summarizing the need for the proposed project,*

*b. concise statement(s) of what the project is designed to demonstrate and the expected results and benefits,*

*c. a description of project activities, including how and where the demonstration project will be implemented,*

*d. a demonstration project time schedule (including future use beyond end of demonstration period) and plans for development, implementation and operation,*

*e. a brief description of the area, available transportation facilities, and other proposed bicycle transportation system improvements in the urban area,*

*f. a summary of project costs and breakdown of funding sources,*

*g. a description of an evaluation plan to measure the success in achieving the project objectives,*

*h. identification of participating organizations and a statement on coordination with ongoing planning efforts,*

*i. estimated amounts of Federal, State, and local funds spent in the urban area on bikeway projects during the last five (5) fiscal years,*

*j. a determination that:*

*(1) for urbanized areas the project is in accordance with Section 134 of Title 23 U.S.C. and*

*(2) a public agency will be responsible for maintenance and*

*k. a one-page project summary sheet (see Attachment 2).*

9. PROJECT SELECTION CRITERIA

*a. Emphasis will be on the selection of a range of projects with potential for nationwide application - differing sizes, types, and geographic locations - in which maximum benefits are achieved soon after project completion.*

*b. The following criteria will be applied by FHWA Regional and Washington Headquarters in selecting demonstration projects:*

*(1) application of new ideas in design, construction, operation, maintenance, utilization, and promotion of bikeways. Particular emphasis will be given to those projects that will provide a safe bicycling environment,*

*(2) involvement in the project by local, State, and Federal agencies,*

*(3) present and past utilization of available funds for bikeway construction,*

*(4) quality of proposed monitoring and evaluation, along with the ability to modify the facility or operation as a result of that evaluation, and*

*(5) the present and projected utility of the proposed project, and the degree to which the project will serve in satisfying community and national goals such as in reducing air pollution and energy consumption.*

10. PROGRAMMING AND FISCAL PROCEDURES

*a. Once a project has been approved, no further programming action is required. Project development shall be in accordance with procedures applicable to Federal-aid highway projects unless modified by this directive.*

b. Projects shall be identified by a three-element project number (e.g., BWD - 333 (2)) as follows:

(1) the prefix designation "BWD,"

(2) a series of numbers, not exceeding four digits, which may be a unique number assigned to each appropriate urban area as permitted in FHPM 6-3-2-2, paragraph 9c, or an alternative statewide numbering plan, and

(3) the agreement number ("(2)" in the example) which shall be the chronological number of the project within each assigned series number.

c. Regular Federal-aid procedures for fiscal and statistical reporting set forth in Volume 23, Chapter VI B, and Volume 22, Chapter V, of the Administrative Manual shall be followed. Federal Highway Administration appropriation code 633 has been assigned to this program. The construction type code Y052, Independent Bicycle or Walkway Facilities, shall be used for all phases. Preliminary Engineering, Right-of-Way, and Construction shall be reported on separate lines of Form PR-37, Project Status Record, with work class 1, 4, or 3 as appropriate.

*d. Upon selection of projects, allotments will be made to the Regional Administrators for projects located in their region. Payment of the Federal share of the costs incurred will be made through the States' current billing procedures as a construction project.*

11. SUBMISSION DATE

*Proposals shall be submitted to the appropriate State highway agency by June 1, 1976.*

*Proposals shall be received in the Washington Headquarters by July 15, 1976.*

88 STAT. 2288 Pub. Law 93-643 January 4, 1975

BIKEWAY DEMONSTRATION PROGRAM

SEC. 119. (a) For the purpose of this section the term—

(1) "bikeway" means a bicycle lane or path, or support facility, a bicycle traffic control device, a shelter, or a parking facility to serve bicycles and persons using bicycles;

(2) "State" means any one of the fifty States, the District of Columbia, or Puerto Rico.

(b)(1) The Secretary is authorized to make grants to States for demonstration projects for the construction of bikeways. Such bikeways shall be for commuting and for recreational purposes and shall be located in urbanized areas and such other urban areas as are designated by the State highway department under subsection 103(d) of title 23, United States Code.

(2) The Federal share of any demonstration project for the construction of a bikeway shall be 80 per centum of the total cost of such project. The remaining 20 per centum of such cost shall be paid by the grantee.

(3) No grant shall be made under authority of this Act unless such bikeway project is in accordance with continuing comprehensive transportation planning process carried on cooperatively by States and local communities in accordance with section 134 of title 23, United States Code.

(4) The Secretary shall establish, by regulation, construction standards for bikeway projects for which grants are authorized by this Act, and shall establish, by regulation, such other requirements as may be necessary to carry out this Act.

(c) Grants made under this Act shall be in addition to, and not in lieu of, any sums available for bicycle projects under section 217 of title 23, United States Code.

(d) There are authorized to be appropriated to the Secretary to carry out this section $10,000,000 for the fiscal year 1976.

- Summary Sheet -

Bikeway Demonstration Project

1. Project Title or Identification No._____

_____

2. Project Sponsor_____

_____

3. Project Contact Person_____

_____

4. Type of Service: Mainly Commuter_____, Mainly Recreational

_____, Both_____.

5. Project Length (if applicable)_____

6. Estimated Total Cost:_____

Estimated Bikeway Demonstration Funds:_____

7. Estimated Number of Average Weekly Bicyclists:_____ 1st Yr.

_____ 2d Yr.

8. Brief Summary of Demonstration Project Objectives and Expected Results (one paragraph):_____

_____

_____

_____

_____

_____

_____

3-1-77

Capitol Ave.

1. School Districts - Comments on having bike paths on their property.

2. Path - across golf course - Airport Maintenance road.

3. Crossing Yellowstone - Central - Use underpass - Golf Course

4. Along Prairie Ave. - land not owned by City. (South side)

5. Problem Section 38
good FAA - land., area by Courtesse.. ??

6. Cemetery use for paths - CC - okt.

7. 5' paths
Lane 7' - parking
5' - bike

8. Hall. Park - Route - label road.

9. Ordinances - riding sidewalks
Prohibited business district
CK. with Ordinance

Present: Chuck Tofoya, Gail Taylor, Walt Estes, Max Kaiser.

#1. Cross - flashing light by parking lot. - Airport Having two cross walks! (by Yellowston North So.

#2. FAA Problems - Specify.

#3. Ch. cemetery. - land owned.

#4 Capitol - use stop signs.
Use Carey & Pioneer

#5. - Use 18th st. instead 19th - 20th

#6. Pat Person - Lar. Traffic Engineer
12th & Ridge Rd. -

#7. Path - width

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Ck. Diane Parker 2-1-77 18.00
ck to see if Marie has Ck.

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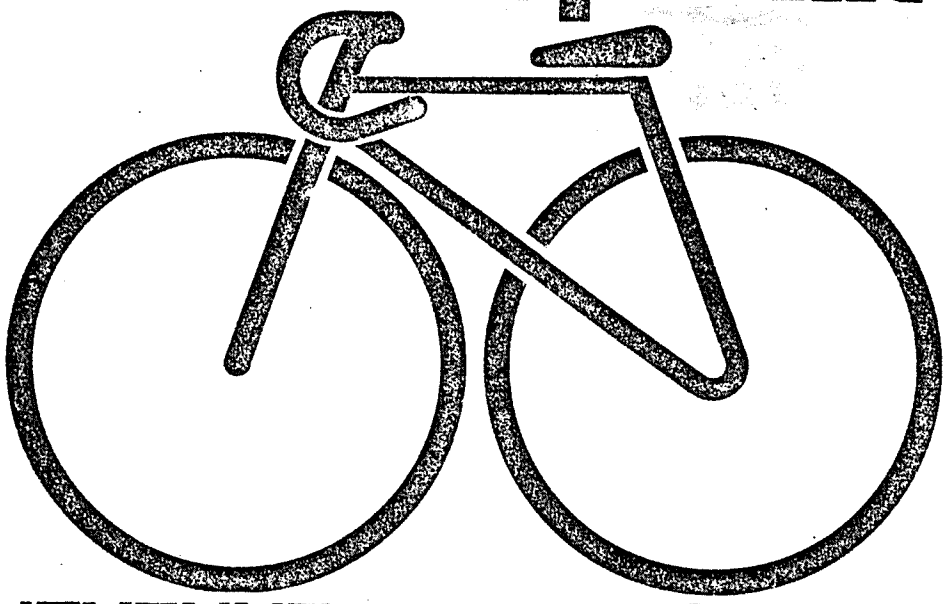
Dottie Johnson 18.00 6-16-74

# Project Manual for Bikeway Development



## CHEYENNE BIKEWAY SYSTEM (1978)

**DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT**
City of Cheyenne, Wyoming

prepared by:
**CSSA - WIRTH ASSOCIATES**
ENGINEERS - LANDSCAPE ARCHITECTS
1780 WESTLAND ROAD, CHEYENNE, WYOMING 82001
307-634-1597

# CRUSHED AGGREGATE BASE COURSE

## 1. SCOPE OF WORK

Furnish all labor, materials and equipment necessary to do all work and related items as shown on the drawings, specified herein or incidental to proper execution of the work.

## 2. DESCRIPTION

This specification includes the requirements for materials, preparation, and construction of one or more courses of crushed aggregates and additives, if required, constructed on the prepared subgrade in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans, and with the lines and grades established by the Engineer.

## 3. MATERIALS

A. Source of Supply: All work involved in clearing and stripping of quarries and pits, including handling unsuitable material encountered, shall be performed by the Contractor at his own expense. Crushed aggregate base course material shall be obtained from sources approved by the Engineer. All aggregate materials shall be free from vegetable matter, clay, frozen lumps or other matter, and shall be handled in a manner that a uniform and satisfactory product can be secured.

Preliminary acceptance of aggregates proposed for use may be made at the point of production. Final acceptance of the base course will be dependent on receipt of satisfactory results of compaction and gradation tests.

B. Crushed Base Course: Base course aggregate shall consist of crushed stone or crushed gravel.

When producing aggregates to meet this specification, all boulders in the pit up to six inches in diameter shall be crushed and blended, if necessary, with screenings or sand to produce a mixture of aggregates that shall be capable of being compacted into a dense and well bonded base.

Pit run screenings rejected during the production of other aggregates will not be accepted as crushed base aggregates.

The term "coarse aggregate" shall apply to materials retained on a No. 4 sieve, and the term "fine aggregate" shall mean materials passing a No. 4 sieve.

The crushed stone shall consist of hard, durable particles or fragments of stone, free from an excess of flat, elongated, soft or disintegrated particles, dirt or other objectionable matter, and shall have a per cent of wear of not more than 50 at 500 revolutions, as determined by A.A.S.H.O. T-96 (Los Angeles Rattler Test).

# CRUSHED AGGREGATE BASE COURSE

(1.) Coarse aggregate shall consist of hard, durable particles or fragments of stone or gravel.

The crushing of the gravel shall result in a product in which all the material retained on a No. 4 sieve shall have at least 50 per cent by weight of particles, with at least one fractured face. If necessary to meet this requirement or eliminate an excess of fine particles, the gravel shall be screened before crushing. The gravel shall have a per cent of wear of not more than 50 at 500 revolutions, as determined by A.A.S.H.O. T-96 (Los Angeles Rattler Test).

(2.) Fine aggregate shall consist of crushed stone, crushed gravel, or natural sand, or a combination thereof. The fine aggregate shall not have a liquid limit greater than 25, nor a plasticity index in excess of six, except that when the plasticity index is non-plastic, the liquid limit shall not be more than 30, when tested in accordance with A.A.S.H.O. T-89 and T-90.

The crushed aggregate shall not show evidence of disintegration, nor show a total loss greater than 12 per cent, when subjected to five cycles of the sodium sulphate accelerated soundness test using A.A.S.H.O. T-104.

The crushed base aggregates shall meet the grading requirements for the following table, as determined by AASHO Method T 27 (Wyoming modified).

| Sieve Size | Percentage by Weight Passing |
|---|---|
| 1½" | 100 |
| 1" | 95-100 |
| #4 | 40- 65 |
| #8 | 30- 55 |
| #200 | 3- 15 |

The gradations in the table represent the limits which shall determine suitability of aggregate for use from the source of supply. The final gradation decided upon within the limit designated in the table, shall be uniformly graded from coarse to fine, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.

During crushing operations the aggregates shall be stockpiled in such a manner as to avoid contamination by foreign material, or segregation.

When the stationary mixing plant method is used, the point of acceptance for aggregates will be immediately before mixing and prior to the addition of water, based on periodic samples.

When a road mix method is used, the point of acceptance for aggregates will be after grading and before laying, based on samples taken from the combined windrow for each.

C. Commercial Additives: The additives, when specified in the contract, shall conform to the following requirements.

| | |
|---|---|
| Sodium Chloride | AASHO M143 |
| Clacium Chloride | AASHO M 144 type I |
| Hydrated Lime | ASTM C 415 |
| Portland Cement | AASHO M 85 Type I or II |

D. Water: Water used in mixing with aggregates shall be reasonably clean and free of silt, mud, vegetable matter, or other foreign materials.

4. CONSTRUCTION METHODS

Aggregate crushed base shall only be placed upon a dry unfrozen surface. Crushed, base containing frozen chunks or clods shall not be used. Material will not be placed when ambient conditions would cause freezing before proper compaction can be achieved.

When failure to complete construction of a base course, due to weather limitations would impede the orderly flow of traffic, construction may be completed using an approved anti-freeze additive, upon approval in writing by the Engineer.

5. MIXING

The Contractor shall mix the aggregate, water, and commercial additive, where specified, using a method which can be demonstrated to efficiently produce a uniform mixture, without resulting in wet or dry pockets, or segregation. The moisture content of the material at the time of compaction shall be within plus 2 and minus 4 percentage points of optimum. Optimum moisture content shall be determined by AASHO Method T 180 (ASTM D 1557).

6. METHOD OF PLACING

The aggregate, as spread, shall be of uniform gradation with no segregation or pockets of fine or coarse materials. The aggregate, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within these limits. No material shall be placed in snow or on a soft, muddy or frozen subgrade.

If the required compacted depth of the base course exceeds six inches, the course shall be constructed in two or more lifts of approximately equal thickness. The maximum compacted thickness of any one layer or lift shall not exceed five inches. When vibrating or other approved types of special compacting equipment are used, the depth of a single layer of the course may be increased upon approval by the Engineer.

The base course material shall be at a satisfactory moisture content when rolling is started, and any minor variations shall be corrected by sprinkling or by aeration, if necessary.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade or shoulder material in the base course.

7. FINISHING AND COMPACTING

After the spreading, the crushed aggregate shall be thoroughly compacted by rolling and sprinkling when necessary. The initial rolling of the course shall be done with a suitable three-wheel roller or other approved equipment. Sufficient rollers of the designated types shall be furnished to adequately handle the compaction of the material that has been placed and spread as specified above.

Rolling shall progress gradually from the side to the center, or from one side toward previously placed material by lapping, uniformly, each preceding rear-wheel track by one-half the width of such tract, and shall continue until the entire area of the course has been rolled by the rear wheels. The rolling shall continue until the stone is thoroughly set, the interstices of the material reduced to a minimum, and creeping of the stone ahead of the roller no longer visible. Rollings shall continue until the base material has been compacted to not less than 98 per cent density. Blading and rolling shall be done alternatly as required or directed, to obtain a smooth, even and uniformly compacted base. For final rolling, either 10-ton three-wheel or 8-ton tandem rollers may be used. Field density shall be determined in accordance with ASTM D698 (D).

Along places inaccessible to rollers, the base course material shall be tamped thoroughly with mechanical or hand tampers. Each hand tamper shall wiegh not less than 50 pounds and have a face area of not more than 100 square inches.

8. SURFACE TEST

After the course is completely compacted, the surface shall be tested for smoothness and accuracy of grade and crown, with a ten foot straight edge. Variations in grade and crown of more than one-half inch shall be cause for rejection of that portion. Such portions shall be scarified, reshaped, recompacted and other wise mainpulated as the engineer may direct, until the required smoothness and accuracy is obtained.

9. PROTECTION

Work on the base course shall not be prosecuted during freezing temperatures nor when the subgrade is wet. When the aggregates contain frozen materials or the underlying course is frozen, the construction shall be stopped.

In general, hauling equipment may be routed over completed portions of the base course provided no damage results, and provided that such equipment is routed over the full width of the base course to avoid rutting or uneven compaction. However, the Engineer in charge shall have full and specific authority to stop all hauling over completed or partially completed base course when, in his opinion, such hauling is causing excessive damage. Any damage resulting

to the base course from routing equipment over the base course, shall be repaired by the Contractor at his own expense.

10. MAINTENANCE

Following the completion of the leveling course, the Contractor shall perform all maintenance work necessary to keep the base course in a condition satisfactory for the prime coat and asphalt surface course.

11. MEASUREMENT AND PAYMENT

Measurement shall be by the cubic yard measured in place, to specifications. Payment will be by the contract unit price for the measured number of cubic yards in place, which shall constitute full compensation for all material, processing, grading, placement, compaction, labor, tools, equipment and incidentals necessary to complete the work.

# SITE GRADING

## 1. SCOPE OF WORK

Furnish all labor, materials and equipment necessary to do all work and related items as shown on the drawings, specified herein or incidental to proper execution of the work.

## 2. CONSTRUCTION METHODS

Clearing:
The area within the limits shown on the Site Grading Plan Sheet shall be cleared of all objectionable material, to include trees, logs, stumps, brush, vegetation, rubbish, etc. Stumps and roots in cuts and in embankments 3 feet or less in depth shall be removed to a depth of 18 inches below subgrade. Outside of slope limits and under embankments more than 3 feet deep, all trees, stumps, brush, etc., shall be cut off approximately level with the surface, except growth designated for preservation.

Spoiled material shall be burned or removed to approved disposal areas as directed by the Engineer. All ashes shall be spread and covered by a layer of earth.

Topsoil:
Topsoil within the grading limits shall be removed and stockpiled as directed by the Engineer. No woody or obnoxious shrubs, weeds or other deleterious material shall be mixed with the topsoil. At the completion of the project, the topsoil will be applied to and spread within the areas of the site in preparation for seeding, as specified and directed by the Engineer.

Excavation:
Excavation shall be made to the lines and grades as shown on the drawings and/or as directed by the Engineer. All excavation shall conform to the provisions and requirements as specified in Earthwork, Streets.

Fill:
All fill areas shall be constructed to the lines and grades as directed, with material from within the grading limits. Excess road and other site excavation which is not needed for embankment and fill within the construction site, will be used for site grading fill material. All embankment and fill shall conform to the provisions and requirements as specified in Earthwork, Streets.

## 3. DRAINAGE DITCH GRADING

Drainage ditch grading will be required in those areas as shown or indicated on the drawings, and as directed by the Engineer. The ditches shall be cleared of all debris and the bottom and sides finished to smooth, uniform slopes. No extra compensation shall be made for this work, but this shall be included and covered in the unit price bid for site grading excavation.

## 4. CLEANUP OF AREA

Upon completion of the work, the entire project site shall be cleared of all debris, and ground surfaces shall be finished to smooth, uniform slopes and shall present a neat and workmanlike appearance. All cleanup, hauling, and grading

as necessary shall be included and covered in the unit price bid for site grading excavation. Any existing utilities or structures or newly installed utilities, etc. which are damaged, shall be repaired or replaced at the Contractor's expense and as directed by the Engineer.

5. MEASUREMENT AND PAYMENT

Topsoil: Measurement shall be by the cubic yard measured in the stockpile upon completion of stripping and stockpiling operations. Payment will be by the Contract unit price for the measured number of stockpiled cubic yards which shall constitute full compensation for all materials, labor, excavation of an average of four (4) inches of topsoil, stockpiling of topsoil in designated areas, spreading of stockpiled topsoil on landscaping areas to a depth as specified, finish grading of topsoiled areas, cleanup, equipment, and all incidentals necessary for completion of the work.

Site Grading Excavation: Measurement shall be by the cubic yard measured in original position prior to excavation. Payment will be by the contract unit price for the measured number of cubic yards in place, which shall constitute full compensation for all materials, labor, excavation, construction of all fills and embankments, compaction, drainage ditch grading, site grading, cleanup, equipment, and all incidentals necessary to complete the work.

# EARTHWORK, STREETS

## 1. SCOPE OF WORK

Furnish all labor, materials and equipment necessary to do all work and related items as shown on the drawings, specified herein or incidental to proper execution of the work.

## 2. CLEARING SITE

The site shall be cleared of all vegetation such trees, stumps, brush and any other organic matter. All rubbish, former construction wastes and like objects shall be removed from the site immediately so that these materials will not be incorporated in backfill material.

## 3. CONSTRUCTION METHODS

### A. Excavation

Excavation shall be performed at such places as are indicated on the Contract Plans, to the lines, grades and elevation show, or as directed by the Engineer. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work. The rough excavation shall be carried to such depth that sufficient material will be left above the designated grade to allow for compaction to this grade.

Should the Contractor through negligence or other fault, excavate below the designated lines, he shall replace such excavation with approved material in an approved manner and condition, at his own expense. All material excavated shall be defined as "Unclassified Excavation Above Subgrade".

### B. Topsoil

Topsoil within the street grading limits shall be removed and stockpiled in the park area as directed by the Engineer. No woody or obnoxious shrubs, weeds or other deleterious material shall be mixed with the topsoil. The topsoil stockpiles shall be graded and smoothed to uniform lines as directed by the Engineer.

### C. Subgrade

All subgrade shall be compacted to the density specified, and the surface when completed shall be true to the lines, grades and cross section shown on the plans and/or as directed by the Engineer. The subgrade shall be scarified to a depth of six inches and then compacted to a firm, unyielding layer of not less than ninety-five (95%) percent of maximum unit weight at optimum moisture, as obtained by ASTM D698(A).

The rolling of the entire area shall be done with an approved power roller weighing not less than ten (10) tons, or other approved type of roller. Any irregularities or depressions that develop under rolling shall be corrected by loosening the material at these places and adding, removing material or replacing material until the surface is smooth and uniform. The material shall be sprinkled with water during rolling or tamping, when directed by the Engineer.

All soft and yielding material, and material which will not compact readily when rolled or tamped, shall be removed as directed by the Engineer, and replaced with suitable material. Backfill shall be obtained from the most select material encountered in excavation, as directed by the Engineer.

D. Embankment & Fill Sections

All sections which require embankment or fill as indicated on the drawings or as directed by the Engineer, shall be constructed with approved excavated material obtained from within the construction site. The top four inches of subgrade shall be compacted to a density equal to ninety-five (95%) percent of that obtained by ASTM D698(A) prior to any embankment or any fill material being placed. All fill material shall be placed in six (6) inch thick embankment layers compacted by use of sutiable compaction equipment and methods to a density equal to ninety-five percent of that obtained by ASTM D698 (A). All fill slopes shall be neatly trimmed and surfaces smoothed out.

4. DRAINAGE DITCH GRADING

Drainage ditch grading will be performed as indicated on the drawings or directed by the Engineer. The ditches shall be cleared of all debris, and the bottom and sides finished to smooth, uniform slopes.

5. CLEANUP OF AREA

Upon completion of the work, the entire project site shall be cleared of all debris, and ground surfaces shall be finished to smooth, uniform slopes and shall present a neat and workmanlike appearance. All cleanup, hauling and grading as necessary, shall be done as directed by the Engineer. Any existing utilities, structures, landscaping, grass areas etc. which are damaged due to ngeligence of the Contractor, shall be repaired or replaced at the Contractor's expense and as directed by the Engineer.

6. MEASUREMENT AND PAYMENT

Measurement shall be by the cubic yard by average end area method in original position prior to excavation. Payment will be by the contract unit price for the measured number of cubic yards in place, which shall constitute full compensation for all materials, labor, excavation, excavation and stockpiling of topsoil, construction of all designated fills or embankments and any additional fill or embankment as directed by the Engineer; compaction, grading, cleanup, equipment and all incidentals necessary to complete the work. Only excavation shall be measured for payment.

# ASPHALT PRIME AND/OR TACK COAT

## 1. DESCRIPTION

This item shall consist of a single application of asphalt material on a prepared subgrade, sub-base, base or asphalt surface, in strict accordance with the plans and specifications.

## 2. CONSTRUCTION METHODS

The prime coat shall be placed only on a slightly moist, clean base free from loose or foreign material, when atmospheric temperature is above 40°F. From 0.2 to 0.5 gal. per sq.yd. (depending on surface texture) of medium-curing cut-back asphalt shall be applied with a pressure distributor.

Liquid cut-back asphalts for prime shall be of the Medium Curing type, MC-30 or MC-70 grade, shall conform to the requirements of AASHO M82, and shall be fortified by the addition of a satisfactory antistripping agent at the refinery. Liquid cut-back asphalts may be conditionally accepted at the source.

Application temperatures for prime shall be as indicated in the table below.

| Type and Grade of Material | Application Temperature Degrees Fahrenheit |
|---|---|
| MC-30F | 90-180 |
| MC-70F | 120-200 |

Following the application, the prime surface shall be allowed to dry for a period of not less than twenty-four (24) hours without being disturbed, or for such additional period of time as may be necessary to permit the drying out of the prime until it will not be picked up by traffic or equipment, which period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the surfacing has been placed. Suitable precautions shall be taken by the Contractor to protect the prime surface against damage during this interval, including supplying and spreading blotter materials when necessary.

Blotter material shall be either sand or screenings, free from vegetable matter, clay or other deleterious matter. The plasticity index shall not exceed six and the fraction passing the No. 200 sieve shall not exceed 20 per cent.

## 3. EQUIPMENT

Distributors: The pressure distributor used for prime and tack coats shall distribute the required amount of asphaltic material at the specified temperature and in a uniform spray, without atomization. The distributor shall be equipped with pneumatic tires of such size and number that the surface being sprayed will not be rutted or otherwise disturbed. It shall have a bitumeter with a dial visible to the truck driver for maintaining the constant speed required for application at the specified rate.

The pump shall be operated by a separate power unit, or by the truck power unit. It shall have a tachometer with a dial readily visible to the operator, registering gallons per minute passing through the nozzles.

The distributor shall be equipped and operated so that the asphaltic material shall be circulated or agitated throughout the entire heating process. Means for accurately indicating at all times, the temperature of the asphaltic material, shall be provided. The thermometer well shall be so placed as not to be in contact with the heating tube.

4. CONSTRUCTION METHODS, ASPHALT TACK COAT.

The asphalt tack coat consists of a light application of a diluted, slow-breaking asphalt emulsion to insure bond between the surface being paved and the overlying course. Immediately before applying the tack coat, the surface to be tacked shall be cleaned of all dirt and loose materials by means of blowers or power brooms, supplemented by hand brooming if necessary. Application shall be made when the surface is dry, or slightly damp and, unless otherwise permitted by the Engineer, when the air temperature in the shade is not less than 40°F.

Emulsified asphalts for tack coats shall be of the Slow Setting type and SS-1 or SS-1h grade and shall conform to the requirements of AASHO M140. Emulsified asphalts may be conditionally accepted at the source.

The asphalt emulsion shall be diluted with water at the rate of one part emulsion to one part water. The diluted emulsion shall be applied by means of a pressure distributor at the rate between 0.08 and 0.12 gallons per square yard.

The water used for the dilution shall be free of sediment and other deleterious matter.

The dilution water and emulsion shall both be heated to approximately 110°F prior to mixing, and this approximate temperature shall be maintained during the application. Dilution shall be made by introducing the water into the emulsified asphalt.

After the tack coat has been applied, it shall be left undisturbed until the asphalt emulsion has "broken", generally within 30 minutes of application. After the emulsion has broken, the next pavement course shall be placed.

The Contractor shall schedule his operations so that all tack coat placed shall be covered with the asphalt paving course in the same day.

5. MEASUREMENT & PAYMENT

Prime coat oil shall be measured and paid for by the ton of 2,000 pounds of the asphalt prime coat material complete in place, at the contract unit price, which price and payment shall constitute full compensation for all demurrage, storage, handling and other charges; all material (including the asphalt prime coat material), tools, equipment, labor and performance of all work necessary to the furnishing, testing, delivery, unloading, heating, hauling and spreading of the asphalt prime coat, cleaning the surface to be primed, blotting excess prime material, maintaining the primed surface, and all incidentals necessary to complete the item.

Payment will be made only for the asphalt prime coat material required and actually used in the work. The Owner will accept no responsibility for any material shipped onto the project in excess of requirements because of tank-truck or tank car capacities or for other reasons.

## B. SIGNS

### 9B-1 Application of Signs

Bicycle use related signs on highways and bikeways serve three basic purposes; 1. regulating bicycle usage, directing bicyclists along pre-established routes, and warning of unexpected conditions. Care should be taken not to install too many signs. A conservative use of regulatory and warning signs is recommended as these signs, if used to excess, tend to lose their effectiveness. The frequent display of guide signs, however, aids in keeping the bicyclist on the designated route and does not lessen their value. Some signs for the bicyclist can also serve the motorist and the pedestrian.

### 9B-2 Location and Position

Where signs are to serve both bicyclists and motorists, mounting heights and lateral placement shall be as specified in Part II, Signs. Figure 9-1 illustrates typical signing placement for bicycle trails. Overhead sign clearance on bicycle trails shall be a minimum of 2.6 metres. 8½ feet The clearance provided should also be adequate for the typical maintenance vehicles used on the bikeway. Where signs are for the exclusive use of bicyclist, care should be taken that they are located so that motorists are not confused by them.

### 9B-3 Design

The design of signs for bicycle facilities should wherever possible be identical to that specified in this Manual for motor vehicle travel. Uniformity in design includes shape, color, symbols, wording, lettering, and illumination or reflectorization. Detailed drawings of the standard signs illustrated in this Manual are available to State and local highway and traffic authorities, sign manufacturers, and similar interested agencies from the Federal Highway

# CONCRETE CURB, GUTTER AND SIDEWALK

## 1. SCOPE OF WORK

Furnish all labor, materials and equipment necessary to do all work and related items as shown on the drawings, specified herein or incidental to proper execution of the work.

## 2. MATERIALS

A. Portland Cement Concrete: Portland Cement Concrete shall be a six (6) sack mix with a minimum 28 day compressive strength of 3750 psi. Reinforcing steel and concrete shall conform to the specifications set forth in the section on concrete work and reinforcing steel.

B. Expansion Joint Material: Expansion joint material shall be ½" thick bituminous preformed joint filler, conforming to A.A.S.H.O. Designation M-153, flexed expansion joint filler as manufactured by the Celotex Corporation, or an approved equal. The joint filler shall be cut to the cross section of the curb and gutter.

## 3. CONSTRUCTION METHODS

Typical cross-section of combined curb and gutter with separate sidewalk section, is detailed on the Standard Detail Sheet. Curb gutter and sidewalk shall be constructed to the line and grade as shown on the plans, or as directed by the Engineer.

Sidewalks, curbs and gutters, shall be constructed in sections of the lengths shown on plans. No section shall be of a length less than eight (8) feet and any section less than eight (8) feet shall be removed at the contractor's expense.

Excavation and subgrade compaction shall be included in and covered under Earthwork, Streets.

The combined curb, gutter and sidewalk shall be placed upon a granular compacted subgrade and shall consist of a minimum thickness of three inches of 1" minus material which shall be acceptable in-place material, asphaltic treated base material placed for the streets, or imported acceptable material, as approved by the Engineer. Subgrade compaction and preparation extending to a point six inches beyond the back of the curb shall be provided for the construction of the combined curb and gutter, as shown on the typical sections.

## 4. FORMS

Forms to be used shall be steel forms, thoroughly cleaned and coated with a light oil to prevent the adherence of concrete. Forms shall be straight, free from warp, jointed neatly, tightly and securely, and of sufficient strength, when installed, to resist the pressure of concrete and vibration without springing. Flexible or curved metal forms of proper radii, or substantial wood forms approved by the Engineer, shall be used for curves having a radius of less than 100 feet.

5. PLACING AND FINISHING CONCRETE

The contractor shall not begin placing of concrete on public property until such area has been inspected and approved by the City Engineer. Any placement prior to inspection and approval shall be removed and replaced at the contractors expense.

Immediately before pouring concrete, the forms and subgrade shall be wetted thoroughly. The concrete shall be poured continuously with the construction joints. The concrete shall be deposited to the specified depth in one operation, and shall be consolidated as rapidly as it is placed by the use of an internal vibrator, to produce a dense, smooth surface.

Sidewalks shall be marked into separate sections, each four (4) feet in length by the use of approved jointing tools.

Street names shall be impressed in face of concrete curb 1/2 inch deep before concrete has set.

The finishing of combined curb, gutter and sidewalk shall conform to the requirements set forth in the section on concrete work. The use of grout on the surface of curb and gutter to facilitate the finishing operation, will not be allowed. The gutter grade and curb face shall be tested with a 10 foot straight edge to verify the uniformity of the gutter grade and curb face. Variations from the gutter grade and curb face greater than one-fourth inch, shall be cause for rejection of that portion. All rejected portions shall be removed and replaced at the Contractor's expense.

6. JOINTS

Expansion joint fillers as specified in 2(b) shall be provided at maximum intervals of 40 feet, and at the P.C. and P.T. of the curb turns.

Contraction joints shall be provided between the expansion joints at 10 foot intervals, except where shorter sections are necessary for closures, but no section shall be less than 8 feet.

[illegible] shall be [illegible] surface of the curb down to a straight line two inches below the low point of the gutter. The joints shall be edged with an edging tool on each side of the severed joint.

7. CURING

The forms shall be removed with 24 hours after the concrete has been placed, and the concrete shall be covered with burlap, or other suitable material, and kept moist for a period of three (3) days, or, an approved curing compound

shall be applied to all exposed surfaces, including the back of curb and face of gutter sections. The concrete shall be suitably protected from the weather and construction activity until thoroughly cured.

8. CURB BACKFILL

All backfill behind the curb or sidewalk shall be done prior to compaction of the base and leveling courses. The area behind the combined curb, gutter and sidewalk shall be filled to the required elevation with suitable select material, compacted to prevent settlement and with the surface leveled off to a neat appearing and free draining surface.

In areas where lawns and grass areas exist and other areas as directed by the Engineer, the top four(4) inches of backfill shall be black loam or good topsoil which is suitable for lawn growth. This backfill shall extend to match the lawn removed during construction or the existing lawn.

Where curb and sidewalk depressions are made for driveways or alleys, the area behind the sidewalk shall be graded to match the existing grade and the disturbed area resurfaced with gravel.

Where driveway and alley approaches are lower than the new combined curb, gutter and sidewalk, adequate filling and grading shall be done to prevent gutter drainage from entering the approaches.

9. MEASUREMENT AND PAYMENT

Measurement shall be by the lineal feet of acceptable curb, gutter and measured in place along the face of the curb, and by square feet of in-place double gutter and fillets.

Payment shall be by the contract unit price, which price shall constitute full compensation for all materials, curing, joint filler, finishing, steel dowels and sleeves, excavation, subgrade compaction and preparation, placing of backfill behind curb, topsoil, raking, grading, equipment, tools, labor, and all incidentals necessary to complete the work.

# CONCRETE WORK AND REINFORCING STEEL

## 1. SCOPE OF WORK

The work covered by this section consists of furnishing all material and equipment and performing all labor for the manufacture, forming, transporting, placing, finishing, and curing of concrete in accordance with the plans and these specifications.

## 2. COMPOSITION AND CLASSIFICATION OF CONCRETE

Concrete shall be composed of Portland cement, water, fine and coarse aggregate and such admixtures as may be authorized for a specific project.

## 3. MATERIALS

The materials for performing the work under this section of the specifications shall meet the following minimum requirements.

### A. Portland Cement

Portland cement shall comply with the Standard Specifications for Portland Cement, ASTM C-150 and shall be a six sack mix with a minimum 28 day compressive strength of 3750 psi, a maximum water content of 5.5 gallons per sack of cement, and a slump range between 2 and 5 inches.

### B. Water

The source of water used in the concrete shall be approved by the Engineer and the water shall be fresh, clear and free from injurious amounts of sugar, sewage, oil, acid, alkali salts, or organic matter.

### C. Fine Aggregate

Fine aggregate shall consist of [illegible] durable particles conforming to the provisions of Standard Specifications for Concrete Aggregate (ASTM Designation C-33) and the following grading specifications:

| Sieve Designation U.S. Standard Square Mesh | Percentage by Weight Passing |
|---|---|
| 3/8-inch | - 100% |
| No. 4 | 95 - 100% |
| No. 8 | 80 - 100% |
| No. 16 | 50 - 85% |
| No. 30 | 25 - 60% |
| No. 50 | 10 - 30% |
| No. 100 | 2 - 10% |
| No. 200 | 0 - 3% |

When subjected to 5 cylces of the sodium sulphate soundness test, the fine aggregate shall have a total loss of not greater than 10 per cent by weight. Instead of the soundness test mentioned above, the Contractor may provide evidence, satisfactory to the Engineer, that the fine aggregate has been exposed to natural weathering, either directly or in concrete, for a period of at least 5 years without appreciable disintegration.

Fine aggregate shall contain not more than 1/4 per cent of organic matter, 3 per cent of material removable by a decantation test, nor more than 1 per cent of clay lumps; or 1 per cent of shale. The total of coal, clay lumps, shale, soft fragments, and other local deleterious substances shall not be more than 5 percent.

D. Coarse Aggregate

Coarse aggregate shall conform to the provisions of Standard specifications for Concrete Aggregates, (ASTM Designation C-33) and shall consist of crushed stone, gravel or other approved material having clean, hard, durable particles free from dust, dirt, or other foriegn substance. Coarse aggregate shall be well graded between the limits specified and shall conform to the requirements prescribed as follows:

| Designated Size | Amounts Finer Than Each Sieve, Per Cent by Weight | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2-1/2" | 2" | 1-1/2" | 1" | 3/4" | 1/2" | 3/8" | No. |
| 2" - #4 | 100 | 95-100 | | 35-70 | | 10-30 | | 0-5 |
| 1-1/2"-#4 | | 100 | 95-100 | | 35-70 | | 10-30 | [illegible] |
| [illegible] | | | [illegible] | [illegible] | | [illegible] | | |
| [illegible] | | | | 100 | 90-100 | | 20-55 | [illegible] |
| 1/2"-#4 | | | | | 100 | 90-100 | 40-70 | 0-10 |

The maximum size of aggregate shall not be larger than one-fifth of the narrowest dimension between sides of the forms of the member for which the concrete is to be used, nor larger than three-fourths of the minimum clear spacing between reinforcing bars.

The percentage of wear when tested in accordance with ASTM Designation D-131 (Los Angeles Rattler Test) shall not be more than 50. The coarse aggregate shall not have more than 1 per cent of material removed by the decantation test, nor more than 5 per cent of soft fragments; nor more than 1/4 per cent of clay lumps. The total of shale, coal, clay lumps, and soft fragments

E. Admixtures

When air entrained concrete is specified, "Protex" or an approved equal, conforming to the requirements of ASTM C-150, may be added to the concrete as an air entraining agent. The air entraining admixtures shall be added to the concrete at the mixing or batching plant to produce a 6% ± 1% air entrainment. When directed or authorized admixtures shall be used in strict accordance with the recommendations of the manufacturer. The use of any other material added to the concrete mix will require prior approval by the Engineer

F. Metal Reinforcement

(1) Reinforcing bars shall conform to the requirements of Standard Specifications for deformed Billet-Steel bars for Concrete Reinforcement (ASTM A615), or Standard Specifications for Rail-Steel Deformed Bars for Concrete Reinforcement (ASTM A617).

(2) Welded wire fabric or cold-drawn wire for concrete reinforcement shall conform to the requirements of Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement (ASTM A82) or Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement (ASTM A185).

G. Premoulded Joint Filler

Premoulded Joint Filler for expansion joints shall meet the requirements of ASTM Designation D 1751, "Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)" or ASTM Designation D 1752, "Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient non-bituminous Types)", unless shown otherwise on the plans.

H. Joint Sealer

Joint Sealer shall meet the requirements of ASTM Designation D 1190 for "Concrete Joint Sealer, Hot Poured Elastic Type", unless shown otherwise on the plans.

I. Waterstops

Polyvinyl chloride water stops shall be placed in joints of structures as [illegible]

The Contractor shall fabricate all special intersections, splices and joints, and make bends at corners as shown on the drawings or as directed by the Engineer. All joints, splices, bends and intersections shall be made in strict accordance with the manufacturer's printed instructions, using materials approved by the manufacturer, and shall be formed to produce a strong, sound and watertight joints.

Polyvinyl waterstops shall be Type No. 4 and 4c, 6-inch Durajoint waterstop (as shown on drawings), as manufactured by Electrovert, Inc., New York, N.Y., or approved equal.

The Contractor shall take suitable precautions to support and protect the waterstops during the progress of the work.

4. STORAGE OF MATERIALS AND REINFORCING STEEL

Cement and aggregates and reinforcing steel shall be stored at the work site in such a manner as to prevent deterioration or intrusion of foreign matter. Any material which has deteriorated or which has been damaged shall not be used for concrete.

5. BATCH PROPORATIONS

The Contractor shall submit his proposed mix designs to the Engineer for approval prior to undertaking any concrete work. The minimum permissable 28-day compressive strength for concrete shall be as stated in Paragraph 2, but the mix shall be designed for strengths at least 15 per cent in excess of this minimum.

6. BATCHING

All dry materials for use in Portland Cement Concrete shall be proporationed [illegible] by weight, with the exception of the air entraining agent which may be proportioned by volume. The cement shall be weighed in an individual hopper and shall be kept separate from aggregates until the batch ingredients are released for discharge. The cement hopper may be attached to the aggregate scale for cumulative weighing; however, if this is done the cement shall be weighed before the other ingredients. Scales may be of a springless dial type or the multiple beam type. If of the multiple beam type, scales shall be provided with an indicator operated by the main beam which will give positive visible evidence of over or under weight. The filling and discharge valves for the water batcher shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. The mechanism for delivering water to the mixer shall be such that leakage will not occur when the valves are closed. The air entraining admixture dispenser shall be interlocked with the batching and discharging operation of the water so that the batching and discharging of the admixture will be automatic. Prior to the use of the batch plant for batching for this contract, the Contractor shall, if requested, supply a certificate [illegible] of the weighing is within 2 per cent for aggregates, 1 per cent for cement and water. At any time during the contract, the Engineer may demand a recertification if circumstances warrant and such certification or re-certification shall be furnished without cost.

7. MIXING

The concrete as furnished can be mixed at the site of the project or can be transported in a transit mix concrete truck.

A. On Site Mixing

If the concrete is mixed at the site, a suitable size mixer shall be furnished which will provide completely mixed concrete meeting the requirements of this specification. Mixers shall be operated at speeds recommended by the manufacturers. Automatic timing device shall be furnished and interlocked with the discharge mechanism in such a manner that no part of the batch can be discharged until specified mixing time has elapsed. In the mixers having a capacity of 1 cubic yard or less, mixing time shall not be less than 90 seconds after all material except the water are in the mixer and before any part of the batch is released. For mixers having a capacity in excess of 1 cubic yard the additional mixing time shall be 15 seconds for each cubic yard or a fraction thereof of additional capacity. The total elapsed time between the injection of the aggregates and the cement into the mixer and before discharge shall not exceed 30 minutes.

B. Transit Mix Concrete

Each truck mixer shall have attached hereto in a prominent place a metal plate or plates on which are shown, clearly marked, the use for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of volumes of mixed concrete and the speed of the rotation of the mixing drum or blades. The mixer shall be equipped with electrically actuated counters by which the number of revolutions of the drum or blades may readily be verified. The counter shall be of a resetable, Recording type and shall be mounted on the driver's cab. The truck mixer, when loaded to the manufacturer's guaranteed capacity, shall be capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass and of discharging the concrete with a satisfactory degree of uniformity.

Each batch of concrete shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the mixer as mixing speed. Additional mixing shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determination of the number of revolutions of the mixer. Concrete shall be delivered to the site of the work and discharge shall be completed while the concrete is still plastic and before it reaches initial set and in no case later than one and one-half (1-1/2) hours after addition of the cement to aggregates or before the drum has been [illegible] first. The concrete discharged [illegible] for the job without the use of additional mixing water. The rate of discharge of the plastic concrete from the mixer drum shall be controlled by by the speed of rotation of the drum in the discharge direction, with the discharge gate fully open. Each batch of ready-mix concrete delivered at the job site shall be accompanied by a ticket showing the volume of concrete, the weight of cement in pounds and a total wieght of all ingredients in pounds. The ticket shall also show the time of day in which the materials were batched into the truck.

## 8. TESTING

When so directed, the Contractor shall at his own expense, provide compression test samples and submit certified test reports of compressive strength from an approved testing laboratory. Compression test samples shall be made and cured in accordance with ASTM Designation C-31, "Standard Method of Making and Curing Concrete Compression and Flexural Test Specimens in the Field." Test samples shall be cured under conditions identical to the portion of the structure they represent insofar as possible. Specimens shall be tested in accordance with ASTM Designation C-39, "Standard Method of Test for Compressive Strength of Molded Concrete Cylinders." The Engineer may make such other tests of concrete delivered to the forms as he deems necessary to determine whether concrete meets the specification requirements. The Contractor shall cooperate fully with the inspector and shall provide labor for assistance if requested. The Contractor shall, when requested furnish the following test equipment for use by the Engineer:

1 - Rubber-tired wheelborrow
1 -D-handle round nose shovel
1 - slump cone with pan, tamping rod, wire brush and steel trowel
As required - disposable cylinder molds

## 9. FORMS

Forms shall conform to the shape, lines and dimensions of the members as called for on the plans, and shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain position and shape. The material to be used and the design of the forms shall be subject to approval by the Engineer before construction of forms is started; however, such approval will not relieve the Contractor of responsibility for the adequacy of the forms nor from the necessity for remedying any defects which may develop or become apparent with use. The Engineer may at any time condemn any sections of forms found deficient in any respect and the Contractor shall promptly remove the condemned forms from the work and replace them at his own expense. Drawings showing the general design and dimensions for forms for structures need not be submitted to the Engineer for approval unless the Engineer so requests such submittal.

Before concrete is placed, the surfaces of the forms shall be oiled with a commercial form oil that will effectively prevent sticking of the concrete to the forms and will not stain the concrete. All bond breaking materials or processes [illegible] by the Engineer. [illegible] applied [illegible] in such a manner as to avoid contact with reinforcing steel [illegible] bond. Any steel which becomes coated with form oil shall be thoroughly cleaned or replaced at the expense of the Contractor.

Forms shall be removed in such a manner as to insure the complete safety of the structure. Where the structure as a whole is supported on shores, the removable floor forms, beams and girder sides, column and similar vertical forms may be removed after 24 hours, providing the concrete is sufficiently hard not to be injured thereby. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support safety their weight and the load thereon.

## 10. REINFORCING

### A. Cutting and Bending

Reinforcment bars shall be cut and bent at the mill or shop before shipment to the work. Bending in the field will not be permitted, except to correct errors or bends caused by handling, and then only when specifically authorized in writing by the Engineer. All bending shall be done cold.

All reinforcement bars furnished shall be listed with complete plans and shall be delivered on the job in bundles securely tied. Both straight and bent bars shall be marked clearly with metal tags giving the quantity, size, length and designation of the structure in which they are to be placed.

### B. Placing Reinforcement

Metal reinforcement shall be accurately placed in accordance with the plans and shall be adequately secured in position by concrete or metal chairs and spacers.

All bars shall be free from rust, cale, grease or oil when placed in the forms. Any bars not meeting this provision shall be thoroughly cleaned to the satisfaction of the Engineer.

### C. Splices and Offsets in Reinforcement

(1) In slabs, beams and girders, splices of reinforcement at points of maximum stress shall generally be avoided. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear, in accordance with the requirements of the American Concrete Institute Building Code Requirements for Reinforced Concrete.

(2) Where changes in the cross section of a column occur, the longitudinal bars shall be offset in a region where lateral support is afforded. Where offset, the slope of the inclined portion shall not be more than 1 in 6, and in the case of tied columns the ties shall be spaced not more than 3 inches on centers for a distance of 1 foot below the actual point of offset.

### D. Concrete Protection for Reinforcement

[illegible] indicated in the plans. Where not otherwise shown the thickness of concrete over the reinforcement shall be as follows:

(a) Where concrete is deposited against ground without the use of forms, not less than 3 inches.

(b) Where concrete is exposed to the weather, or exposed to the ground but placed in forms, not less than 2 inches for bars more than 5/8 inch in diameter and 1-1/2 inches for bars 5/8 inches or less in diameter.

(c) In slabs and walls not exposed to the ground or to the weather, not less than 3/4 inches.

(d) In beams, girders and columns not exposed to the ground or to the weather, not less than 1-1/2 inches.

(e) In all cases the thickness of concrete over the reinforcement shall be at least equal to the diameter of the bars.

(2) Exposed reinforcement bars intended for bonding with future extensions shall be protected from corrosion by concrete or other adequate coverings.

11. PLACEMENT OF CONCRETE

A. No concrete shall be placed until all formwork, reinforcement, installation of parts to be embedded, bracing of forms, and preparation of surfaces involved in the placing have been approved by the Engineer. No concrete shall be placed in water, except with the written permission of the Engineer, and the method of depositing the concrete shall be subject to his approval. All surfaces of forms and embeded materials that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before the surrounding or adjacent concrete is placed. Immeidately before placing concrete, all surfaces upon or against which the concrete is to be placed shall be free from standing water, mud, debris or loose material. The surfaces composed of absorptive materials against or upon which concrete is to be placed shall be moistened thoroughly so that moisture will not be drawn from the freshly placed concrete.

B. The concrete shall be placed by equipment which will prevent segregation or loss of ingredients. There shall be no vertical drop greater than 5 feet unless suitable equipment is provided to prevent segregation. Any belt conveyor, chute, tremie, or other similar equipment which may be used in the placement of concrete will be subject to approval of the Engineer. Concrete shall not be transported in the form by use of the vibrator. Placement of the concrete shall be regulated so that concrete may be effectively compacted with a minimum of horizontal movement and [illegible] [illegible] such a rate that the formation of cold joints will be prevented. The temperature of the concrete as placed in the form shall not exceed 90 degrees Fahrenheit.

Concrete shall be compacted with mechanical vibrating equipment as required. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all concrete.

## 12. CONSTRUCTION JOINTS

The location of all construction joints will be subject to the approval of the Engineer. The surface of all construction joints shall be cleaned of all laitance, loose or defective concrete, coatings, or foreign material by wire brushing or sand blasting followed by thoroughly washing with high pressure airwater jets immediately prior to placement of fresh concrete. In addition, joints shall be thoroughly wetted and slushed with a coat of neat cement grout immediately before the placing of new concrete.

## 13. FINISHING

### A. Formed Surfaces

Immediately after removal of forms all unsightly ridges or lips shall be removed by appropriate means. Any voids or any honey comb shall be cut out to firm dense concrete and shall be patched with an approved dry-pack mortar mixture. Holes left by removal of tie-rods or other form hardware shall be cleaned and completely filled with a dry patching mortar. The dry ptaching mortar shall be blended of Portland cement and white Portland cement to provide a color that will blend in with the parent concrete. As soon as this patching has sufficiently set, the entire surface of any concrete which will be exposed to view or the weather shall be thoroughly wet with a brush and rubbed with a No. 20 carborundum stone or an abrasive of equal quality, bringing a thick paste to the surface. The rubbing shall be continued to remove all form marks and projections. The paste shall be brushed to a rough finish over the entire surface and allowed to set. The final finish shall be obtained by a second rubbing to be done within seven (7) days after the paste caused by the first rubbing has thoroughly set. This rubbing shall be done in the same manner as the first, except that the paste shall be neatly brushed over the entire surface to obtain a smooth texture and uniform color.

### B. Unformed Surfaces

Unless specifically approved by the Engineer, all unformed surfaces shall be screeded to conform to the lines, and elevations shown on the drawings and given the following finish:

(1) Concrete sidewalks and exterior slabs shall be [illegible]

(2) [illegible] shall be floated and steel troweled to a smooth, dense surface.

Floating shall be started as soon as the surface has stiffened sufficiently to permit floating and shall be the minimum necessary to produce a surface that is free from screen marks and is uniform in texture.

## 14. CURING AND PROTECTION

All structural concrete shall be cured for a period of no less than 14 consecutive days starting immediately after placement by an approved method or a combination of methods. The curing medium shall be applied so as to prevent loss of moisture from the concrete for the duration of the entire curing period. Unhardened concrete shall be protected from heavy rains and flowing water. Curing may be accompanied by either of the following methods:

A. Water Curing:

Wood forms shall be kept continuously wet while in place. Immediately upon removal, all concrete surfaces shall be kept wet by suitable sprays, covering and/or other methods of keeping water on the surface.

B. Membrane Curing

At the option of the Contractor, the concrete may be cured with an approved surface membrane formed from a curing compound manufactured for that purpose. The compound shall be white pigmented and shall conform to the specification for liquid membrane forming compounds for curing concrete ASTM Designation C-309-58. The Compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment, except the cleaning of loose sand, mortar, and debris from the surface. The surface shall be thoroughly moistened with water and the curing compound applied as soon as free water disappears. On unformed surfaces, the membrane shall be applied as soon as the wet sheen disappears. A two-coat application shall be used with approved power spraying equipment and at the coverage of not more than 200 square feet per gallon for both coats. The second coat shall be applied at approximately right angles to the direction of the first application. Coated surfaces which are subject to heavy rainfall within three hours after the curing compound has been applied shall be resprayed by the methods and at the coverage herein specified. Coatings shall be protected from pedestrian and vehicular traffic and any other causes which will disrupt the continuity of the curing membrane.

## 15. COLD WEATHER PROTECTION

Concrete placement will not be permitted when the temperature [illegible] protect the concrete from freezing.

A. Adequate equipment shall be provided for heating the concrete materials in order to place the concrete at temperatures between 50° and 80°F. No frozen materials or materials containing ice shall be used.

B. All concrete materials and all reinforcement, forms, fillers, and ground with which the concrete is to come in contact shall be free from frost. Adequate means shall be provided for maintaining a temperature of the concrete as not less than 70°F. for 3 days or 50° F. for 5 days except when high early-strength concrete is used the temperature shall be maintained at not less

than 70° F for 2 days or 50°F. for 3 days or for as much more time as is necessary to insure proper curing of the concrete. The housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

16. WATERPROOFING OR FOUNDATION WALLS

Exterior foundation walls below grade shall be primed with one coat of Barrett Carbosota Creosote Oil and two coats of Barrett Waterproofing Pitch, or approved equal. The first coat shall be applied at a rate of 25-30 pounds per hundred square feet, and the second coat at a rate of 20-25 pounds per hundred square feet. Surfaces to be treated must be clean, dry and free of dust or loose particles.

17. METHOD OF MEASUREMENT AND BASIS-OF PAYMENT

A. Unless stated otherwise in the proposal, concrete and reinforcing steel will not be paid for separately, but the cost thereof shall be included in the price for the structure of which they are a part.

Admixtures, premoulded joint filler, joint sealer and water stops shall in all cases by included in the price bid for the concrete structure of which they are a part, whether the price be lump sum or per cubic yard.

B. When specifically stated in the proposal, concrete will be paid for at the unit price bid per cubic yard and reinforcing steel will be paid for at the unit price bid per pound for reinforcement. These prices shall be full compe sation for furnishing all materials, for all preparation, delivery and installation of these materials and for all labor, equipment, tools and incidentals necessary to complete the item. In computing the yardage of concrete for payment, the dimensions used shall be those shown on the plans or ordered by the Engineer. No measurements or other allowances will be made for forms, false work, coffer-dams, pumping, bracing, expansion joints or finishing of the concrete.

# BIKEWAY SIGNS

## 1. SCOPE OF WORK

Furnish all labor, materials, and equipment necessary to do all work and related items as shown on the drawings, specified herein or incidental to proper execution of the work.

## 2. DESCRIPTION

This item shall consist of the placement of and specification for signs to be used on the Cheyenne Bikeway in accordance with the new standards set for under Part IX Traffic Controls for Bicycle Facilities of the Manual of Uniform Traffic Control Devices.

## 3. EXECUTION

The standard signs will be placed according to the drawings and the MUTCD. (Detailed drawings for standard signs illustrated in these drawings are available to sign manufacturer or interested agencies from the Federal Highway Administration, Washington D.C. 20590. Spacing of signs are indicated on the drawings and in the details. The main intent of placement of the sign is that the message shall be easily visible to the bicyclists.

A. Surface Condition: Prior to all work of this specification, carefully inspect installed work of other trades and verify that such work is complete to the point where installation of the signs made properly commence.

In the advent of discrepancy, immediately notify the engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been resolved.

B. Installation: Install all signs on steel posts where indicated on the drawings, anchoring all posts firmly in place.

## 4. MEASUREMENT FOR PAYMENT

The unit of measurement for payment will be each. Measurement [illegible] this price.

# AGGREGATE BASE COURSE

## 1. SCOPE OF WORK

Furnish all labor, materials and equipment necessary to do all work and related items as shown on the drawings, specified herein or incidental to proper execution of the work.

## 2. DESCRIPTION

This item shall consist of a base course composed of crushed or uncrushed selected borrow aggregate meeting the gradation or maximum size as specified, constructed on the prepared subgrade in accordance with these specifications, and in conformity with the dimensions and typical cross section shown on the plans, and with the lines and grades established by the engineer.

## 3. MATERIALS

A. Source of Supply: All work involved in clearing and stripping of quarries and pits, including handling unsuitable material encountered, shall be performed by the Contractor at his own expense. Aggregate base course materials shall be obtained from sources approved by the Engineer. All aggregate materials shall be free from vegetable matter, clay, frozen lumps or other matter, and shall be handled in a manner that a uniform and satisfactory product can be secured.

Preliminary acceptance of aggregates proposed for use may be made at the point of production. Final and complete acceptance will be made only after tests have been made of the aggregate base course, finished and in place.

B. Uncrushed Base Course: Base course aggregate shall consist of hard, durable particles of stone, gravel or other suitable materials mixed or blended with sand or approved filler materials, to provide a uniform mixture complying with the requirements of these specifications. That portion of the material retained on the No. 4 sieve shall be known as the course aggregate, and shall have a percent of wear of not more than 50 at 500 revolutions, as determined by A.S.S.H.O. T-96 (Los Angeles Rattler Test). Gradation shall be in accordance with gradation table under section 3.C. of these specifications.

C. Crushed Base Course: Base course aggregate shall consist of crushed stone or crushed gravel blended, if necessary, with screenings or sand to produce a mixture of aggregates that shall be capable of being compacted into a [illegible]

The crushed stone shall consist of hard, durable particles or fragments of stone, free from an excess of flat, elongated, soft or disintegrated particles, dirt or other objectionable matter, and shall have a percent of wear of not more than 50 at 500 revolutions, as determined by A.A.S.H.O. T-96 (Los Angeles Rattler Test).

The crushed gravel shall consist of hard, durable stone and rock, crushed to specified sizes, and shall be free from an excess of flat, elongated, soft or disintegrated pieces, dirt or other objectionable matter. The method used in production of crushed gravel shall be such that the finished product shall be as uniform as practicable. The crushing of the gravel shall result in a product in which all the material retained on a No. 4

sieve shall have at least 50 percent of weight of particles, with at least one fractured face. If necessary to meet this requirement or eliminate an excess of fine particles, the gravel shall be screened before crushing. The gravel shall have a percent of wear of not more than 50 at 500 revolutions, as determined by A.A.S.H.O. T-96 (Los Angeles Rattler Test).

All material passing the No. 4 sieve produced in the crushing operation shall be incorporated in the base material, unless there is an excessive amount which, if included, would not meet the gradation requirements.

The crushed aggregate shall meet the requirements of the gradation given in the following table, using A.A.S.H.O. Methods T-11 and T-27:

REQUIREMENTS FOR GRADING OF AGGREGATES

| Sieve Designation | Percentage by Weight Passing Square Mesh Sieves |
|---|---|
| 3 in. | 100 |
| 1 in. | 45-75 |
| No. 4 | 25-60 |
| No. 200 | 0-12 |

The gradations in the table represent the limits which shall determine suitability of aggregate for use from the source of supply. The final gradation decided upon within the limit designated in the table, shall be uniformly graded from coarse to fine, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.

The amount of the fraction of material passing the No. 200 sieve shall not exceed one-half the fraction passing the No. 40 sieve.

The portion of the base aggregate, including any blended material, passing the No. 40 sieve shall have a liquid limit of not more than 25, and a plasticity index of not more than 6, when tested in accordance with A.A.S.H.O. T-89, T-90 and T-91.

4. CONSTRUCTION METHODS

Preparation of Previously Constructed Subgrade - The underlying course shall be checked and accepted by the Engineer before placing and spreading operations [illegible] thereon.

5. METHOD OF PLACING

The base course shall be constructed in layers not less than three (3) inches nor more than five (5) inches of compacted thickness.

The aggregate, as spread, shall be of uniform gradation with no segregation or pockets of fine or coarse materials. The aggregate, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkoing shall be kept within these

limits. No material shall be paced in snow or on a soft, muddy or frozen sub-base or underlying course.

The base material shall be at a satisfactory moisture content when rolling is started, and any minor variations shall be corrected by sprinkling or be aeration, if necessary.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, sub-base or shoulder material in the base course mixture.

6. FINISHING AND COMPACTING

After the spreading, the crushed aggregate shall be thoroughly compacted by rolling and sprinkling when necessary. The initial rolling of the course shall be done with a suitable three-wheel roller or other approved equipment. Sufficient rollers of the designated types shall be furnished to adequately handle the compaction of the material that has been placed and spread as specified above.

Rolling shall profress gradually from the side to the center, or from one side toward previously placed material, by lapping uniformly each preceding rear-wheel tract by one-half the width of such tract, and shall continue until the entire area of the course has been rolled by the rear wheels. The rolling shall continue until the stone is thoroughly set. The interestices of the material reduced to a minimum, and creeping of the stone ahead of the roller is no longer visible. Rollings shall continue until the base material has been compacted to not less than 95 per cent density. Blading and rolling shall be done alternatively as required or directed, to obtain a smooth, even and uniformly compacted base. For final rolling, either 10-ton three-wheel or 8-ton tandem rollers may be used. Field density shall be determined in accordance with ASTM D698 (D).

Along places inaccessible to rollers, the base course material shall be tamped thoroughly with mechanical or hand tampers. Each hand tamper shall weigh not less than 50 pounds and have a face area of not more than 100 square inches.

7. SURFACE TEST

After the course is completely compacted, the surface shall be tested for smoothness and accuracy of grade and crown, and, if any portions are found to [illegible] as the Engineer may direct, until the required smoothness and accuracy is obtained.

The finished grade shall not deviate more than one-half inch below the edge of a 10 foot straight edge laid parallel to the length of the street, and shall not deviate more than 0.05 foot from the staked elevations.

8. PROTECTION

Work on the base course shall not be prosecuted during freezing temperatures nor when the subgrade is wet. When the aggregates contain frozen materials or the underlying course is frozen, the construction shall be stopped.

In general, hauling equipment may be routed over completed portions of the base course provided no damage results, and provided that such equipment is routed over the full width of the base course to avoid rutting or uneven compaction. However, the Engineer in charge shall have full and specific authority to stop all hauling over completed or partially completed base course when, in his opinion, such hauling is causing excessive damage. Any damage resulting to the base course from routing equipment over the base course, shall be repaired by the Contractor at his own expense.

9. MAINTENANCE

Following the completion of the base course, the Contractor shall perform all maintenance work necessary to keep the base course in a condition satisfactory for the leveling course material.

10. MEASUREMENT AND PAYMENT

Measurement and payment shall be by the cubic yard measured in place, to specifications. Payment will be by the contract unit price for the measured number of cubic yards in place, which shall constitute full compensation for all material, grading, placement, compaction, labor, tools, equipment and incidentals necessary to complete the work.

# ASPHALTIC SURFACE COURSE

## 1. GENERAL

This specification includes the requirements for materials, preparation and plant mixing of bituminous mixtures, and the construction of one or more courses of bituminous pavement on a prepared surface in reasonably close conformity with the lines, grades, thicknesses and typical cross sections shown on the plans or established by the Engineer.

## 2. FINAL COMPACTION

All utilities, underground electrical conduit and other underground facilities shall be completed prior to surfacing of those areas. Prior to placing the base course material the entire area to be surfaced shall be given final compaction by use of compaction equipment approved by Soils Engineer. The area shall than be bladed in preparation to receive the base course material.

## 3. MATERIALS

A. Bituminous Materials. The type and grade of bituminous material will be specified in the contract provisions. The grade may be changed one step by the Engineer at no change in unit price. All mixing grade asphalts shall be fortified by the addition of a satisfactory anti-stripping agent at the refinery.

Bituminous material may be conditionally accepted at the source based on test reports furnished by the contractor for each 40 tons or 10,000 gallons loaded.

A sample of each load of Asphaltic Materials is to be obtained at the time of conveyance loading, and the Certificate of Compliance, together with this sample, shall be surrendered to the representative of the Engineer on the project. Sampling shall be accomplished using methods described and outlined in AASHO T-40.

1. Asphalt cements shall meet the requirement of AASHO M20 or AASHO M226, depending upon the grading system designated by the contract.

2. Liquid cut-back asphalts shall meet the requirement of AASHO M82 or AASHO M141.

Bituminous Materials that do not meet the specification requirements in any respect shall not be accepted, and any mixture in which the non-specification [illegible] shall be rejected [illegible]

and (2) there is a determination by the Engineer that the nonconforming material may be accepted or allowed to remain in any completed work.

B. Aggregates. In the production of aggregates to comply with this specification, all boulders in the pit up to six inches in diameter shall be crushed to meet the required gradation and shall be uniformly distributed in the remainder of the material.

## ASPHALTIC SURFACE COURSE

The term "coarse aggregate" shall mean materials retained on a No. 4 sieve and the term "fine aggregate" shall apply to materials passing a No. 4 sieve.

Aggregates shall be of uniform quality, crushed to size, and shall be composed of sound, tough, durable pebbles or fragments with or without natural or mineral fillers. The aggregate shall be free from vegetable matter, lumps, or balls of clay, adherent films of clay or other matter that would prevent thorough coating with bituminous material. The crushed aggregate shall have a percentage of wear no greater than 40, and the plasticity index shall not exceed three.

During crushing operations the coarse and fine aggregates shall be stockpiled in separate piles. Sotckpiling shall be conducted in such a manner as to prevent segregation. If the carryover for either coarse or fine aggregate exceeds ten percent, the material will be considered as not meeting specifications.

1. Coarse aggregate shall be crushed stone or crushed gravel of such gradation that when combined in the proper proporation with other aggregate fractions or fillers, the resultant mixture shall meet the gradation requirements of the contract. Not less than 50 per cent by weight of the materials retained on the No. 4 sieve shall have at least one fractured face.

2. Fine aggregate shall consist of crushed stone, crushed gravel, or natural sand. Its gradation shall be such that when combined with other required aggregate fractions in proper proportion, the resultant mixture shall meet the gradation requirement of the contract.

3. Natural filler, when required, shall consist of clean, hard, durable grains of naturally occurring sand or granular material, and shall be stockpiled separately.

The several aggregate fractions for the mixture shall be sized, graded, and combined in such proportions that the resulting composite blend meets one of the grading requirements of the following table.

| Sieve Size | Percentage by Weight Passing 3/4" Max. | 1/2" Max. |
|---|---|---|
| 1" | 100 | |
| 3/4" | 97-100 | 100 |
| 1/2" | - | 97-100 |
| #4 | [illegible] | [illegible] |
| #8 | 45- 60 | 50- 65 |
| #30 | 27- 42 | 30- 45 |
| #200 | 4- 10 | 4- 10 |

C. Composition of Mixtures. The bituminous plant mix shall be composed of a mixture of aggregate, natural filler or commercial additive if required, and bituminous material. The several aggregate fractions shall be combined in such proportions that the composit blend meets the specified gradation band of subsection 1.02.

The bitumen content, taken as a percentage of the total mix, shall be within the range of 6.0% to 6.75%. At the discretion of the Engineer a more specific asphalt content may be determined by a construction mix design using materials produced for the project .

The point of acceptance for the plant mix will be after the aggregate and bitumen have been blended and mixed in the plant. Gradation and asphalt content compliance will be determined by an approved extraction-gradation method.

D. Bituminous Mixing Plant. Plants used for the preparation of bituminous mixtures shall conform to all requirements of AASHO M156-71 as modified herein:

1. Section 2.5, Screens. Paragraphs 2.5.2 and 2.5.3 are deleted.

2. Section 2.10, Dust Collectors. The first sentenee of this section is amended to require that all plants be equipped with dust collectors.

3. A new requirement is added as follows:

   The plant shall be equipped with suitable truck platform scales, meeting the approval of the Engineer, for weighing the mixture for payment. Nearby public scales may be used to satisfy this requirement.

   In lieu of truck scales the plant may be euqipped with an approved automatic printer system which will print the batched weights of the materials delivered to the mixer, provided the system is used in conjunction with an approved automatic batching and mixing control system.

E. Preparation of Bituminous Material. The bituminous material shall be heated to the specified temperature in a manner that will avoid local overheating and provide a continous supply of the bituminous material to the mixture at a uniform temperature at all times. Temperature ranges for asphalt cements [illegible]

| Type and Grade of Material | Mixing Temperature Degrees Fahrenheit |
|---|---|
| AC-2.5F | 240 - 265 |
| AC-5F | 255 - 280 |
| AC-10F | 265 - 295 |
| AC-20F | 280 - 310 |
| MC & SC-800F | 175 - 240 |
| MC & SC-3000F | 200 - 250 |

At no time shall asphalt cement be heated to a temperature in excess of 350°F.

F. Preparation of Aggregate . The aggregates shall be metered into the drier in such a manner that uniform temperature will be obtained, and that the specified gradation band of subsection 1.02 will be uniformly met.

The aggregates shall be dried and heated to the temperature range specified in sub-section 1.05. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregates or coating the aggregates with soot, oil, or other contaminants.

G. Mixing. The dried aggregates and the bituminous material shall be measured or gauged and introduced into the mixer in the proportions specified by the contract.

After the required amounts of aggregate and bituminous material have been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate is achieved.

The mixture shall be produced at the lowest possible temperature that will furnish a workable mix within the appropriate temperature range specified under subsection E. The bituminous material and aggregate shall be introduced into the mixer within the prescribed temperature range.

H. Control of Bituminous Mixtures. All specified and required tests for approval of materials shall be made at the expense of the Contractor by a properly equipped laboratory of established reputation, whose work and testing facilities shall be approved by the Engineer. Any change in origin, method of preparation, or physical makeup of such materials will require new tests and approval. Reports of all tests shall be furnished to the Engineer in as many certified counterparts as may be required.

4. CONSTRUCTION

A. Weather Limitations. Plant mix bituminous pavement shall only be placed on a dry unfrozen surface and when the atmospheric temperature is above 40°F. The mixture shall not be placed when weather conditions prevent proper handling, compacting and finishing.

B. Asphaltic Prime and Tacks Coats. See Separate Section.

C. Old Base is Irregular, It Shall be Brought to Uniform Grade and Cross section as directed.

When specified by the contract all cracks shall be sealed by the application of an emulsified asphalt or liquid cut-back asphalt before any bituminous paving mix is placed. All excess asphalt shall be removed from the surface prior to placement of the mix.

Prior to placing bituminous plant mix over an existing concrete or bituminous surface, and between lifts in multiple lift construction, a tack coat shall be applied. Tack coat shall be applied to a sound, clean surface. The surface shall be relatively free of irregularities. Tack coat shall not be applied during wet or cold weather, after sunset, or to a wet surface. Emulsified asphalt, SS-1 or SS-1h, shall be applied at the temperature and rates prescribed in the section on tack coats.

When a bituminous plant mix is to be placed upon a granular base course, the base shall first be shaped, uniformly compacted to prescrubed density, and primed using the materials and rates specified in subsection 2.03. Prime coat will only be applied to a dry unfrozen surface and only when the atmospheric temperature is above 32°F. Should the prime coat fail to penetrate, a blotter material meeting the requirements of subsection 2.04 shall be applied to absorb the excess asphalt.

All surfaces to be paved shall be free of debris, loose granular material, mud, and any other deleterious material immediately prior to paving.

Contact surfaces of curbing, gutters, manholes and other structures shall be painted with a thin uniform coating of bituminous material prior to the bituminou paving mixture being placed against them, as directed by the Engineer.

D. Hauling Equipment. Vehicles used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with a minimum amount of paraffin oil, lime solution, or other approved material to prevent the mixture from adhering to the beds. Asphalt solvents, such as diesel fuel, will not be used to cost the beds.

E. Bituminous Pavers. Bituminous pavers shall be self-contained, power-propelled units, with an adjustable activated screen or strike-off assembly, heated if necessary, and capable of spreading the mixture to the thickness and with specified, true to the prescribed line, grade, and crown.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed or strike-off assembly.

The screed or strike-off assembly shall produce a finished surface without tearing, shoving, or scuffing the mixture.

[illegible] satisfactory [illegible] of the mix.

F. Rollers. Rollers shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mix. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. The use of equipment which results in excessive crushing of the aggregate will not be permitted.

F. Rollers. Rollers shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mix. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. The use of equipment which results in excessive crushing of the aggregate will not be permitted.

G. Transporting, spreading, and finishing . The mixture shall be transported from the mixing plant to the point of use in vehicles conforming to the requirements of subsection 2.06.

Bituminous mixtures containing asphalt cement shall be delivered to the paver at a temperature no more than 30°F below the lower limit of the appropriate temperature range specified under subsection 1.05.

The mixture shall be laid upon an approved surface, spread and struck off to the grade and elevation established. Bituninous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

Where irregularities or unavoidable obstalces make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked. and luted by hand tools. The mixture shall be placed in such a manner as to furnish the required compacted thickness.

The minimum lift thickness shall be at least two times the nominal maximum particle size. The maximum lift thickness shall be that which can be demonstrated to be laid in a single lift and compacted to required uniform density and smoothness. Placement of the mixture shall be a continuous operation. If any irregularities occur, they shall be corrected before final compaction of the mixture.

When placing multiple lifts of bituminous plant mix the longitudinal joint in one layer shall offset that in the layer immediately below by approximately 6 inches. Transverse joints shall be formed by cutting back on the previous [illegible] the full depth of lift is exposed.

The Engineer will furnish such engineering as may be required to establish controls for the work. The Contractor shall furnish, place, and maintain such materials, devices, and equipment as may be required to provide proper line and grade control.

[illegible] selected locations. [illegible] testing edge of the straightedge shall at no point exceed 3/16 inch. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material at the Contractors expense, or as otherwise directed.

H. Compaction. Immediately after the bituminous mixture has been spread and struck off and the surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. Rollers will meet the requirement of subsection F.

The surface shall be rolled while the mixture is in a workable condition, until all roller marks are eliminated, and unless otherwise designated in the contract, until a minimum density of 95 percent of a laboratory compacted specimen made in like proportions of the established mixture has been obtained.

Rolling will be conducted in such a manner as to avoid cracking, shoving, or undue displacement of the mix.

Cold rolling of the bituminous mixture in order to increase density will not be permitted. If the specified density cannot be obtained while the mix is in a workable condition, the limits of the failing section shall be determined by testing, and one of the following remedial actions shall be taken, as prescribed by the Engineer.

1. The bituminous mix will be removed from the failing section and replaced with new material, at the expense of the Contractor.

2. The bituminous mix will be left in place, and an emulsified asphalt fog seal, as described in subsection 2.02 , shall be applied to the failing section at the Contractor's expense.

3. The failing section shall be tentatively accepted, and tested later to see if traffic has increased the density to an acceptable degree.

Compliance with density requirements shall be determined by the use of nuclear density gauges, or through the use of specimens cut or cored from the pavement.

I. Compaction Control. Density testing shall meet the requirements of subsection H., Materials Specifications.

## 5. MEASUREMENT AND PAYMENT

Hot Plant Asphalt Mix [illegible]

[illegible] used in the completed and accepted work. The Contractor shall weigh, on certified scales, each truckload of hot plant asphalt mix to be delivered to the project. Weight tickets shall be given by the truck drivers to the project inspector prior to the laying of asphalt pavement.

"Hot Plant Asphalt Mix" shall be paid for at the unit price bid per ton of 2,000 pounds which price and payment shall constitute full compensation for cleaning base or underlying course; for producing, furnishing, transporting, stockpiling, heating, drying and screening of aggregate materials; for furnishing handling measuring, mixing, manipulation and placing of materials; for hauling, placing, shaping, compacting and finishing of the paving mix; for

improving unsatisfactory areas; for furnishing samples; for furnishing, testing and sealing of scales; for furnishing the weigh house and field laboratory; for maintenance of the completed work until final acceptance; for all materials (exclusive of asphalt), manipulation, labor, tools, equipment and incidentals necessary to complete the work in full compliance with the plans and specifications.

Penetration Asphalt: This item shall be measured by the ton of 2,000 pounds at 60°F. The tonnage to be paid for shall be the number of tons of the asphalt cement materials used, as ordered, in the accepted work. Tonnage used in the paving mixture shall be computed from the truck weigh tickets by using the percentage of asphalt in the approved mix. "120-150 Penetration Asphalt", measured as provided above, will be paid for at the unit prices bid per ton, which price and payment shall be full compensation for furnishing, handling, storing, heating, transporting and placing in the mixture; for all samples and tests and for all labor, tools, equipment and incidentals necessary to complete the work in full compliance with the plans and specifications.

Mineral Filler: This item shall be measured by the ton of 2,000 pounds for the amount of mineral filler actually used in the completed and accepted work.

The quantities of "Mineral Filler" measured as provided above, shall be paid for at the unit price bid per ton, which price and payment shall constitute full compensation for furnishing, storing, handling and other charges; all tools, equipment, labor and performance of all work necessary to mix the material with the Asphalt Concrete Surface Course, and all other incidentals necessary to complete this item.

Mayor



PRESS RELEASE

TIME TO BE RELEASED: Sunday Eagle-Tribune
DATE: September 27th

CONTACT: Jerry Logemann
Parks & Recreation Dept.
637-6427

CHEYENNE BIKEWAY SYSTEM

Jerry please note that when you refer to the mayor please include my name
Don Erickson

In 1973, individuals and organizations interested in developing a comprehensive bike system in Cheyenne started holding meetings to make the bike system become a reality.

After many hours, months & years of meetings and input from interested groups including City Bikeway Planning Committee, Laramie County Safety Council, CHATPP Citizens Committee, City Planning Department, Wyoming Highway Department, Cheyenne Police Department, City Engineer Office, Parks & Recreation Department, Cheyenne City Council & Mayor, the City Council of Cheyenne passed a resolution endorsing "Cheyenne Bikeway Plan".

In 1980, the City of Cheyenne applied for and received approval from the Wyoming Highway Department to participate in the Federal Highway Bicycle Grant Program. Withfunds received from this program, City work forces have now completed the signing phase of the bike system with the exception of Lions Park which will be completed with signs and overlay work immediately following the major road construction currently taking place, and, estimated to be completed in early October.

Sunday Eagle-Tribune
September 27th

CONTACT: Jerry Logemann
637-6427

Initial maps have been finalized designating the first phase of where routes, lanes and paths will be located throughout the City.

CHEYENNE BIKEWAY SYSTEM MAPS MAY BE OBTAINED AT

1. Cheyenne Parks & Recreation Dept. - 610 W. 7th St.
2. Parks Division Office - 520 W. 8th Avenue
3. Municipal Swim Pool-Carey Ave. & Kennedy Rd.
4. Pioneer Park Recr. Center - 1331 Talbot Ct.
5. City Municipal Bldg.-City Clerks Office, 2101 O'Neil
6. Wahls Bike Shop - 408 W. 17th St.
7. Bike Shoppe - 1813 Carey Avenue
8. Bicycle Haus - 6000 Weaver Rd.

Increased safety for motorist and bicyclist alike is the primary reason for providing bike facilities. There are different kinds of bicycle facilities. However, their purpose is the same, to make bicycling safer by integrating it into the overall transportation system.

BIKEWAYS ARE CLASSIFIED INTO THREE CATEGORIES

1. BIKE ROUTE - Is a shared right-of-way, a street designated as a bike route by signs or paintings on the pavement. Primary function is to warn motorists of potential bicyclists and to advise the bicyclist of a desireable route.

2. BIKE LANE - Is a restricted travel lane for the exclusive use of bicycles. Bike lanes are denoted on the street by signs and street markings including a lane strip. Bike lanes clearly designate which part of the street a bicyclist should use and which part motorist should use.

3. BIKE PATH - Is a completely separate right-of-way for the exclusive use of bicycles. Bike paths provide the maximum safety for bicyclists.

This is the beginning in providing bikeway facilities for the City of Cheyenne. As the City changes and grows, so will the bikeway system.

Individuals, groups and organizations interested in assisting with education and safety programs concerning the bike system or general information about the Cheyenne Bikeway System call the Parks and Recreation Department at 637-6423 or 637-6424, or by dropping by at 610 W. 7th St.