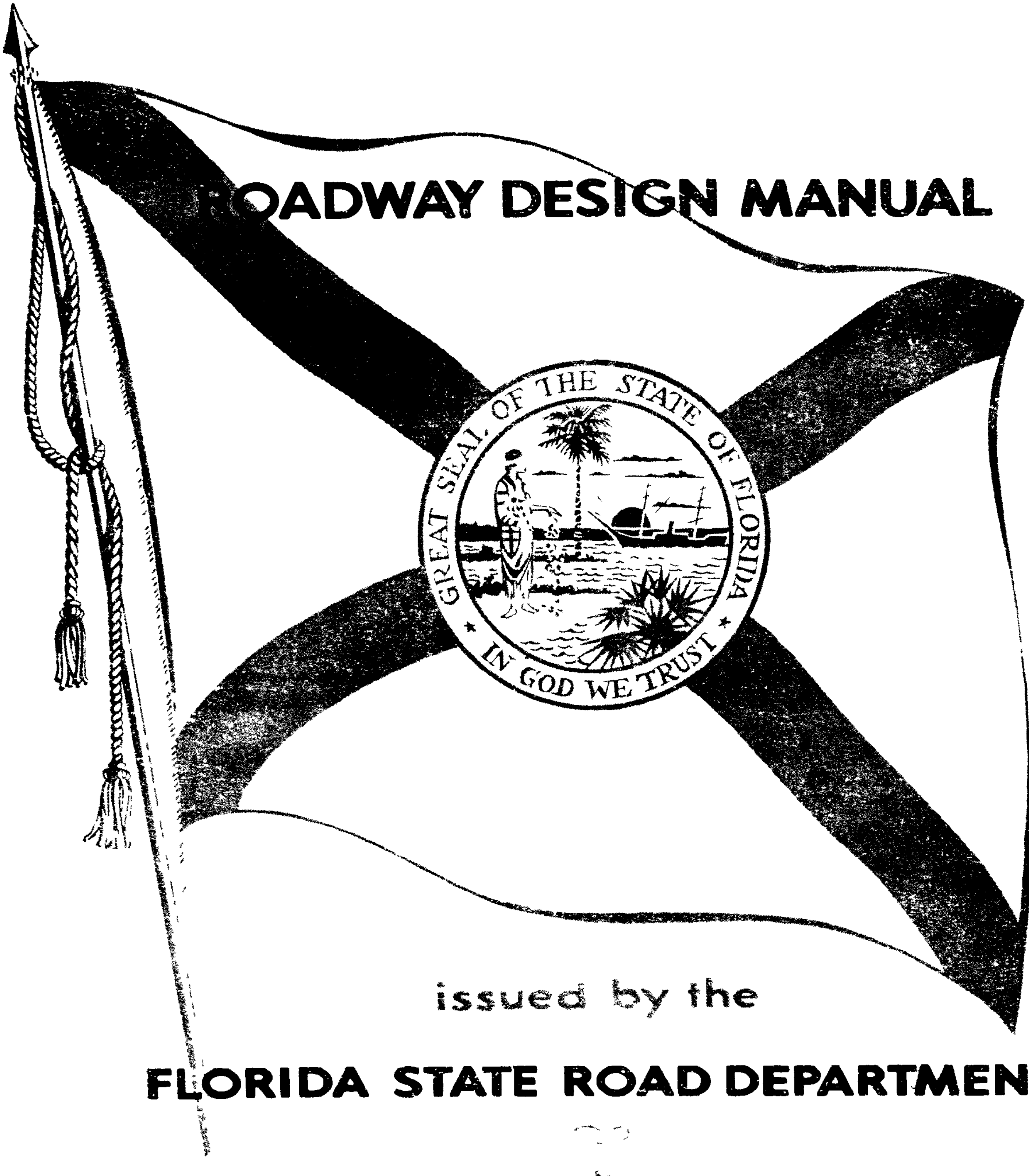
ROADWAY DESIGN MANUAL



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FLORIDA STATE ROAD DEPARTMENT

CLAUDE R. KIRK JR.
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FOREWORD

This manual has three purposes: to standardize highway construction plans as assembled by the various districts of the Florida State Road Department and consultants employed by the Department, to serve as a guide in the actual procedure of design and plans assembly, and to provide design criteria with explanations of their application and use

Through description and examples of standard plans assembly, all parties become aware of the amount and nature of information and data that must be gathered, and the procedure through which it is documented in form of highway construction plans Standardized plans facilitate checking and revising and thus reduce chances for errors

The manual is not intended for use of draftsmen and designers alone They can place in the plans only the information gathered by those engaged in the location survey. The accuracy and thoroughness of the designer's work depends entirely on the amount and accuracy of the survey information It is, therefore, incumbent upon surveyors, draftsmen and designers alike to familiarize themselves thoroughly with these procedures

The manual is in four sections:

Section 1 Assembly of Roadway Contract Plans

Section 2 Roadway Design Procedure

Section 3 Design Controls and Criteria

Section 4 Plates

Design procedures and criteria are subject to changes or additions which will be incorporated in the manual by revisions as need arises. Situations will develop in which it might appear desirable to deviate from prescribed design methods and criteria Approval for such variations should be requested from the Tallahassee office in all cases where design criteria are involved, but approval may be granted by the engineer in charge of design in the District Office if it appears that referral to the Tallahassee office is unnecessary

Standard Drawings (identified by an Index Number) are not included in this manual unless they contain design tables, charts and applicable design criteria Complete, up-to-date sets of Standard Drawings are available for reference

ROADWAY DESIGN MANUAL

GENERAL INDEX

SECTION 1 - ASSEMBLY OF ROADWAY PLANS

SECTION 2 - ROADWAY DESIGN PROCEDURES

SECTION 3 - DESIGN CONTROLS AND CRITERIA

SECTION 4 - PLATES

INDEX — SECTION 1

ASSEMBLY OF ROADWAY PLANS

ROADWAY DESIGN MANUAL

CHAPTER 1

GENERAL

This portion of the manual contains descriptions and illustrations of the components of highway construction plans as currently prepared by the State Road Department. Presentation of the necessary information is illustrated by numerous examples and should be adhered to in order to achieve uniformity and to produce plans of maximum readability and usability.

Construction plans now are reproduced by Xerox photography and offset printing. In the reproduction process, they are reduced in size to half the original dimensions. The reduction in size in printing requires a better quality of draftmanship than would full size repproduction demand.

The greater portion of the plans is prepared in pencil, and full size prints frequently are needed, in addition to reduced size reproductions For this reason, emphasis is given to proper density of line work, sufficient lettering size and proper arrangement of notes, dimensions, etc. It must be remembered that the plans details are not drawn for the convenience of the draftsmen. They are to be prepared in such a manner as to permit clear reproduction and to afford the most expeditious use to all concerned. Included are those giving the plans a final review and check, specifications writers, governmental agencies involved such as Counties, Municipalities and the Bureau of Public Roads, and contractor's personnel.

Constant reference should be made to the illustrations to determine proper letter size, keeping in mind that most of the plates have been reduced to half the original dimension. The absolute minimum for lower case letters should be No. 3 size. The letters always should be open and formed with a dense narrow line.

One of the characteristics of Xerox reproduction is that line width does not decrease in proportion to the dimensional reduction of the drawing, resulting in a tendency to close up the loops in letters which are not open. A line which is not dense might Xerox satisfactorily but burn out in blue print or blue line reproduction.

Running dimension lines, note arrows, etc., through notes or figures must be avoided. Colored pencil must never be used on original tracings. Limiting care in drafting to that required to produce only a barely legible drawing is not sufficient. Work must be of such quality to be perfectly legible even with poor reproductions.

The small amount of additional care in drafting is more than offset by the elimination of a great deal of the inking that would otherwise be required.

ROADWAY DESIGN MANUAL

CHAPTER 2

KEY MAP

This sheet, sometimes called the Title Sheet, is the first one in the plans and contains general information concerning the project and the plans themselves. It is prepared on standard printed cloth Key Map sheets with the following information listed.

1 LOCATION MAP

This map is placed in the center of the sheet and consists of a reproduced portion of one or more county maps, showing the project locations. City maps, usually are used for municipal projects. Any convenient scale may be used for rural projects and the map can be traced directly from a county map on a scale of 1/2" - 1 mile or 1" - 1 mile depending on the size required.

Section, Township, Range and County Lines together with Section, Township and Range Numbers should be shown. Cities, towns and physical features such as lakes, streams and canals must be indicated. City limits are shown as are urban limits where applicable.

If a city map is used, section lines are not important, but streets should be shown and named. State highways are shown by State Road number and U.S. highway number if appropriate, with arrows at the edges of the map, pointing to the next principal city to which these roads lead Local roads are indicated with parallel broken lines

The project location is shown by a heavy solid line of substantial width. It is sometimes advantageous to show station numbers at regular intervals, particularly with city street projects. The beginning and end of Federal projects or State jobs, any station equations, exceptions and beginning and ending of proposed bridges are to be stationed.

When several jobs or projects are covered by the same set of plans, the beginning and end of each job and project must be indicated clearly by Job and Project number and stationing.

The scale of the Location Map should be chosen so it will not interfere with other features of the Key Map. A common error is to trace the Location Map in ink and then discover that a insufficient space remains for the Index of Sheets, Project Title or the Length of Project Tabulation.

Sometimes stationing flags are inked in advance of completion of the Key Map, and when it is completed, interference with these flags is encountered. The flags, however, should be arranged, whenever possible, to lie outside the body of the map.

When tracing county maps, avoid copying hatched or stippled area, culture symbols and other information which is not pertinent. Culture symbols should be used sparingly to avoid a cluttered appearance. The population of incorporated towns and cities and census year is given according to the latest Federal census.

2 PROJECT OR JOB NUMBER, COUNTY, AND ROAD NUMBER

These are in the form of a title, and large heavy letters are used. They are placed above the Location Map.

Where Federal Project numbers are involved, the corresponding State Job Number is placed near the top of the sheet to the left of the sheet title block.

Project, Job, Road Numbers and name

of County should be inked with a mechanical lettering device All of the remaining lettering on the Key Map may be free hand. See plate 2 for recommended size of letters.

3 NORTH POINT AND SCALE

The north point is placed at the top or on one side of the Location Map, preferable to the right. The map scale is shown in conjunction with the north point. The map should be oriented so that the north point will be either toward the top of the sheet or to the right.

4 LENGTH OF PROJECT

Lengths of roadway, bridges, exceptions and net and gross lengths are shown in a box at center of sheet below the Location Map. When a Federal Aid project is both within and outside an urban area (municipality having 5,000 population or greater) the length must be divided into rural and urban sections.

5 INDEX OF SHEETS

A complete index of roadway plan sheets must be placed on the left side of the key map under the printed headings. In the case of projects containing plans for bridges, signing, signalization, etc., the plans for these items need not be itemized. These may be referred to under the index of roadway plans in this manner: "For Index of Bridge Sheets see Bridge Plans " etc.

6 GOVERNING SPECIFICATIONS

The date of the governing specifications is inserted in the printed note at the lower left corner of the Key Map.

7 STATE MAP

A small scale state map is printed at the upper right portion of the Key Map. The location of the project should be indicated thereon.

NOTE: Plates 1 and 2 illustrate complete Key Maps for rural and municipal projects. Plate 3 illustrate various title combinations.

ROADWAY DESIGN MANUAL
CHAPTER 3
DRAINAGE MAP

The Drainage Map is prepared on printed cloth or film drainage map sheets with a cross section grid printed across the upper portion for plotting the project profile and proposed grade. It is plotted to some convenient scale according to need. Scales such as 1" = 200', 1" = 500' or 1" = 1,000' generally should be used to simplify plotting the profile. For municipal projects, the scale should be no smaller than 1"-200'. The horizontal and vertical scales of the drainage map profile must always be such that the stations and elevations can be read directly from the grid without use of a scale. For jobs involving interchanges a supplemental drainage map on a 1" = 100' scale will be required for each interchange area. Only the plan portion will be required and it will be shown on a sheet without a profile grid. The purpose of this detail is to show the small areas needed to calulate pipe sizes for the tabulation of drainage structures within the interchanges. Should major drains pass through the interchange area a note should refer to the proper sheet for drainage area for the through structure.

The plan portion includes:

1. Centerline of project with beginning and ending stations of jobs and projects and station equations and exceptions. Stationing should be shown at regular intervals.

2. Physical land features affecting drainage, such as lakes, streams, swamps, etc., together with high water elevations.

3. Existing roads and streets and drainage structures, showing type, size, flow line and any other pertinent data.

4. Drainage divides and information, where applicable, to indicate the overland flow of water. Drainage areas on 1" : 100' scale maps may be shown to an accuracy of one hundredth acre. Maps or municipal sections may show areas to either one tenth or one hundredth acre pending on scale and the accuracy necessary. Areas of about 10 acres or larger should be shown to whole acres only, whether on municipal or rural drainage maps. Inserts are used to show areas that are of such magnitude that the boundaries cannot be plotted at the regular scale. Proposed drainage structures are plotted by symbol only in the plan portion.

5. Section, Township, Range and County lines are indicated for rural projects, when possible, and urban projects.

6. A north point and scale are included on the plan. The map is oriented in a manner similar to the Key Map.

Preparation of the profile portion:

The horizontal scale must be the same used for the plan portion. The standard vertical scale for rural and urban projects is 1"= 10', although a scale of 1" = 20' sometimes is used for rural projects through rough terrain to avoid numerous profile breaks. However, a scale of 1" = 20' never should be used at locations of proposed storm sewer systems.

The existing ground line is plotted with a light solid line. In rural projects which follow existing roads, the approximate original ground line also is plotted, using a light broken line. For municipal jobs, the existing centerline profile is used.

It has been the custom in the past to place the elevations of the existing groundline at the bottom of the profile box. As these elevations have little practical value, they are to be omitted in the future.

Show elevation datum at each side of sheet. At times the 5" deep profile is insufficient while the space available in the plan portion is in excess of need. The Tallahassee office can supply drainage map sheets on drafting film with either 8" deep or 10" deep profile block.

The proposed project grade line is plotted on the profile with a heavy solid line. PVI's are plotted and the elevations given. Percents of grade are shown. The grade profile is plotted around vertical curves, but no V C. data are shown.

Proposed special ditches, except median, are plotted in the profile when horizontal and vertical scales permit. They are indicated with a heavy broken line (long dashes).

Proposed cross drains are plotted in the profile section and carry a note giving station, size of structure and flow lines. Do not attempt to show skew or pipe slope in plotting but merely plot to elevation and location at point of crossing the construction centerline. In cases of more than usual slope, show elevation at each end of structure. Median drains are not plotted in the profile section.

For municipal projects, the storm sewer main only is plotted in the profile section, and no attempt is to be made to show lateral or stub pipes

All high waters affecting construction must be placed in the profile. High waters remote from the project and not influencing construction should not be referenced to the appropriate location in the plan. Any high water that is to be lowered should be so noted and the design high water elevation given. A light broken line is plotted at the high water elevation, and the elevation is given.

NOTE: Plates 4, 5 and 6 illustrate drainage maps or rural and urban projects.

ROADWAY DESIGN MANUAL

CHAPTER 4

SUMMARY OF QUANTITIES AND RELATED TABULATIONS

Summary of quantities and related tabulations always are prepared on standard cloth or film sheets. The Summary of Quantities is a tabulation of quantities of all work for which direct payment is made. Items are arranged in numerical order and are worded exactly as in the Standard Specifications. Qualifying or descriptive information such as pipe size, base thickness, curb type, etc., is placed after the standard item and in parentheses or brackets.

When bridge structures (other than box culverts of bridge length) are involved, the summary of bridge quantities will be incorporated in the bridge plans, and proper reference by foot note, under the summary of roadway quantities, must be made. Quantities for bridge length culverts listed in the summary of drainage structures are separated by symbol opposite the item with a foot-note.

Also grouped with the Summary of Quantities are the various tabulations. Proposed drainage structures always are tabulated in summary form. A tabulation of proposed guardrail is included. Other information tabulated as the need arises includes "Basis of Estimate" (generally of surfacing quantities and for plant mix asphalt quantities), measurement of length for grading when payment is on a road mile basis, and turnouts and side drain pipe. Locations are specified for special size or shape (lo head or elliptical) side drain pipe and areas of ditch pavement, sodding, grassing and mulching, etc where applicable.

Plans for resurfacing projects frequently carry a tabulation showing widths, lengths and areas when several different widths are involved. Tabulations for other work are provided in special cases, such as in the installation of electrical conduit for future roadway lighting.

All tabulations should reflect the same breakdowns as the Summary of Quantities, with subtotals for each breakdown. Frequently it is necessary to supply additional information about various items in the Summary of Quantities by foot-notes. Referencing these foot-notes to items by means of symbols sometimes leads to confusion. A more satisfactory method is to reference by item numbers. However, the use of foot-notes under the Summary of Quantities should be avoided if the information can be indicated more appropriately in other portions of the plans.

The Summary of Quantities and Summary of Drainage Structures frequently occupy such widths, due to multiplicity of columns, that it is impossible to follow the horizontal lines across the tabulation without use of a straight-edge. In such cases, horizontal guide lines should be ruled with a thin solid ink line on the back of the cloth sheet.

NOTE: Plate 7 shows examples of Summary of Quantities and various tabulations, and plate 8 illustrates various combinations of headings for the quantities columns. **Plate 9 illustrates the Summary of Drainage Structures.**

ROADWAY DESIGN MANUAL

CHAPTER 5

MASS DIAGRAM

Mass diagrams are included in all plans having roadway cross sections, except for projects such as single interchanges, parking areas, etc., the nature of which would make a mass diagram meaningless

The mass diagram is prepared on standard cross section sheets. Project stationing is used for horizontal datum and mass ordinates for vertical datum.

The length of project influences the horizontal scale. For long projects, a maximum ten stations per inch is allowable. For short projects, a horizontal scale should be chosen so that the mass diagram will occupy a major portion of the sheet. Stations numbers will be placed across the top of the sheet.

The extremes of the mass ordinates dictate the vertical scale to a great extent. The vertical scale should be such that few or no breaks in vertical datum will be necessary. Where the difference between the greatest and least mass ordinate is small, a fairly large scale should be used.

The mass ordinate datum is to be placed on both the right and left sides of the sheet. The mass ordinate of each station is plotted and the points connected by a medium weight solid line. This line generally can be drawn free hand instead of connecting points with a straight-edge.

With the mass diagram for suitable subgrade material, the beginning and end of project, or of construction, station equations, bridge stationing and station of balance points are indicated. A horizontal line is drawn at zero datum. Horizontal balance lines are indicated between balance points, and earthwork quantities are given for balance, borrow and excess sections.

Excavation and fill of materials other than A-2 and A-3 generally are indicated with a dimension line between the extremes of cut and fill, together with the stations at the beginning and end of the section and the quantities However, mass diagrams should be computed and plotted for this earthwork when the haul is significant.

Borrow pit locations are indicated on the mass diagram, using a simple sketch showing the tie to the project, haul route and pit outline Dimensions of the sides of the pit and along the haul route should be given, but the sketch need not be to scale

The reason for showing the pits on these sheets is to enable a rapid evaluation of the haul of material from the pits. Information not pertinent to haul should not be included. Avoid cluttering the mass diagram with unnecessary detail of the pits.

A summary of earthwork is placed on the last mass diagram sheet. If a quantity breakdown is necessary in the Summary of Quantities due to the project crossing a Municipal or Urban limits line, etc., the summary of earthwork on the mass diagram should reflect the same breakdown.

NOTE: Plate 10 is an illustration of the mass diagram

ROADWAY DESIGN MANUAL

CHAPTER 6

ROADWAY PLAN-PROFILES

Normally, the roadway plans and profiles are prepared on standard 22"x 36" plan profile sheets The top half of the sheet is blank for the plan portion, and the bottom portion contains a grid having 10 x 10 units per square inch

Standard scales for plans for rural construction are 1" = 100' horizontally, and 1" = 10' vertically in the profile Scales for municipal plans usually are 1" = 20' horizontally and 1" = 2' vertically

It is advantageous at times to use scales other than those mentioned The most common variance is a scale combination of 1" = 50' horizontally, and 1" = 5' vertically Such a combination of scales is useful when a large amount of existing topography would result in difficulty using a 1" = 100' scale and in cases where it is desired to show the profile to greater accuracy than is possible with the 1" = 100' horizontal and 1" = 10' vertical combination.

6-A ROADWAY PLAN PORTION (RURAL CONSTRUCTION)

The survey centerline is centered approximately in the plan portion of the sheet, with the stationing running from left to right When horizontal curves are involved, the centerline is so located on the sheet to avoid breaks or match lines whenever possible

Thirty stations per sheet are used when the horizontal scale is 1" = 100' and 15 stations for 1" = 50' For 30 stations per sheet, each sheet should begin and on an even 10 station A "tick" mark perpendicular to, and on the upper side of, the centerline is placed at every station. When 15 or 30 stations to the sheet are used, "tick" marks on the even 5 stations are made approximately 0.2" long, and the station number shown above the "tick" mark For the remaining stations, the "tick" marks will be approximately 0.1" long and no station numbers shown When a 1" = 100' scale is used, the station numbers are placed outside the right-of-way line, and when 1" = 50' scales are used, the station numbers should be placed near the "tick" marks.

P.C. and P.T. points of horizontal curves are indicated by small circles. Short radial lines are drawn from the P.C. and P. T. points with the station of the P.C. or P.T. shown above these lines. P.I.'s are plotted using a small circle with a short section tangent on either side. Complete curve data are tabulated for each horizontal curve.

In cases where the construction centerline does not coincide with the survey centerline, the construction centerline is to be indicated, with complete alignment data and ties to the survey centerline. As an exception to this, the construction centerline need not be shown when it is offset uniformly from the survey centerline for the entire length of the job.

All station equations must be included. These include both equations occurring on the survey centerline and those equating survey and construction centerlines.

All existing topography is shown, with the exception mentioned later. Of particular importance are existing roads, streets, drives, buildings, power and telephone lines, both underground and otherwise, underground pipes and cables of all kinds, inlets and manholes, retaining walls, curbs, sidewalks, fences, railroads, bridges and culverts For Interstate projects, it is presumed that all buildings will be removed prior to taking of bids, so buildings within the right-of-way need not be plotted. Streams, lakes, swamps, wooded areas and other physical features also must be included.

Existing pavement edges, pipes, culverts, sidewalks, etc. are plotted using a light broken line. The type of existing pavement must be noted. The type of vegetation must be indicated. See plate 36 for standard symbols.

Bearings are indicated for all tangents. A north point is placed on every plan sheet and should be located in a clear area near the center of the sheet or in the right hand portion. This north point need not be large, but should be of such weight as to be easily located.

Where side roads and streets intersect the project, the station of, and angle between the intersecting centerlines are noted.

All reference points are indicated by sketches or diagrams. The sketches should be placed at locations removed from the project centerline, giving station and intersecting angle.

County, city and urban limits are included and tied to centerline by station and angle.

The proposed construction limits for rural projects are indicated in the plans.

The limits are flagged and stationed:

1. Beginning and end of State Jobs and Federal projects, and also beginning and end of construction in cases where construction limits are outside the Job or Project limits. If one set of plans covers more than one job or project, the limits of each must be shown clearly by job or project number and stationing.

2. The limits of Job and Project breakdown necessary for separation of length and quantities on Federal Aid Projects.

3. The limits of each type of construction classification where more than one type is involved, such as "Urban" "Rural", FA non-participating, etc

4. Limits of exceptions

For rural projects, the cross drain pipes and small culvert are indicated in the plan by plotted symbol only Culverts having a clear span (between inside faces) of 20' or more are designated as bridge culverts. On the plan, bridge culverts are indicated by noting the beginning and ending stations (outside wall to outside wall) along the centerline.

Proposed bridges and approach slabs are plotted by simple outline The beginning and ending stations of the bridges are noted. Notes given for the approach slabs are the lengths and index numbers.

Lateral ditch details usually are shown on plan-profile sheets separate from the roadway details. A short section of lateral ditch centerline is plotted on the roadway plan-profile sheet together with a note referring to the proper lateral ditch sheet. When very short lateral ditches are to be constructed, the ditch details may be included on the roadway plan-profile sheets. If it is necessary, however, in a particular assembly of plans, to have separate sheets for some lateral ditches, all lateral ditch details should be shown in that portion of the plans. (See section on lateral ditches).

Proposed pavement edges are not plotted ordinarily on plan sheets for rural construction. Exceptions are in the case of intersections, pavement transitions, and median openings on four-lane projects. Pavement edges here are indicated only within the limits of the intersection, transition or median opening. Reference notes indicate plan sheet.

Where the proposed roadway construction is in accordance with the typical section, it is not necessary to plot the edges of pavement on the plan sheets for rural construction. The pavement edges should be plotted only at non-typical locations such as intersections, pavement transition, median openings, etc. At these locations, only sufficient details to outline the limits of the non-typical design are required. Notes referring to standard design sheets or special design shown in the plans are given.

Right-of-way lines are shown and are dimensioned from the survey centerline or base line. All breaks in right-of-way are shown by station, dimension, and angle. Dimensions are shown at both ends of the sheet and must always be placed outside the beginning and ending station for each sheet.

The centerline with station "ticks", station numbers, and stationing information are inked. The remaining work usually is in pencil.

6-B ROADWAY PLAN PORTION (MUNICIPAL CONSTRUCTION)

The centerline is laid out on a scale of 1" = 20', and exactly six stations are used for each sheet. Each sheet should begin and end with an even-numbered station. Each station is marked by a "tick" mark 0.2" long, and the station number is placed near this mark "Ticks" 0.1" long are placed at every 20' point between stations, but no plus station numbers are shown.

Existing topography is plotted. Alignment data, reference points, north point, bearings, job and project limits, etc., are shown as in the plan portion for rural construction plans.

Proposed construction for municipal-type construction includes

1. Pavement edges, curb and gutter, median curb, barrier curb, traffic separators, sidewalks, retaining walls, steps, bridges, approach slabs, etc.
2. Station of return points, with grade elevations of gutter or pavement edge at these points
3. Station of radius points of traffic separator or median curb at median openings.
4. Station of end of curb and gutter at side street intersections, (when end is not at a return point) with proposed gutter grade elevation at these points. No station need be shown when the curb and gutter on returns is terminated three feet back of the right-of-way line, as the point of termination is set by the right-of-way width.
5. Limits of pavement and grading at side street intersections. The limits of stabilizing and clearing and grubbing may be shown on the plan sheets or by special details.
6. Control radii for traffic turns when these set median nose locations.
7. Proposed drainage. The storm sewer system is indicated by plotting the storm sewer centerline and the outline of inlets, manholes and junction boxes. Storm sewer pipes are noted by size and length. Proposed inlets, manholes, junction boxes and special structures are noted only by station and type.
8. Construction limits, when outside of the right-of-way line, are indicated by a broken line and so noted, except in the case of pavement areas such as filling station drives, parking areas etc., where construction limits cannot be determined accurately by the designer. In such cases, the limit of construction line should be omitted through the limits of the paved areas.

6-C ROADWAY PROFILE PORTION (RURAL CONSTRUCTION)

The horizontal scale is the same as that used in the plan portion, and the station limits of the profile must correspond exactly to those of the plan portion of each sheet. Station numbers are placed across the bottom of the sheet just above the border line. Full station numbers are used for even ten stations and single digit numbers for the remainder. For a horizontal scale of 1" = 100', a vertical scale of 1" = 10' is normally used, and for a horizontal scale of 1" = 50', a vertical scale of 1" = 5' generally is suitable.

The vertical elevation datum is selected with due regard for the extremes of elevation which will occur on each sheet, so that the profile will not crowd either the upper or lower limits of the profile strip.

Elevation datum is indicated on both the right and left sides of the sheet and should be placed so that even ten-foot elevations will be on the inch lines for a 1" = 10' vertical scale, and even five-foot elevations will be on the inch line for a 1" = 5' vertical scale. Existing groundline elevations on the survey or base line are lettered vertically just above the station numbers.

All even and plus station elevations should be given and plotted in the profile. Where breaks in the profile are so numerous that there is not sufficient room to show all of the elevations, breaks should be plotted in the profile but only significant elevations, such as drainage structure flowlines, pavement edges, tops of rails, etc., need be given.

The existing ground line profile is plotted and inked, using a light solid line. When an existing two-lane facility is being expanded to a multi-lane highway by the construction of a parallel roadway, the plotted profile may be that of the existing pavement edge adjacent to the proposed median. This facilitates establishing matching grades, especially at the location of superelevated curves.

When the survey follows an existing road, it is sometimes advantageous to approximate and plot the original ground line profile, using a light broken line. See the section on Drainage Map profiles

A-8 (muck) strata limits are plotted in the profile and cross hatched. In cases where no soil profile is included in the plans, strata boundaries of other unsuitable materials also are plotted in the profiles and labeled.

High water conditions are shown by the use of a light broken line (long dashes) at the high water elevation, with the elevation indicated numerically, and the year of the indicated high water given. If high water is to be lowered, the design high water elevation must be given.

Bench mark data are normally given just below the upper margin of the profile strip, or may be placed in the plan portion just above the upper profile margin.

The proposed profile grade is shown by a heavy solid line. Vertical curve P. C., P. T. and P. I.'s are indicated by a small circle. The grade line is plotted around the vertical curve, and sections of tangent are drawn from the P. I. on either side using a light solid line. Vertical lines are extended from the P. C. and P. T. points, and a dimension line placed between these lines indicating the length of the vertical curve.

For vertical curves, the profile grade elevations are given every fifty feet (on even stations and half stations) are placed between the dimension line and the grade line. The length dimension and the profile grade elevations are placed above the grade line for sag vertical curves, and below the grade line for crest vertical curves. The dimensions and elevations should be placed reasonably near the grade line whenever possible.

The P I elevation is lettered vertically above the P. I. circle for crest curves and below for sag curves. The profile grade elevation of the beginning and ending station of each sheet is lettered vertically just above the grade line, except when the beginning or ending station is on a vertical curve.

When the P. I. does not fall on an even station, the plus station is given Percents of grades are indicated for each tangent on every sheet In cases where the beginning or ending station of the sheet is on a vertical curve, the P. I. of which falls within the sheet, the percent of grade of the tangent extending from the adjacent sheet is indicated.

Station equations and exceptions shall be shown

Special ditches are indicated in profile with a heavy broken line (long dashes) and the percents of grade and a beginning or ending (Ditch P. I.) elevations are given. In plans for four-lane projects, three special ditch grades (right and left roadway ditches and median ditch) sometimes will occur at the same location. In this case, it may be necessary to plot the median ditch against separate elevation datum for clarity.

When ditches of uniform but other than standard depth are used, the limits of such ditches are indicated by a dimension line and an appropriate note in the lower portion of the profile strip.

Proposed cross drain pipes and culverts are plotted in section with a solid heavy line The section should be at the proposed location and grade of the structure crossing the centerline of construction. Bridges and bridge culverts are noted as such and the beginning and ending stations given. Construction notes for cross drain pipes and culverts include station, size, flow lines and skew angle. Length and index numbers are not given.

The job and project limits on applicable sheets are given in the same manner as in the plan portion of the sheet.

General notes for the project are placed in the upper left hand portion of the profile strip of the first plan-profile sheet. These notes include those concerning bench mark elevation datum, placement of information signs and any special notes concerning the specific project.

6-D ROADWAY PROFILE PORTION (MUNICIPAL CONSTRUCTION)

The profile portion of plan and profile sheets showing municipal construction is prepared in a manner very similar to that for rural construction. The standard scales are 1" = 20' horizontally and 1" = 2' vertically, although a vertical scale of 1" = 5' has been used satisfactorily for some jobs in hilly terrain.

When a 1" = 2' vertical scale is used, the vertical elevation datum should be placed so that numerically even elevations fall on the inch lines and only the elevations for the even two-foot intervals are shown. When a 1" = 5' scale is used, only even 5' and 10' elevations are shown, and these are placed on the inch line.

Existing ground line profiles and elevations, proposed profile grade line, vertical curve elevations, high waters, station equations, exceptions, reference points, bench mark notes, job project limits and general notes are indicated exactly as in plans for rural construction.

All water and gas mains, all sanitary sewers and ducts are plotted by using light broken lines. Small service lines for these utilities need not be plotted in the profile, however, the elevations should be shown in the plan at locations where the elevations were taken.

When a number of utility lines of various kinds are present and overlap each other in profile, it is sometimes advantageous for clarity to use different colors of ink as well as to differentiate by use of different length dashes or combinations. The different colors are helpful during design stages by making identification of the various lines easier.

For normal construction, proposed gutter line profiles are not necessary. However, when a warped section is used, or when gutters are not at normal grade due to proposed superelevation, the gutter profile grades should be indicated.

When the plans do not include separate sheets of profile grades and sections for street intersections, prolongations of gutter profile grades across street intersections should be included

Bridges, cross drain pipes and culverts are plotted as in rural construction. The storm sewer system including main, stub, inlets and manholes is shown. Pipes are noted by size, and inlets and manholes by station and type for all proposed construction. Proposed flow line grades are indicated. Proposed drainage structures are plotted with a medium heavy line.

NOTE: Plate 13 illustrates a conventional roadway plan-profile sheet for a rural project. Plate 14 is also a plan-profile sheet for rural projects, the right side of the sheet illustrating a four-laning project, and the left side illustrating details for plans containing no soil profile and no separate drainage structure or lateral ditch plan-profile sheets.

Plates 11 and 12 illustrate plan-profile sheets for municipal construction.

ROADWAY DESIGN MANUAL

CHAPTER 7

PROPOSED DRAINAGE STRUCTURES

Separate sheets of proposed drainage structure cross sections are included in construction plans for both municipal and rural projects

In the past, attempts have been made to reduce the amount of time consumed in plans preparation by omitting plotting drainage structures in plans for municipal projects and plotting cross drains in the profile portion of the plan-profile sheets in plans for rural projects Little, if any, time is saved by this omission On many municipal jobs more time was spent in duplication of test sections by both design and checking personnel than would have been consumed in the orderly and regular plotting of drainage structures at the outset Therefore, drainage structure cross section sheets must be included in plans for jobs requiring drainage structures

Drainage structure cross sections are prepared on standard cross section sheets, usually to the same scale as the roadway cross sections The centerline of construction is located at or near the center of the sheet, and the existing ground line is plotted at the location of each proposed structure

The spacing of sections must be such that the proposed structure can be plotted and proper notes included without overlapping of adjacent sections Sections are plotted successively, beginning at the bottom of the sheet If, for any reason, a structure is plotted out of order, a note should be placed in the correct place in sequence referring to the sheet on which such structure is plotted

The existing ground line is inked with a thin solid line, and the existing ground line elevation is placed immediately below the ground line at project centerline or base line Any existing structures at the location of the proposed structure are plotted using a medium weight broken line

For ordinary cross drains, this procedure should be followed:

The roadway template and proposed structure are plotted in pencil using a heavy solid line, and the proposed profile grade elevation is given above the grade point The ends of the proposed structure are dimensioned from the centerline or reference line.

Elaboration in plotting the structures is to be avoided; they should be plotted simply as sections along the centerline of the structure, except that lines representing the outside line of the shell of pipe culverts are not plotted.

In the case of skewed cross drain structures, the section must be along the centerline of the structure A note is placed below the plotted structure giving station, length and size of proposed pipe, right and left flow lines, skew angle in case of skewed structure and standard index numbers for endwalls, inlets, or other accessory structures

It is also helpful to show the station of the structure in fairly large letters near the right border of the sheet Ordinarily, no separate notes are used for endwalls, an exception being when the pipe is placed parallel to the project and endwalls are required in which case the station, index number and flow line of each is given

The procedure in plotting drainage structures for municipal construction is similar to that for rural construction with a few exceptions.

A large proportion of structures for municipal construction is for the purpose of drainage within the lateral limits of the right-of-way, hence, the existing ground line is not pertinent in these cases and may be omitted.

The ground line, however, should be plotted for cross drains, for stubs to inlets or endwalls outside the sidewalk lines and for ditch bottom inlets placed at side streets. Where mains or laterals run diagonally across the project, they should be plotted in such a manner as to indicate the minimum cover that will result over the pipe. Longitudinal pipes are plotted as shown in the illustrations.

Structures of storm sewer mains along the project always should be plotted in proper sequence and without interruption. When inlets are placed at the ends of the returns on cross streets, they should be plotted with a section normal to the side street. These sections usually can be placed to one side of the sheet without interrupting continuity of plotting.

When systems extending along cross streets cannot be placed in regular order without interrupting plotting of the main system along the project, these structures should be plotted on separate sheets with appropriate sheet cross references given.

It is very important to indicate existing underground utilities on the drainage cross sections so that conflicts may be detected, and to alert the construction forces to the instances of near conflict The same utilities as are indicated on the profile portion of the roadway plan-profile sheets should be shown on the drainage structure sheets in conjunction with each plotted structure. In the case of longitudinal pipes, a section should be plotted for each location of a crossing of any underground line.

Notes for cross drain structures are to conform with those of rural construction plans. For storm sewer systems where cross drains are not involved, proposed inlets, manholes, junction boxes and endwalls are indicated as to station, type, index number and flow line elevation. The top grade elevation of proposed manholes also is given as are grating and inlet elevations of proposed ditch bottom inlets. Notes for the pipes are to include only size and length.

Flow line grades are indicated at appropriate places on the plotted sections. Arrows indicating direction of flow for each pipe should be included in the case of cross drains and in storm sewer systems. Existing structures which are to be abandoned but are to be plugged and remain in place must be plotted along with the proposed template at that location.

NOTE: Plates 15, 16 and 17 illustrate drainage structure cross section sheets for rural projects, showing the arrangement of notes, various types of drainage structures and combinations of structures. Plate 17 also gives the requirements at locations where proposed structures go under railroads. Plates 18 illustrates drainage structure cross sections for municipal projects.

Plate 19 illustrates the method of establishing the length of special pipe under railroads and gives criteria for plotting inlets on returns.

ROADWAY DESIGN MANUAL

CHAPTER 8

LATERAL DITCH PLAN-PROFILE

Lateral ditch plan-profiles are prepared on standard plan-profile sheets in a manner very similar to that of roadway plan-profiles The standard horizontal scale is 100 feet to the inch

If storm sewer construction is anticipated over a portion of the line, a horizontal scale of 1" = 50' may be used, and, in the case of very long ditches, a scale of 1" = 200' or more may be used to permit placement of the entire ditch alignment on one sheet However, if an unusual amount of topographic information is involved, it may be necessary to use additional sheets with a larger scale

The vertical scale, in all cases, should be ten feet to the inch Since many proposed lateral ditches are quite short, it is possible sometimes to include details for more than one ditch on one sheet However, ditches on any one sheet should be confined to the number that can be identified readily with reasonable intervening spaces and no overlapping

Plotting in the plan portion should be oriented so that the ditch centerline will be approximately parallel to the long edge of the sheet, with the project centerline being approximately parallel to the short edge The direction of project is to run from bottom to top of sheet

The centerline of the ditch and the centerline of project are plotted and stationing is indicated in the same manner as described in Chapter 6 entitled Plan-Profiles Existing topography is plotted, and centerlines, topography, north point and appropriate alignment data for the ditch are inked

The bearing of the project centerline is given, and, if it is on a curve at the location of the lateral ditch, the P I station and degree of curve are given. If a P C. or P. T. falls within the limits plotted, it should be indicated in the standard manner

The centerline of construction of the ditch must be indicated when it does not coincide with the surveyed line The proposed drainage structure is plotted by symbol in pencil and the project and ditch right-of-way lines plotted and dimensioned in pencil

In the plan portion a few spaces above the upper margin of the profile block, the location station of the ditch is given in large letters Just below the ditch description a cross reference of the cross section sheets is indicated

The profile section should be prepared much in the same manner as the profile portion of the roadway plan-profile sheets Existing ground line profile, ground line elevations, high water elevations, underground utilities, bench mark information and elevation datum are shown as described in Chapter 6

When the ditch survey centerline is down an existing ditch, the approximate natural ground profile is indicated with a broken line and identified When the ditch survey centerline follows an existing ditch but does not follow the flow line of the channel, the approximate channel profile is shown with a broken line and so identified

The limits and width of proposed clearing and grubbing outside the roadway right-of-way are indicated by a dimension line above the profile The limits and quantity of the proposed ditch excavation from the end of the structure to the end of excavation are indicated by a dimension line above the profile

The station, size, type and flow line

indicate the bottom of the pavement or sidewalk, outline of curbs, etc Existing rigid type construction (concrete) is to be indicated by the symbol for concrete

Earthwork columns for A-2 or A-3 material are provided at the right side of the sheet, and columns for all other materials are placed on the left side whenever possible When two columns of cross sections are placed on a sheet, the A-2 and A-3 earthwork columns are placed to the right of the respective column of cross sections, those for all other materials are placed to the left of the respective column of cross sections

Earthwork columns are inked with fairly heavy solid lines, but only after it has been established that space for additional columns of unsuitable material or additional earthwork classifications is available if needed.

Strata boundaries of rock or unsuitable material are plotted on the cross sections and inked in red, using a medium weight broken line (long dashes). Unsuitable material is identified by its subsoil group designation (with stratum number, when necessary) and must be clearly labeled Any rock encountered is labeled similarly

The proposed roadway template is plotted in pencil, using a heavy solid line The proposed grade elevation is placed vertically just above the template grade reference point Cut and fill areas are indicated in pencil in the area column opposite the station number, and volumes are penciled in the volume columns about midway between the area values

The same earthwork columns sometimes are used for both roadway and subsoil quantities of the same soil type to avoid a multiplicity of earthwork columns Distinction is made between the two classifications by enclosing the subsoil quantities in parentheses In this case, the first cross section sheet should carry a note indicating the meaning of the quantities in parentheses

In cases where more than one soils classification and more than one earthwork classification are involved, attempts have been made to avoid the use of additional earthwork columns by using a combination of parentheses and brackets to distinguish between the various soils types and classifications of excavation. This, almost invariably, has lead to confusion and errors. Separate columns are to be used for each soil classification that must be handled differently

Station equations are indicated even though a cross section was not obtained at that point

Balance points are shown to the nearest even foot (or ten feet in case of heavy earthwork), and earthwork totals for the balance are given

The completed sheet will have the proposed template, profile grade and earthwork figures in pencil All other data must be inked

These approximate lettering sizes and weights are recommended·

Station Numbers - 0 2" high, No 1 speedball weight

Earthwork figures - No 5 lettering guide size

All lettering on cross section sheets should be between the horizontal 0 2" grid lines

NOTE: Plates 21, 22 and 23 illustrate roadway cross sections for rural projects, and plate 24 illustrates a roadway cross section sheet for an urban project

CHAPTER 10

LATERAL DITCH CROSS SECTIONS AND TEMPLATES

Lateral ditch cross sections are prepared in a manner almost identical to that of roadway cross sections The same type cross section sheet is used, and the scale generally is the standard 1" = 5'. However, regardless of the horizontal scale used, the vertical scale must always be 1" = 5'.

Ditch rights-of-way frequently are narrow, and often it is possible to place two or more columns of ditch cross sections on one sheet They are plotted exactly as roadway cross sections, progressing from bottom of sheet to top and from left to right

A heavy vertical grid line should be chosen as the centerline or base line of each column of ditch cross sections, and a heavy horizontal grid line for the elevation datum for each section as with roadway cross sections

Soil surveys usually are not made on the lateral ditch locations except when a large amount of material is expected to be excavated and when the suitable material is to be used in the roadway.

All other points mentioned in "Roadway Cross Sections and Templates "are applicable equally to lateral ditch cross sections

NOTE· Plates 25 and 26 illustrate a lateral ditch cross section sheet

ROADWAY DESIGN MANUAL

CHAPTER 11

PROFILE DATA FOR SIDEWALK GRADES

Profiles for use in establishing back-of-sidewalk grades are prepared on standard cross section sheets. They consist of two profiles, one along each right-of-way line, and are plotted against the same elevation datum. They are plotted with broken lines, different break patterns being employed for the two profiles to distinguish between the right and left right-of-way lines. It is helpful in the design stage to use different colors of ink.

The standard scale is 1" = 100' horizontally and 1" = 5' vertically. This combination works very well for projects having few locations where the grade would be critical. In business districts, however, it is often advantageous to use a vertical scale of 1" = 2' and a horizontal scale of 1" = 50' or 1" = 20'.

The elevation datum is shown on both right and left sides of the sheet. Station numbers are given below the profile. Full station numbers are shown at each even five stations and single digit numbers at every other station when the horizontal scale is 1" = 100'. For all other horizontal scales, the full station numbers are given at each station.

Existing pavement such as parking areas and filling station drives which should be matched if possible with the proposed sidewalk grade is indicated by dimension lines for each profile. The centerline for each intersecting street is indicated with a vertical line at the proper station, noting the station and street name. Intersecting streets on the right are shown by name below the profile, and those on the left are shown by name above.

Drainage arrows to indicate slope of the ground at the right-of-way line are shown at each station and at plusses, when the information is available, and the drainage at that location significant

Drainage arrows for the right right-of-way line are placed below the profile and those for the left right-of-way line are placed above Arrows pointing toward the profile indicate drainage to the project, and arrows pointing away from the profile indicate drainage away from the project

Building floor elevations for those along the project are indicated by a horizontal line drawn at the floor elevation and between the stations of the building limits. The elevation is shown numerically and the distance from centerline to face of building and side (right or left) are given. Entrances to buildings also are indicated if it appears this information would influence the grade selection.

The proposed sidewalk grade line is plotted in pencil. Percents of grade are shown, P I stations and elevations are given and vertical curves, if any, are dimensioned. No elevations around V C 's need be given.

A title completes the sheet. Since grade profiles on this sheet are at the back of proposed sidewalk, and those shown on plan-profile sheets are centerline grade profiles, the difference in elevation between the two is noted below the title

Too much stress cannot be placed on the necessity for accuracy and completeness of information contained on this sheet, as it must embrace all information necessary, and be utilized wholly, in establishment of grades for the project.

NOTE Plate 27 illustrates a profile data sheet for sidewalk grades.

ROADWAY DESIGN MANUAL

CHAPTER 12

INTERSECTION AND INTERCHANGE LAYOUTS

Due to the amount of detail and the impracticability of showing all necessary information on regular 100-scale plan-profile sheets, it usually is necessary to detail intersections and interchanges on special sheets.

It also is generally necessary to provide special detail sheets for large channelized intersections on municipal projects, since, even though the standard scale for these plans is 1" = 20', there is seldom sufficient space in the plan portion of the sheet

In the case of simple intersections covering relatively small areas, regular plan-profile sheets can be used, placing the intersection layout in the plan portion and necessary profile grades in the profile block.

For larger and more complicated intersections involving channelization or long connections, the layout should be placed on one or more sheets, with profile grades and detail sections on separate cross section sheets when necessary When the layout is placed on a sheet by itself, standard size cloth or film sheets are to be used whenever possible, and oversize sheets used only when absolutely necessary

Existing topography usually is not plotted on intersection layouts if it is covered elsewhere in the plans, unless pertinent to the design. In most other respects, information given is exactly as in the plan portion of municipal construction. Pavement edges, curb and gutter, channelizing and median curbs , drainage structures, pavement dimensions, radii and appropriate notes are included.

When detail sections through island noses and other critical points are included with the profile grades and sections, the section locations are indicated. Design speed data are included when appropriate. Extra pavement areas and curb and gutter quantities are given for each intersection

All intersection layouts must be dimensioned completely, adequately stationed and must include all pertinent construction notes and alignment data. A north point and scale is indicated for each intersection.

The scale used should be sufficiently large to enable all necessary details to be covered clearly. A scale of 1"=40' is the smallest that ordinarily should be used for intersection layouts. The scale should be such that scaled dimensions can be obtained easily through use of a standard Engineer's scale.

As turning path templates are used frequently to check the widths of turning lanes and possible encroachments or conflicts, a scale suitable for such a check should be used. The templates are cut for scales of 1" = 20', 1" = 40' and 1" = 50'.

Interchange layouts are prepared in a manner similar to that described for at-grade intersections. As it is a decided advantage to place the entire interchange layout on one sheet, it is usually feasible to use a smaller scale (1"=50' is satisfactory) for the entire layout, with blow-ups of ramp terminals or other channelized areas on a scale of 1"=20', or 1"=40' if required.

Dimensions, grades, sections, etc., which are shown on the 1"-20' blowups need not be duplicated on the 1"-50' layout. Except for those portions covered by blow-ups, the layout must be dimensioned and stationed completely, and all alignment data and necessary construction notes included.

In the case of large directional and cloverlead interchanges, a scale of 1"-100' has been used successfully for the general layout with the ramp terminals detailed in plan with profile grades on plan-profile sheets. For convenience and simplification, when a large number of curves is involved, each should be assigned a number and the curve data presented in tabular form on the layout sheet. A co-ordinate system must be provided for all interchanges and the coordinates computed for all control points, and the coordinate data presented in tabular form.

Interchange ramps are to be identified systematically, using letters. Locations of ramp base lines must be clearly indicated. They are located usually on the right edge of the pavement with relation to the direction of traffic and should be stationed as shown in chapter 28. Ramp stationing must be equated to project and cross road stationing at ramp terminals.

Traffic data are given by a line drawing. Both current (if applicable) and design year traffic are given. In the case of all at-grade intersections which are to be signalized, all information regarding signal location, signal phasing, etc. must be given The design speed of the various segments of the ramps and connectors must be given.

NOTE: Plate 28 illustrates use of a plan-profile sheet to detail simple intersections. The layout is detailed in the plan portion, and the necessary profiles are placed in the profile block.

Plate 29 illustrates use of a plan-profile sheet to detail larger and more elaborate intersections. The layout is detailed completely in the plan portion, but a supplemental sheet is necessary for profiles and sections.

Plate 30 illustrates a channelized intersection layout detailed on a standard size sheet.

Plate 31 is a complete interchange layout. This layout was prepared on a scale of 1"=100'. For this illustration, it has been reduced in size to 1"=400'.

Plate 32 illustrates ramp terminals detailed on a plan-profile sheet.

Plates 33 and 34 illustrate intersection profiles detailed on cross section sheets.

Plate 35 illustrates a ramp profile detailed on a cross section sheet.

CHAPTER 13

INTERSECTION AND INTERCHANGE PROFILE GRADES

In addition to normal roadway grade line profiles, supplemental grade profiles and sections are necessary at intersections to define pavement grades other than those controlled by the profile grade line These supplemental profiles are developed around returns, along pavement edges and gutter lines for added lanes, for lane lines as are necessary, etc

It is particularly important to develop accurate profiles and sections at locations of curbed channelizations to insure proper drainage Pavement surface sections are plotted at nose points and other critical locations, and a series of sections may be used when it is necessary to present changing pavement cross slope

When intersections are detailed on plan-profile sheets, the horizontal scale in the profile must be the same as that used in the plan portion A vertical scale of 1" - 1' is satisfactory, enabling spot elevations to be picked from the profile with sufficient accuracy

For intersections having the plan portion detailed on a separate sheet, a standard cross section sheet is used in developing profiles and sections

For ordinary street intersections of municipal projects, scales of 1" = 10' horizontally and 1" = 1' vertically are satisfactory

The distance around returns and lengths of necessary profiles for rural projects make it necessary, in some cases, to use a horizontal scale of 1" = 20' Various combinations of vertical and horizontal scales are used for interchange ramp profiles, the most common being 1" = 20' horizontally with 1" = 1' vertically and 1" = 50' horizontally with 1" = 2' vertically Both of these combinations are satisfactory, and it is recommended that one of them be used for ramps throughout each set of plans

NOTE: Plate 28 illustrates detailing profiles for simple intersections in the profile portion of the plan-profile sheet

Plate 29 illustrates use of a plan-profile sheet in detailing a more complicated intersection In this case, the main control profiles for both project and cross road are placed in the profile block, and a supplemental sheet (Plate 33) is used for return profiles and sections

Plate 32 illustrates the detailing of ramp terminal profiles and sections in the profile portion of the plan-profile sheet

Plate 34 is a profile sheet for an intersection on a municipal project. Plate 12 is the corresponding plan-profile sheet

Plate 35 illustrates use of a cross section sheet to detail ramp profiles beyond the limits of the ramp terminals

ROADWAY DESIGN MANUAL

CHAPTER 14

TYPICAL SECTIONS

Typical sections show the design elements for the cross section of a proposed roadway. They are in the form of cross sections depicting the work which is typical or standard for the project, and part sections to cover other details.

These sections must be complete in every detail and must show clearly all work to be done and the limits of the work.

Several examples are given to illustrate various materials used in highway construction in Florida, and to illustrate and explain reasons for the various widths and thicknesses of pavement and the various types and thicknesses of surfacing.

It should be realized, however, that it is not feasible to include an illustration of every possible combination of base type and thickness and surface type and thickness. These elements depend upon the location of the project, availability of materials, character and volume of expected traffic, and other considerations.

Typical cross sections should show typical conditions only, and no attempt should be made to include sections covering non-standard construction or to cover conditions that prevail for short distances only, such as transitions from one typical section to another.

When it is necessary to use more than one typical section, they should be placed consecutively, in so far as possible, in order of the stationing, from top to bottom of the sheet The station limits of each typical section are shown below the typical section title. The stationing must be continuous with no gaps or overlaps Limits of transitions from one section to another should be included in the stationing of one or the other of the typical sections. Transition stationing from highway to municipal sections of from 2-lane to multilane sections generally should be included in the stationing for the highway or two-lane portion.

Errors in minor details, confused wording of notes, etc., can be avoided by carefully studying the examples presented and following them when preparing the plans.

The typical sections for all projects other than those of maintenance nature (resurfacing, and drainage projects, etc.) must include the design data. These data will constitute a permanent record of the basis for design. Traffic data must include Design year ADT, the ADT for the estimated year of completion of the project, together with the K, D and T factors. When these data vary considerably over different sections of the project, the data for each section should be given. The design speed (or speeds) must also be given.

In these examples, double zeros are used to indicate dimensions which vary, such as right-of-way widths. All references to Standard Index Drawings use the index drawing number followed by an X instead of the current revision letter. In plans assemblies, the current revision letter always must be used. These drawings are not necessarily to scale.

Typical Section No. 1 illustrates a typical grading section. This is applicable to projects on which pavement is to be provided as second stage construction, on relocated sections of graded roads, on graded frontage road construction, etc. The section illustrated is for a two-lane primary system highway. However, the same general section could be used, providing for any type of future construction by adjusting the future pavement section, shoulder width, stabilizing requirements, etc. The grading template line should be set to give ample cross slope from centerline to shoulder, and its depth below the future paving grade should be such that trenching for the base in the future paving operation will provide sufficient material for the shoulder build-up.

Typical Section No. 2 is a section illustrating a limerock stabilized base. This base is constructed by mixing limerock material with the existing subgrade material, and compacting. This is a comparatively inexpensive type of construction, and is suitable only for light traffic. This type of construction is used mostly in the Second District, although a few such bases have been built in the First and Fifth Districts and the extreme eastern part of the Third District. Some materials not meeting specifications for Ocala Limerock for use in standard limerock base are satisfactory for limerock stabilized base construction. Due to the relatively light traffic using this type of pavement, the surfacing is not usually of a higher type than Type 2 Surface Treatment or 1 1/4" of Type I Asphaltic Concrete. Due to the superior wearing quality of asphaltic concrete, it is frequently advisable to use that type of surfacing. The dimensions in the example are typical for a road carrying a low volume of traffic.

Typical Section No. 3 illustrates a typical shell stabilized base. This base is constructed by mixing oyster or clam shell with the existing subgrade material and compacting. This base is constructed principally in the Third District where the shell material generally is available at locations along or near the coast. It is applicable also to some areas in other Districts. Depending upon the base and surface thicknesses, the shell stabilized base is capable of carrying light to heavy traffic. A variety of surfaces may be used, depending on traffic requirements. The example is typical for a light volume minor road. By increasing pavement and shoulder widths, base thickness and surfacing type, this base may be adapted for fairly heavy traffic projects.

Typical Section No. 4 illustrates a typical section for a limerock base with an asphaltic concrete surfacing. Limerock suitable for base construction is found over an appreciable portion of the State. When used for base construction, in the proper thickness, and topped with suitable surface courses, it will support relatively heavy traffic loads. The pavement and shoulder widths, pavement thickness, light plant mix surfacing and bearing value requirements in the illustration are for a minor primary system road. A six and one-half inch rock base with a Type 2 Surface Treatment and possibly reduced pavement and shoulder widths could be used for projects similar to those controlling the designs illustrated by Typical Sections Nos. 2 and 3. See Typical Section No 6 for a limerock base designed for heavy traffic. This standard would be used for a design traffic volume of less than 1500 ADT

Typical Section No. 5 illustrates construction providing for a sand-clay base. Bases of this material are applicable to the Third District, where limited deposits of suitable sand-clay bases are available. These bases are capable of carrying light to heavy loads when constructed to the proper thickness and surfaced with suitable wearing courses. The typical section illustrated is for a project designed for a traffic load from 3000 to 4000 VPD Sand-clay bases six and one-half inches in thickness with lighter surfaces and appropriate lateral dimensions are used under the same circumstances as pavements illustrated in Typical Sections 2, 3 and 4.

Typical Section No. 6 illustrates the typical section for a limerock base and plant mix surfacing. This section is designed to the same high standard as is Typical Section No. 5, and is expected to be subjected to the same type of of traffic.

Typical Sections 1 through 6 illustrate typical sections for rural construction .

Typical Section No. 7 illustrates the "village section". This is a section intermediate between the rural section having only the traffic lanes paved and the municipal section utilizing curb and gutter and parking lanes. The "village section" provides for a paved parking area outside of the normal traffic lanes. The parking area is usually the width of the normal parking lane (8') and is sloped downward from the outer edge and the traffic lane edge to form a "V" at the center. The slope is at a rate sufficient to discourage use by through traffic and also to provide effective drainage. This section is used generally in rural areas where short sections of development along the highway demand more than a simple two-lane highway section, but where a municipal type section with curb and gutter is not justified. Although a limerock base is shown in the illustration, the base could be sand-clay, sand asphalt hot mix, shell or shell stabilized base of the appropriate thickness.

Typical Section No. 8 illustrates a four-lane rural section with a narrow median. Four-lane sections generally are indicated in rural areas when the design traffic volume exceeds 5000 VPD Narrow medians such as the one shown in this typical section are undesirable for rural sections, and usually are the result of restricted right-of-way, and preferably should be outlined with a barrier type curb Medians having a width of 20 feet or less are crowned at the center, surface run-off being across the pavement. A base thickness of 10 1/2" is shown in this typical section. This base thickness is for heavy to very heavy traffic . Although the subgrade, base, and surfacing design chart calls for a total of 4 inches of plant mix, only a total of 3 inches (2 inches binder and 1 inch asphaltic concrete) is used, it being considered that this is first stage construction, with an additional thickness of asphaltic concrete being placed later.

Typical Section No. 9 illustrates a four-lane rural section with a wide median. The 40 foot median is a standard width which permits expansion to a six-lane facility by the construction of additional traffic lanes on the median side , leaving a 16 foot wide median for development of left turn storage lanes. For illustrative purposes, the pavement has been shown as plain portland cement concrete, although any appropriate flexible base with suitable surfacing could be used. A portland cement concrete pavement with a thickness of eight inches is normally used on the Primary Highway System, while a nine inch thickness is used on the Interstate system.

Typical Section No. 10 illustrates a standard city street section. This section is provided generally for minor arterial streets carrying traffic volumes possibly up to 4, 000 VPD. It provides for two 12-foot traffic lanes (12' for traffic with 2' offset adjacent to parking lane) and two eight-foot parking lanes, curb and gutter and sidewalks. The standard sidewalk width is five feet and the back of the sidewalks normally are placed on the right-of-way line. Streets which are improved with municipal type construction generally carry moderate to heavy traffic, hence the thinner bases and low type surfaces seldom are used. This section can be expanded to a four-lane undivided section by adding two 12 foot traffic lanes, increasing the right-of-way width as necessary and increasing the total pavement crown.

Typical Section No. 11 illustrates a four-lane divided municipal section. Except for the median separation, this section is similar to the undivided municipal section. Four-lane sections are required when the traffic volume generally exceeds 5, 000 VPD. Divided sections are greatly superior to undivided sections in that opposing traffic is separated and capacity at the intersections is increased considerably due to the opportunity to develop left turn storage lanes in the width of the median divider.

Typical Section No. 12 illustrates a multi-laned variable width Portland cement concrete pavement, actually an urban expressway section. Note that the location of the various base lines are indicated on the typical section and that the location of a keyed longitudinal joint is specified.

Typical Section No. 13 illustrates a municipal eight-lane expressway with four-lanes in each direction. A median distress area is necessary. This section provides for a total six-foot paved width on the median side, which will restrict only slightly the four through lanes. Note that with the crowned section, median drainage must be provided. The concrete pavement is illustrative. An appropriate thickness of flexible base and plant mix surfacing could be used when desirable.

Typical Section No. 14 illustrates a typical section for widening an existing pavement by the addition of widening strips and over - building the entire width with limerock for the purpose of widening the existing pavement and attaining a smooth surface. The limerock over-build on the existing concrete pavement adds structural strength. Although a wearing course of 1 1/4" of Type I Asphaltic Concrete is illustrated, other thickness of plant mix surfacing could be used depending upon the anticipated traffic.

Typical Section No. 15 is a section for the rehabilitation of an existing pavement by reworking the existing base to a wider section. Sufficient new material is added to produce the required base thickness. The total thickness of base and the type of surfacing to be provided depends upon traffic requirements. A double bituminous surface treatment is illustrated in this typical section. This type of surfacing, however, is seldom used in locations of greater than medium anticipated traffic volumes.

Typical Section No. 16 illustrates the resurfacing of an existing pavement. This is strictly a maintenance operation. It should be noted that the amount of leveling course is indicated as an estimated average amount per square yard while the wearing course is expressed as a specific quantity per square yard. Type I Asphaltic Concrete is nearly always specified as the surfacing course. If build-up of the shoulders should require borrow, appropriate notes regarding amount and source of borrow material should be shown.

Typical Section No. 17 is for a minimum design rural Interstate project. The phrase "minimum design" is used for the reason that the lateral dimensions given are the minimum. The standard right-of-way for this section is 300 feet. Spreading of the roadways naturally will require more right-of-way in most cases. The 64' width median permits expansion to a 6-lane section with a 40 foot median in the future if future traffic volumes demand such a section.

The typical section illustrated is the first stage for a grading and paving section. The section illustrated is for flexible base. The second stage is to be a strengthening of the base and surface structure by the addition of a course of Type I Asphaltic Concrete, to be applied over the traffic lanes and shoulder pavement. If stage construction is not planned, the section would indicate 2 1/2 inches of binder and 1 1/2 inches of Type I AC over the traffic lanes and an average of 1" thickness over the shoulders.

If this section were to be constructed of cement concrete pavement, only one stage of construction would be considered. The concrete pavement would be 9 inches thick and the shoulder pavement would consist of 5" of Sand Asphalt Hot Mix and 1 inch of Type I Asphaltic Concrete.

Typical Section No. 18 is for a 6-lane municipal section with parking. A 6-lane section with parking is seldom used in urban areas demanding a 6-lane facility, due to right-of-way restrictions. In areas, where such a section would be appropriate, off-street parking is usually provided.

Typical Section No. 19 illustrates a 6-lane Interstate section through a rural area. Such sections are seldom if ever used on primary roads. Regardless of whether this typical section is for a primary or Interstate project, it represents the first stage of a stage construction project with the second stage (strengthening of the surface structure) to follow later.

Typical Section No. 20 illustrates a six-lane municipal section without parking. This section represents an ideal condition with standard width traffic lanes, a condition seldom attained. This section should be used only in an urban area with high traffic volumes, and should provide frequent parking bays for disabled vehicles. The other cross section elements have been discussed previously.

FOREWORD

SECTION 2

The purpose of these instructions is to achieve uniformity and to preclude to the greatest extent possible unnecessary work in plans preparation, thereby assisting the designer in avoiding errors and omissions which consequently would require excessive alterations and corrections This section includes a step-by-step guide for preparation of plans for both rural and municipal type construction The sequence of operations in plans assembly depends upon numerous factors In many cases, a number of preliminary operations may be carried on simultaneously

Design squad set-up and the degree of complexity of the job usually dictates the actual procedure during the early stages of design

Care must be exercised, however, to avoid starting any operation before the proper investigation and assembly of data has been accomplished After the preliminary field inspection, the step-by-step precedure outlined must be followed if discrepancies and revisions are to be avoided

These instructions also contain specific requirements for the application of design criteria set forth in Section 3 These criteria must be used in accordance with instructions in this section and in Section 3.

INDEX — SECTION 2

ROADWAY DESIGN PROCEDURES

ROADWAY DESIGN MANUAL

CHAPTER 15

GENERAL DESIGN PROCEDURE

The desirable design squad should consist of two or more designers and draftsmen. A designer is designated as squad leader and is responsible for the prosecution of work. The squad leader should be a designer of considerable experience, capable of directing the design and plans assembly with minimum supervision by superiors.

Throughout the progress of the plans preparation, he must be completely familiar with all work performed by subordinates, and thus maintain at a minimum, errors, discrepancies, faulty design and lack of standardization. More design experience is required on the part of designers supervising design work on municipal construction and freeway plans than for those planning rural construction.

Prior to proceeding on designs for any job, the squad leader should familiarize himself with all data concerning the project, including location of job, approved typical section, design speed and anticipated traffic. He should also be familiar with all correspondence on file.

The skeleton right-of-way maps, if available, should be examined in light of requirements of the typical section. The typical section also should be examined for compliance with current design standards. Any data in support of changes in the typical section should be brought to the attention of the Design Engineer in charge.

The proposed typical section for an improvement is, to a great extent, established on the basis of traffic volume forecast 20 years in the future and the availability of right-of-way, both of which could be subject to reappraisal should changes occur subsequent to adoption of the section

If the time interval between establishment of the section and initiation of designs and plans assembly is of appreciable extent, the designer should request confirmation of the section prior to proceeding with detail planning

All of the material in the field note books is to be indexed prior to any plotting of field notes This indexing is independent of the Location Engineer's book index and should provide, for quick reference, a complete and accurate record of all field information together with its location in the field notes

All entries in field note books by the location party should be dated and all superseded information marked void so there will be no possibility of designers using incorrect field notes No erasures are permitted in field note books, either by the location party or by designers. It is particularly important that field information obtained after the original survey be dated

After the field notes have been indexed, bench marks and levels can be checked and reduced in this order--check bench marks, check H I. elevations and reduce and check elevations at centerline, high water shots, flow lines of existing structures, rail elevations at railroads and other pertinent elevations

Errors in bench levels are to be referred to the location party through the District Office for correction. It is usually not necessary to reduce elevations of cross section shots except at the centerline. Levels for lateral ditches, crossroads and other elevation data also should be similarly checked before plotting.

The proposed typical section is plotted

on a cross section work sheet so prints will be available to all design squad members. Plotting of field notes now can proceed.

Experience in the Tallahassee office has proved there is a definite advantage in development of plan-profile portions of the plans on "hard roll". The small amount of duplication of work is negligible in comparison to the "wear and tear" on plan sheets, the completed plans are much neater in appearance, and a great deal of last minute "heavying-up" of pencil work is avoided.

The continuous roll will provide a record of the development of the plans. The designer's notes concerning specific instructions, reasons for certain design features and other information which would not appear on completed plans can be placed on the "hard roll" for a permanent record.

ROADWAY DESIGN MANUAL

CHAPTER 16

PREPARATION OF PLANS FOR RURAL PROJECTS

This procedure applies specifically to rural projects, however, many phases are applicable equally to urban projects. The procedure applies only to conventional methods of plans assembly. Another section will show the use of the electronic computer in plans preparation.

The profile of the existing ground line at the project centerline is plotted in the profile portion of the continuous roll. Station numbers are placed just above the lower margin. Do not indicate existing ground elevations. Only those elevations which would influence the grade, such as railroad rails, high waters, pavement of intersecting roads, etc., are shown.

If it is necessary to break the profile, several stations of overlap should be provided. Elevation datum should be shown at frequent intervals The profile is inked with a light solid line. Existing cross drain structures are not plotted in the profile unless they are to remain.

Alignment and topography are plotted in the plan portion of the roll, keeping the stations, as nearly as possible, directly above those in the profile. Horizontal curve data should be checked prior to plotting the alignment See Section I for description and examples of plan-profile sheets. Information placed on the roll should be legible, but there is no necessity to go to great pains to achieve neatness, as this will be accomplished when tracing on the plan sheets

Alignment should be reviewed. If undesirable alignment is discovered, such as broken back curves, curves in opposite directions with insufficient intervening tangent, curvature exceeding the maximum for the design speed, etc., a study should be made of possible remedial measures by realignment. A check also should be made of undesirable horizontal-vertical curve combinations noted in Chapter 23.

The rate of superelevation, based on the design speed of the highway, is indicated in conjunction with the curve data for each horizontal curve. In cases where no superelevation is required, it should be noted. Superelevation rates are obtained from charts on the appropriate Standard Drawings and are shown to the thousandth of a foot per foot rate of cross slope.

After determining that alignment is satisfactory, a tentative grade then can be established on the continuous roll. Many factors influence the choice of grades

1. A minimum stopping sight distance, based on the design speed, must be provided throughout the entire project. The minimum length of crest and sag vertical curves for practical design speeds and grade combinations are obtained from charts in Chapter 21. Since the formulae from which the charts were prepared contain averaged and arbitrary factors, time consumed in computing exact values is not justified. It is emphasized that a more liberal design than the minimum must be employed whenever practical.

2. Definite clearances of bottom of base or pavement above high water elevations must be maintained. The standard clearance is 3.0'. The validity of clearing the high waters should be checked. When it is apparent that the high water condition is caused by an existing restriction which will be remedied, or that the water will be drawn down by roadway ditches or by lateral ditch work, the present high water may be disre-

garded. Existing high waters other than those discussed above are meaningless. Superelevation of curves must be taken into account so the required clearance will be obtained at the low edge of the pavement. For further discussion of high water grades, see the Drainage Manual.

3. If a maximum gradient has been established, it should not be exceeded.

4. The grade should be held well above marshy areas or locations of high ground water. Ground water conditions may not be known at this stage of design, but an experienced designer frequently can anticipate trouble spots through knowledge of the terrain and study of the topography and profile. In the past, through many areas where the groundwater table was high during wet seasons, grades have been set low with the expectation that the side ditches would draw down the groundwater. This, in some cases, did not occur, resulting in failure of subgrade and base.

5. The soil profile usually is not available when the tentative grade is set. However, when it is available, the proposed grade should be reviewed with the object of minimizing the removal of unsuitable material. It often is possible to eliminate or reduce the undercutting of plastic material with the resultant backfilling by using higher grades with an overall economy in grading costs.

6. While a rolling grade is not in itself objectionable, secondary dips which might break up passing sight distance must be avoided. If the surface of the road is not visible to the driver, it is not apparent to him whether or not the dip could hide a vehicle. These secondary dips with the pavement not visible result in reduced use of legitimate passing zones.

7. If the location is along an existing facility, sizes of existing drainage structures may give some indication of drainage requirements and allow establishment of grades providing the required cover.

8. Unless a grade separation is to be provided, railroads must be crossed at grade, and the proposed grade line must meet the rail elevations. If the crossing consists of more than one set of tracks at different elevations and the grades of all tracks cannot be matched conveniently, the grade of the project pavement generally should be established to match the elevation of the higher tracks. It is much easier to make a small adjustment of the grade on a railroad by raising it than by lowering it. The grade of intersecting highways also should be matched closely when possible.

9. Economy of construction is an important factor in establishing grades. Total earthwork should be held to a practical minimum. When practical, cuts should produce sufficient material for construction of the fills. When it is possible to balance in this manner, small amounts of borrow or waste are to be avoided. Consideration also should be given to the haul of earth material along the project. Material normally is hauled downhill from cuts in high places to fills in the lows. Uphill hauls or excessively long hauls increase the cost materially.

10. In the case of multi-lane highways, passing sight distance is no consideration. If, however, the highway is a two-lane facility, zones of passing sight distance should be marked on the hard roll.

After the profile and tentative grade is completed on the continuous roll, the existing ground line then should be plotted and inked in the profile portion of the plan-profile sheets The tentative grade line then is indicated in pencil on prints of these sheets, and the prints submitted to the District Materials and Tests Engineer for use in preparing the roadway soil survey

The roadway cross section ground lines now can be plotted, using the tentative grade line as a guide for spacing the sections

At the present time, most cross section field notes are reduced to actual elevations by use of the electronic computer If the notes are not reduced by computer, a time saving self checking method of reduction and plotting of notes can be utilized This consists of plotting the sections using a rod-reading method, then check plotting by actual elevations, either reducing the notes mentally or by machine

The ground line, ground line elevation at the centerline of survey and station numbers then are inked Existing underground utilities are plotted, checked and inked

If it is anticipated that a considerable amount of plastic material will be encountered in the grading operations, suspend work on the designs at this point pending receipt of the soil profile

Upon receipt of the soil survey, the strata boundaries of all unsuitable material are plotted on the roadway cross sections, checked and inked and muck strata cross hatched Earthwork columns are set up in pencil

Now reexamine the grade in this way for possible improvement

1 Can poor grade-alignment combinations be eliminated?

2 It usually is desirable, and sometimes necessary, to clear high water table This often will prevent future maintenance problems.

3 Can passing sight distance be improved?

4 Can unnecessary handling of unsuitable material be avoided?

5 Are grade changes indicated by any special conditions revealed by examination of the plotted roadway cross sections?

6 Are truck climbing lanes necessary? Check traffic data and warrants for truck climbing lanes

Outfall and infall ditch surveys now are plotted on a hard roll Alignment, topography and profiles only are plotted at this time Cross sections are plotted after it has been determined at which locations outfalls will be constructed When the survey is at the location of an existing water course, the profile must be plotted as described in Section 1, "Lateral Ditch Plan Profiles". The profile is inked, and the remainder of the plotting is to remain in pencil Applicable high water elevations must be indicated in the proper locations Existing structures are plotted in both plan and profile This roll will be used in the field inspection of drainage and later in establishing lateral ditch grades

The roadway cross section templates now may be plotted When there is a possibility that numerous grade changes will be required to balance the earthwork, plot the templates for tentative grades on prints of the cross section sheets in order to preserve the originals Grade changes also can be plotted on these prints, thus providing a record of the development of the final grade Any special ditches should be planned at this stage

On superelevated curves in well drained soils, the same elevation of both ditches need not be maintained unless drainage considerations dictate otherwise The Department policy of providing ditches 3 5' deep, measured from the shoulder point should be observed generally in multi-lane divided roadway construction Special ditch grades must be used when necessary to avoid water pockets, etc

When asphaltic concrete and binder are placed over a flexible base, the base is wider than the surfacing and binder When templates are plotted, it is not necessary to indicate the small rectangle of fill above each edge of the base It also is not necessary to indicate the thickness of surfacing Only the total thickness of base and surfacing need be plotted

The preliminary drainage map should be prepared as soon as the necessary information is available It must be as complete as possible for the preliminary field inspection

Geometric layouts for intersections, pavement transitions, etc , are made prior to the preliminary field inspection Intersection profiles should not be completed until the grade is finalized, but sufficient work profiles should be prepared to establish definitely the possibility of satisfactory operation of the intersection

The centerline of an intersection or connection should coincide with the centerline of the dedication or right-of-way of the side road Computed stationing of return points and other control points should be made using computer "canned" programs

After this plan work has been completed and all data assembled, the preliminary field inspection is made During preparation of plans to this stage, it is desirable to make a list of questions of design which arise that should be resolved at the time of the inspection As many such questions as possible should be resolved at this point, to minimize future changes in the completed plans

The preliminary field inspection is made by the roadway designer, and District Drainage and Location Engineers All preliminary plans (or prints), continuous rolls, and aerial photographs (if available) are taken The inspection is made by walking or riding the location

Design features developed this far are checked The location, sizes and skew of the proposed drainage structures are established The necessity for infall or outfall ditches is determined and the ditch sizes set Validity of high water elevations is verified Conditions requiring special design features, such as special or interceptor ditches, rim ditches, erosion control features, maintenance berms, etc , are examined

Any condition indicating inadequacy of survey information is to be noted Comments concerning design details or changes to be made may be placed on the continuous rolls and prints

Upon completion of the preliminary field inspection and after any necessary supplemental survey information has been obtained, design and plan details are completed with first attention directed to corrections or alterations noted on the field check

Grades are now to be finalized Any grade or ditch revisions resulting from field check recommendations are accomplished first Grades are examined for proper clearance over the proposed drainage structures, and revised if necessary Earthwork then is computed, and a preliminary mass diagram is prepared (At this stage, the soil profile must be available)

Earthwork volumes are computed by the average end area method End areas are obtained by planimetering or computing the cut and fill areas of the template Muck, plastic materials and A-2, A-3 materials are computed separately Material in each category is separated into roadway and subsoil excavation when both classifications occur The person computing the areas must be completely familiar with excavation classifications

If extensive muck pockets occur, muck excavation and muck fill should be balanced, if possible, prior to computing the fill proposed from A-2 and A-3 material. When plastic material is encountered in cuts, a check should be made for its use in fills. Only after the amount of fill by muck or plastic material has been established can the preliminary mass diagram for A-2, A-3 material be prepared. A-2 & A-3 materials are to be used whenever possible in the subgrade.

Correction for earthwork shrinkage is accomplished by adding an amount to the fill quantity This is called the "shrinkage factor" and is expressed as a percentage Shrinkage factors for various materials vary considerably and should be established by the District Office for each project A factor of 100% is to be used for muck

The preliminary mass diagram now is prepared and the earthwork analyzed

In rolling terrain, where balancing grades are possible, it is often helpful to plot the grade profile on the mass diagram sheet (or print). Balance lines are introduced at proper points to insure balances at peaks of hills which provides for downhill haul in both directions Excessively long hauls must be avoided

A careful examination of the Mass Diagram will reveal locations where grade changes, if necessary, should be made Excavation from any lateral ditches, intersections, or channel changes which might yield an appreciable amount of accessible material usable for roadway construction should be estimated roughly and considered in the analysis.

Necessary grade changes now should be made, earthwork revised and the preliminary mass diagram (or applicable portion) recomputed and plotted After no further improvement can be made in grades, the remaining work on earthwork computations, except for the approximate location of borrow sections with the resulting amounts of borrow, may be deferred until the plans have been detailed completely This will eliminate the necessity of last minute changes, etc

The District Engineer, or his assistant, now should be notified of the location and amount of borrow so location and testing of borrow pits may proceed Grades should be placed on the drainage map and the necessary corrections made on the plan-profile work sheets

Intersection layouts should be completed and proposed profile grades and sections plotted Although the layout may have been detailed on a work sheet for tracing later, grade profiles and sections usually can be developed on the sheet which will be placed in the completed plans. Roadway cross sections and earthwork must be corrected, when necessary, to reflect proposed intersection construction

Locations of shoulder curb inlets and down pipes, median drains and intersection drainage now should be determined, and the drainage structure cross sections plotted The standard minimum cover over pipes is 15" from bottom of the base to the outside shell of the pipe Reference must be made to the roadway cross sections to insure that the proper side slopes are used on the drainage structure sections When substandard clearance between base and structure cannot be avoided, special treatment must be employed, using extra base material around the structure

Care must be used to indicate superelevation at locations of superelevated curves In case of skewed structures, the cross section is plotted along the centerline of the structure, correcting for pavement and shoulder width and side slopes on the skew

When a pipe is placed under a railroad, care must be taken that the proper minimum cover is obtained and the limits of the special pipe accurately determined See illustrations of drainage structure cross sections for details of installations under railroads.

Flow lines of drainage structures having been established, the required lateral ditches now can be developed. Cross sections are plotted for the ditches to be excavated, drainage structures are plotted in the plan and profile and ditch grades established. Ditch templates are plotted, and earthwork is computed

Proposed drainage structures now are to be indicated in the plan and profiles of the remainder of the plans, e.g. drainage map, plan profiles and intersection and special detail sheets

Right-of-way requirements now must be checked Roadway cross sections are reviewed, and if the limits of construction lie outside the established right-of-way, additional right-of-way must be requested, or cut or fill slopes revised so all proposed construction will be within the right-of-way

A reasonable berm width must be provided between the top of cut slope or toe of fill slope and the right-of-way line, especially in the case of heavy cuts and high fills A minimum of 10' is desirable between limits of construction and the right-of-way line in moderate cuts and fills A berm of 15' to 20' should be provided in areas of heavy cuts and fills

In some cases, it may be less expensive to obtain a construction easement rather than right-of-way in fill sections where the toe of slope is outside the right-of-way. In these cases, however, a careful check should be made to determine if future development to the right-of-way line by the property owner would be detrimental to drainage of the project

Lateral ditch cross sections are examined, and right-of-way requirements for the ditches established A reasonable distance will be required between top of slope and right-of-way line, on one side, at least, if maintenance equipment cannot be operated in the ditch

After right-of-way requirements are determined, the data are referred to the Right-of-Way Branch for completion of the right-of-way maps

If, during the development of the drainage structures, it becomes necessary to revise or add roadway or other ditches, roadway cross sections and earthwork now must be revised.

Earthwork can now be finalized. The mass diagram is recomputed or revised to reflect earthwork changes. Balance lines are drawn as described and balance points computed to the nearest foot. Earthwork quantities between balance points are added, and the balance quantities shown at the proper place on the roadway cross section sheets. These balances and quantities are placed on the mass diagram sheets and are added for the summary of earthwork which is placed on the last mass diagram sheet.

Quantities can be computed and tabulated on the quantities sheets, described and illustrated in Section 1 Quantity sheets are prepared in pencil on standard cross section sheets or prints of blank tabulation sheets A careful check must be made to insure all construction being covered by pay items and payment for all work set up in accordance with the Standard Construction Specifications

The Key Map can now be prepared in pencil and completed, with the exception of the Index of Sheets, and the drafting and tracing of the plans completed in pencil form Final drafting consists of tracing the plan portion of the plan-profile sheets from the continuous roll and placing the profile grade line and the special ditch grade lines in the profile, transferring cross section templates to the tracings if prints were used as work sheets, completing intersection and special detail sheets, etc , in pencil The typical section should be corrected, if necessary, to reflect special conditions encountered during the final design of the project

The soil profile will have the preliminary grade line plotted in pencil when received in Tallahassee This grade line is to be corrected where necessary

On jobs requiring borrow, availability of sufficient suitable material in the pits should be checked immediately upon receipt of the pit detail soil survey sheets. The amount of available material should be given on the first pit sheet

When final drafting has been completed, plans are assembled in proper order. The sequence of sheets for various types of jobs is illustrated at the end of this section. The sheets now are numbered and cross referenced in the body Unnecessary cross referencing is discouraged Examples of necessary cross referencing are in the illustrations

The Index of Sheets is prepared on a work sheet and is attached to the Key Map It is extremely important that all Standard Drawings necessary for construction of the project be included Intermediates of culvert standard drawings and originals or intermediates of approach slab drawings are placed in the plans. Prints of the other Standard Drawings are added by the Reproduction Unit

The plans now are complete and ready for final field inspection and checking In case of state projects, a final field inspection usually is not necessary If the project is to be financed wholly or partially with Federal funds, however, the Area Engineer of the Bureau of Public Roads will, in all probability, request a field inspection of completed plans in company with Department personnel

The placing of construction notes in the plans was discussed in Section 1 It is emphasized again, however, that vague and muddled notes with uncertain or ambiguous meaning have no place in construction plans Any note, the intent of which is not perfectly clear, is not satisfactory Care must be taken that notes do not conflict with Standard Specifications

The scope of all work must be indicated clearly and fully, whether by drawing or by note

Once a change or revision is initiated, it must be carried through all sheets affected

After the final field inspection (if any) and final corrections, plans are subject to a complete check This encompasses both a complete design and engineering review and a rigid routine check and cross check of details. A mimeographed check list setting forth specific procedures has been distributed and is available in the Tallahassee Road Design Section

No person involved in the preparation of a set of plans should be assigned the checking duties. When a discrepancy, ambiguity or point of doubtful meaning is encountered, the matter should be referred to the supervisor of the checking squad for clarification, not to one of the designers who prepared the plans After checking has been completed, the Index of Sheets, typical sections, summary and special detail sheets, etc , can be inked to complete the final plans assembly

Each set of plans prepared by the District Office or consultants and submitted to the Tallahassee office for checking should be accompanied by a letter outlining any special design features in the plans assembly. Reasons for non-standard design should be explained as well as the basis for design In the case of plans prepared in the Tallahassee office, documentation of design will be required

Close cooperation and coordination of activities is to be maintained with the Right-of-Way Division in the selection of corridors for location of the improvement and the establishment of reasonable right-of-way limits based on economics, alignment, grades, land use, typical sections, etc As the preliminary layouts progress the Engineer of Rights-of-Way is to be constantly contacted, field reviews held and rough appraisals obtained where necessary in order to assure a reasonable and practical facility that can be economically, esthetically and operationally justified

The Right-of-Way Division should be appraised of the approximate right-of-way requirements as early as possible in the plans preparation stage in order that title search may be initiated and the final requirements furnished immediately after firm establishment of the requirements

If for any reason the requirements are altered after having been furnished to the Right-of-Way Division, that Division must be notified immediately in writing The right-of-way check of completed plans is made jointly by representatives of the Design Office and the Right-of-Way Division

The right-of-way shown on the plans must be in exact agreement with that shown on the Right-of-Way Map, however, the ties and manner of dimensioning need not necessarily be identical

The above applies to all projects and is not confined to rural projects

CHAPTER 17

PREPARATION OF PLANS FOR MUNICIPAL PROJECTS

Many procedures followed in the preparation of plans for rural projects also are applicable to the preparation of plans for urban projects. Since these procedures have been discussed, complete descriptions will not be repeated.

The first several steps in urban plans preparation are the same as for rural projects

1. Familiarization of the squad leader with pertinent project data.
2. Indexing field notes.
3. Checking level notes.
4. Drawing proposed typical section or sections.
5. Plotting alignment, existing topography, underground utilities and ground line profile in the plan and profile portions of the continuous roll.
6. Outlining the drainage map.
7. Plotting alignment, topography and profile of outfalls (The location of outfalls for municipal projects frequently cannot be determined until the storm sewer system is designed, so this operation may be deferred).

Roadway cross section ground lines now are plotted on cross section sheets. In municipal type construction, there is usually relatively little departure of grade from the existing ground, so variation in spacing of cross sections therefore seldom is necessary. The plotting is the same as for rural projects. Existing pavement must be plotted. It is especially important to show existing pavement such as filling station drives, parking areas and similar construction at the right-of-way line.

Underground utilities are plotted as in rural plans design. Fronts of buildings near the right-of-way line are indicated at the correct distance from the centerline, and existing floor elevations are given. Strata boundaries of unsuitable material are plotted.

The Geometric layout now is plotted on the continuous roll. This includes proposed sidewalk, curb and gutter, returns at cross street intersections, median curbs, traffic separators and left turn storage and other auxiliary lanes. The right-of-way line, which usually coincides with the back of the proposed or future sidewalk, is indicated. Care must be exercised to insure conformance of geometrics to the approved typical section and design criteria for the project.

Intersections to side streets are centered on the street dedications, except in rare cases when an existing street with curb and gutter is off center and proposed construction must meet existing construction. A minimum width of 32 feet face to face of curbs is used for side street connections. Standard widths should be used for side streets except when connections must conform to existing curb and gutter sections.

Profiles used for establishing back-of-sidewalk grades now are plotted.

Grade requirements for municipal projects are quite different from those for rural projects. The ideal grade for a municipal project is one in which the proposed grade for the back of the sidewalk matches the existing ground profile in elevation This condition rarely occurs except for short distances if back-of-sidewalk grades are established in accordance with design criteria, and compromise grades which will minimize damage to adjacent property usually result.

To establish back-of-sidewalk grades, profiles along each right-of-way line are plotted against the same elevation datum. These profiles usually are plotted from elevations obtained from roadway cross sections at the right-of-way line. This method is satisfactory when sufficient cross sections or part sections are available to produce a reasonable accurate profile. At locations of considerable development, however, a profile taken along each right-of-way which will reflect all breaks should be used.

Cross sections will be used to establish direction of drainage arrows which are placed above and below the profile. Care must be taken to avoid plotting invalid or misleading elevations, which would be the case if the right-of-way line were to fall in an existing ditch. In this event, the ground line immediately beyond the ditch limits should be plotted.

Elevations and limits of floors, locations of building entrances, and limits of existing pavements along the right-of-way line are indicated as described in Section 1. Limits of private drives and entrance walks need not be shown. Profiles are inked using different colored ink for the right and left sides and different symbols for each side. Although the different colors will not be reproduced, they are a help to the designer.

Tentative grades now are established. On a print of the back-of-sidewalk profile are drawn grade lines which match as well as possible existing ground at the right-of-way line, using these criteria

1. The minimum tangent length of the grade line is 300 feet, with an absolute minimum of 250 feet unless otherwise specifically authorized.
2. The minimum rate of grade is 0.2%.
3. Vertical curves will be required for breaks in grade of 1.0% and greater.
4. The P.I.'s should be at or near the centerlines of cross streets where possible.
5. The placing of low points in the grade at locations which would be detrimental to existing development should be avoided.
6. Standard clearance above high water elevations must be provided.

The grade must be such that the back of the sidewalk will not be above building floor elevations at entrances, particularly in the case of buildings at or near the right-of-way line. The grade should be sufficiently lower than floor elevations to allow for provision of adequate drainage away from the entrance. If at all practical, the grade of the sidewalk also should be such that water will not be ponded behind it at locations where ground slopes toward the project. It is generally desirable to avoid fill sections at the back of the proposed sidewalk. In case of a decided cross slope of the ground from one side of the project to the other, a compromise grade, compatable to the property development, is established, with cut on one side and fill on the other.

At the location of superelevated curves, separate profiles must be used for establishing grades for the right and left back-of-sidewalk

Occasionally, a situation will arise where extensive development exists on both sides of the street and the ground or development on one side is higher somewhat than on the other. In this situation, a grade line fitting existing development on one side may cause extensive property damage on the opposite side. In such cases, an unsymmetrical section may be used, the total drop from centerline to gutter being greater than normal on one side and less than normal on the other. Separate profile grades would be required for each side. Through transitions from unsymmetrical to normal sections and through superelevation transitions, care must be taken to avoid gutter grades flatter than the 0. 2% minimum.

When preliminary back-of-sidewalk grades have been established, proposed sidewalks are plotted on prints of roadway cross section sheets. The prints are examined carefully for every possible improvement of grades, and grades revised as necessary, and the proposed sidewalk replotted.

The preliminary field inspection is now in order, the primary purpose of which is to determine feasibility of the geometrics and to make a careful review of proposed grades. A preliminary drainage inspection also may be made at this time, designating possible outfalls. However, the final drainage system design naturally will depend upon the final grades adopted.

This inspection party should consist of the designers in charge of the plans preparation, the Assistant District Engineer (Planning) or his designated substitute, and whenever possible, the District Location Engineer. At times, it might be helpful to have the District Drainage Engineer in the party, but usually the drainage review might be deferred until the grades are established. The continuous plan and profile rolls, prints of the sheets covering proposed back - of - sidewalk grades, roadway cross sections with the proposed sidewalks plotted, skeleton drainage map and aerial mosiacs are taken on this inspection.

The most important function is the inspection of the proposed grades. The grades are reviewed carefully, and any possible inprovements noted. Of particular importance is the matching of grades at entrances of commercial buildings, parking areas, filling station drives, etc. Matching of grade at side street intersections also is reviewed carefully. Conditions not evident in field notes should receive careful attention, and notes concerning possible improvement made directly on the continuous roll or cross section prints.

Frequently, state highways slated for municipal improvement are in fast growing areas. Notes of development that has taken place subsequent to the field survey should be made, and the District Location Engineer notified so pertinent additional field information can be obtained.

The adequacy of geometrics at street intersections must be reviewed. This includes the location and appropriate width of side street connections and median openings, left turn storage lanes, location of median openings and design at channelized intersections, railroad crossings, etc.

Following the preliminary field inspection, all necessary changes and corrections in proposed grades, additional topography, etc., are made on the continuous roll, back of sidewalk profile grades, and cross sections.

At this point, back of proposed sidewalk grades are converted to proposed centerline grades, and proposed grades of gutters on superelevated curves and median curbs are plotted where applicable.

Profile grades for street intersections now are established. Profiles of existing cross street dedication lines are plotted, and probable future back-of-sidewalk grades for a short section on the cross streets are established.

The centerline profile grade of the cross street is established. The normal cross section slopes for the project should be maintained to the outer edge of the outside traffic lane in all cases. If parking lanes are proposed on the project, these lanes may be warped in order to obtain suitable connections to the cross street.

If it is an arterial street or state highway with present or future high volume traffic potential, special consideration should be given to the proposed grade through the intersection. Better drainage to the gutters of returns will be obtained when the centerline grade of the side street is maintained fairly high at the line of prolongation of the normal gutters.

When no parking lanes are proposed, however, it will not be practical to provice a distince rise in grade along this line as an undesirable hump would result in the outer traffic lane.

Proposed return profiles and sections now are plotted. The minimum 32 feet width, face to face, is attained at the end of the return on cross streets. The drop from the proposed centerline grade of the cross street to the gutter line is computed in the standard manner. In cases where widths of existing cross streets are greater than 32 feet, special studies may be required in order to better match existing conditions.

A minimum draining gutter grade of 0. 2% must be maintained around returns as well as along the project. If a low point occurs on a return, care must be taken to avoid placing it in line with an existing or probable future sidewalk. Unnecessary sags must be avoided.

The steepness of grades on returns should be limited to a maximum desirable grade of 5% with 10% the absolute maximum. The steepness of grades around returns can be reduced by warping the crowns of both project and side street within the limits mentioned.

Diagonal sections are plotted through the intersection returns to check the adequacy of drainage to gutters on the returns, and to reveal possible undesirable dished sections.

Templates and earthwork quantities may be transferred now or later to the roadway cross section sheets, and the final mass diagram plotted.

After necessary grades have been established, the Drainage Section will then proceed with the design of the proposed drainage system. Drainage tabulation sheets are used by the designer in plotting the drainage system on the various plan sheets.

Proposed inlets, manholes and pipes first are plotted in plan, omitting now any construction notes. Locations of proposed structures are reviewed carefully. Inlets must be placed at low gutter points along the project and on returns and side street connections. When inlets are located within the limits of sag vertical curves, a minimum gutter grade of 0. 2% must be maintained, using special gutter grades and a warped crown when necessary.

"Corner clipping" by pipes connecting the main system with structures on cross street connections or returns to cross streets should be avoided whenever possible if "clipping" necessitates more right-of-way. Inlets which would obstruct existing driveways or which fall in line with the proposed sidewalk or crosswalk must be shifted to eliminate these undesirable conditions.

The drainage structure cross sections are now plotted on cross section sheets with pertinent construction notes. The standard minimum cover between the outside shell of the proposed pipe and the bottom of the proposed base is 15 inches, and 18 inches of cover is preferable. Existing underground utilities are plotted on the sections and a check is made for possible conflicts.

Every effort should be made to avoid conflicts between the proposed storm sewer and existing sanitary sewers, large water or gas mains, telephone or power installations not easily adjusted or other public utilities.

If conflicts cannot be avoided, or if an isolated conflict would result in lowering a considerable length of the proposed drainage system, it is advisable usually to provide a manhole for passage of storm water around the conflicting installation.

In the case of a sanitary sewer conflict, plans should indicate that a length of cast iron pipe is to be constructed through the inlet or manhole by the owner of the sewer. Conflicts and remedial installations are referred to the Drainage Section and the Right-of-Way Utilities Section for final approval.

A check should be made to assure that longitudinal pipes behind the curb will have sufficient cover at driveways. Proposed flowline grades are noted to the nearest 0.1 foot, except in the case of very flat pipe grades when the flow lines are indicated to the nearest 0.05 foot. Proposed top grades of manholes in pavement areas are indicated to the nearest 0.01 foot. Proposed underdrains are plotted on drainage structure sheets only and tabulated separately on quantity sheets.

Proposed outfall plan sheets now may be completed. Ditches are treated in the same manner as for rural construction. When pipe outfalls are provided, pipes, inlets, manholes and endwalls are plotted in the plan and in the profile with standard construction notes. It is possible sometimes, in case of very short outfalls, to plot them in plan on the plan-profile sheets and to include the structures on the drainage structure sheets.

Drainage notes now may be placed on the plan-profile sheets, and structures and notes placed on the drainage map.

Right-of-way requirements now are established. The right-of-way line for urban projects is usually along the back of proposed or future sidewalks, obtaining construction easements for any work outside of these lines. Additional right-of-way beyond the normal width is necessary frequently at intersecting streets due to incroachment of returns and storm sewer stub pipes, especially in cases of existing narrow dedications for side streets.

In addition to right-of-way necessary for construction, every effort should be made to establish right-of-way limits sufficient to provide for or preserve sight distances at corners, and provide space for pedestrian traffic. The right-of-way line at street corner returns should be set a minimum of five feet back of the face of curb.

Ample right-of-way for outfalls is established so it will contain the proposed construction. When right-of-way requirements have been established, they are furnished to the Right-of-Way Division for completion of the right-of-way map.

Drafting work on the plan-profile sheets now can be completed, and the Key Map prepared. Defer as much drafting as possible on the plan-profile sheets until final designs are completed to minimize thinning of pencil lines due to wear and to minimize the necessity for last minute "touching up". Any other incompleted drafting is concluded at this time.

The Summary of Quantities and various tabulations now are prepared in the same manner as described under "Plans for Rural Projects" and in Section 1.

Plans sheets now are assembled in order, the sheets numbered and cross referenced, and the Index of Sheets completed as described for rural projects, and at this stage are ready for final checking.

In this procedure, the major portion of design is developed on the continuous roll and prints of roadway cross sections. Tracing and transferring of information to the plan-profile and cross section sheets is deferred until the design is practically completed.

In some cases, however, this procedure cannot be followed exactly due to requests for alignment and layout information by property owners, city officials and others. Drafting on the original sheets prior to completion of design should be maintained at a practical minimum.

CHAPTER 18

SAMPLE PLANS INDEXES

Sample Index of Sheets For Rural Projects

Index of Sheets

Sheet No.	
1	Key Map
2-3	Drainage Map
4-6	Typical Section and Summary of Quantities
7	Mass Diagram
8-14	Plan and Profiles
15-21	Drainage Structures
22-31	Intersection Details
32-35	Lateral Ditch Plan and Profiles
36-45	Lateral Ditch Cross Sections
46-49	Borrow Pit Soil Survey
50-57	Roadway Soil Survey
58-100	Roadway Cross Sections
Index No.	
1101-X	Miscellaneous Roadway Construction Details (2 sheets)
2300-X	Guardrail (4 sheets)
ETC	ETC

For Index of Bridge Sheets, See Bridge Plans

For Index of Signing Sheets, See Signing Plans

Sample Index of Sheets For Rural Project With Interchange

Index of Sheets

Sheet No.	
1	Key Map
2-4	Drainage Map
5-9	Typical Section and Summary of Quantities
10-11	Mass Diagram
12-24	Plan and Profiles, State Road No. 800
25-28	Plan and Profiles, State Road No. 901
29-47	Drainage Structures
48	Detail of Interchange
49	Cross Section Pattern of Interchange
50-53	Interchange Ramp Profiles
54-57	Ramp Terminal Details
58-60	Lateral Ditch Plan and Profiles
61-66	Lateral Ditch Cross Sections
67-70	Borrow Pit Soil Survey
71-91	Roadway Soil Survey
92-146	Roadway Cross Sections, State Road No. 800
147-166	Roadway Cross Sections, State Road No. 901
167-180	Roadway Cross Sections, Interchange Ramps
Index No.	
1101-X	Miscellaneous Roadway Construction Details (2 sheets)
2300-X	Guardrail (4 sheets)
ETC	ETC

For Index of Bridge Sheets, See Bridge Plans

For Index of Signing Sheets, See Signing Plans

Sample Index of Sheets For Municipal Projects

Index of Sheets

Sheet No.	
1	Key Map
2-4	Drainage Map
5-11	Typical Section and Summary of Quantities
12	Mass Diagram
13	Back-of-Sidewalk Profiles
14-26	Plan and Profiles
27-37	Drainage Structures
38-42	Special Profiles along Project
43-46	Intersection Details
47-57	Intersection Profiles
58-65	Outfall Plan and Profiles
66-70	Outfall Ditch Cross Sections
71-73	Borrow Pit Soil Survey
74-77	Roadway Soil Survey
78-120	Roadway Cross Sections
Index No.	
1101-X	Miscellaneous Roadway Construction Details (2 sheets)
1307-X	Inlets (Sheet 1 of 2)
ETC	ETC
Sheet No	
T-1 to T-5	Signalization Plans
L-1 to L-4	Highway Lighting Plans

For Index of Retaining Wall Sheets,
See Retaining Wall Plans

For Index of Bridge Sheets, See Bridge Plans

FOREWORD

SECTION 3

Discussed in this section are the criteria required for the design of major highways and primary roads. Where practical, secondary roads should also be designed according to these criteria.

The basic criteria found in this section were taken from the AASHO Manual entitled "A Policy on Geometric Design of Rural Highways, 1965." We have arranged the material under appropriate headings to aid the designer in locating the desired information.

Discussions of the proper applications of the design criteria are also included. The examples and illustrations should provide a better understanding of the results expected in the design.

The criteria and illustrations should serve the designer as a guide in preparing the roadway plans. It is emphasized that the proper use of this material should be combined with personal imagination and initiative. A superior design must include this combination of factors.

INDEX — SECTION 3

DESIGN CONTROLS AND CRITERIA

INDEX—SECTION 3

(Continued)

ROADWAY DESIGN MANUAL

CHAPTER 19

TRAFFIC

(A) TRAFFIC DEFINITIONS

In traffic discussions for this portion of the manual these definitions will apply·

ADT - current average daily two-way volume with the year specified

ADT - future average daily two-way volume with the year specified.

DHV - future design hourly volume, the 30th highest hour, two-way unless specified otherwise.

K - ratio of DHV to ADT, generally ranging between 12 and 18 percent, represents two-way traffic.

D - directional distribution of DHV, one-way volume in predominant direction of travel expressed as percentage of total. Varies from 50 to about 80 percent of two-way D.H V.

T - percentage of trucks, exclusive of light delivery, expressed as a percentage of DHV. As an average on main rural highways in Florida, T ranges from 5 to 12 percent of D H V during the design hour

When designing interchanges and major intersections, it is advantageous to know the design year DHV for one direction. This value is determined from the projected factors for ADT, K, D an T. The following formula is used:

DHV (one way) = ADT x K x D

Example ADT (1989) = 24,000, K = 12%, D = 60%, T = 7%

DHV = 24,000 x 0.12 x 0.60 = 1728 vehicles

When determining the DHV for design, the above value is usually increased to reflect the percentage of trucks (T). The overall effect on traffic operations of one truck is often equivalent to several passenger vehicles. In Florida, one truck is normally considered to be equivalent to 2 to 4 passenger vehicles, depending upon the K and T factors and terrain.

Example: DHV = 1728 vehicles (1607 passenger cars and 121 trucks), one truck is equivalent to two passenger cars

Adjusted DHV = 1849 vehicles (1607 passenger cars and 242 equivalent vehicles)

The Adjusted DHV value can also be determined from the following formula

Adjusted DHV = DHV x 1+ [T x (Equiv. Cars - 1)]
= 1728 x 1 07 - 1849 Vehicles

(B) DESIGN VEHICLES

One or more of four design vehicles should be used as controls in geometric design. They are

DESIGN VEHICLE		DIMENSIONS IN FEET					
TYPE	SYMBOL	WHEELBASE	Overhang		Overall Length	Overall Width	Height
			Front	Rear			
Passenger Car	P	11	3	5	19	7	-
Single Unit Truck	SU	20	4	6	30	8.5	13.5
Semi-trailer Combination, Intermediate	WB-40	13+27=40	4	6	50	8.5	13.5
Semi-trailer Combination Large	WB-50	20+30=50	3	2	55	8.5	13.5

For design purposes, use the largest vehicle which represents a significant percentage of the traffic for the design year. For design of most highways accommodating truck traffic, one of the design semi-trailer combinations should be used. A design check should be made for the largest vehicle to insure that such vehicle can negotiate the designated turns, particularly if the pavement is curbed. In special cases a design may be necessary to accommodate vehicles larger than WB - 50.

(C) DESIGN AND RUNNING SPEEDS

A design speed should be selected and used for correlation of the physical features of a highway that influence vehicle operation. The assumed design speed should be a logical one with respect to the character of terrain and the type of highway. Some geometric features of highway design, such as superelevation rate, critical length of grade, intersection curves, etc., require consideration of average running speeds.

Average running speed is the average for all traffic or component of traffic, being the summation of distances divided by the summation of running times.

Design speeds normally recommended and the corresponding average running speeds for different volume conditions are shown in the table on the next page.

MAIN HIGHWAYS			
Design speed, mph	Average Running Speed, mph		
	Low volume	Intermediate volume	Approaching possible capacity
30	28	26	25
40	36	34	31
50	44	41	35
60	52	47	37
65	55	50	
70	58	54	

The running speed for low volumes is a major design control for certain highway elements, such as superelevation, intersection curves, and speed-change lanes.

The values given in the chart for "Intermediate volume" represent the relation between Design Speed and Running Speed when the traffic volume approximates the design capacity of rural highways.

The highest practical design speed should be used, preferably a constant value for any one highway. Where there is variation in terrain and other physical controls, changes in design speed for some sections of highway may be necessary.

Low design speeds should not be assumed for secondary and minor roads where the topography is such that drivers are apt to travel at high speeds. Drivers do not adjust their speeds to the importance of the highway but to the physical limitations and traffic thereon.

Many design features, such as the roadway alignment, profile grade, and sight distances are directly related to the design speed. When designing the roadway, consideration should be given to establishing a design speed that will allow for probable future increases in the roadway speed limit. If the roadway is properly planned, the cross sectional elements can be altered in the future without undue difficulty, but major changes in alignment and profile grade entail considerable expenditure.

(D) RECOMMENDED DESIGN SPEEDS

Design speeds recommended for use in Florida are listed in the following table.

RECOMMENDED DESIGN SPEEDS	
Type of Highway	Design Speed, mph
Interstate, Rural	70
Interstate, Semi-rural	60
Interstate, Urban	50
* Major Highway, Rural (Divided)	70
* Major Highway, Rural	65
Secondary Highway, Rural	50-65
Major Highway, Urban	35-45
Secondary Highway, Urban	30-40
Local Street or Road	25-35

* Rural highways having medians 20' wide or greater may be designed for a Design Speed of 70 M. P H The maximum Design Speed for rural undivided highways, and rural divided highways with medians less than 20' wide, is 65 M P H

ROADWAY DESIGN MANUAL

CHAPTER 20

HIGHWAY CAPACITY

Recommended capacity values in the "Highway Capacity Manual (1965)" and "A Policy on Geometric Design of Rural Highways (1965)" should be used as guides for highway design. Highway capacity is considered in two broad categories-uninterrupted flow or open highway conditions and interrupted flow as at intersections.

(A) UNINTERRUPTED FLOW

The uninterrupted flow of traffic occurs to a considerable extent on rural highways where the influence of intersections at grade and roadside development is not significant. Also it occurs on highways with control of access.

Speed is the most sensitive measure of operating conditions as related to traffic capacity. Three appropriate ranges of average running speeds are:

1. Average running speed 45-50 mph: Applicable for most main rural 2-lane, two-way highways and all rural multilane highways in level and in rolling terrain.
2. Average running speed 40-45 mph Applicable for highways approaching urban areas.
3. Average running speed 35-40 mph: Applicable to controlled access highways in urban areas where during the design hour it is expected that freedom to travel at high speed will be curtailed by DHV traffic.

The designer should determine by analysis the design characteristics of a highway and the corresponding running speed which in combination will have a design capacity at least as great as the design volume. It is generally not economically feasible to provide a facility that will permit running speeds during the design hour higher than those mentioned above. Running speeds lower than those indicated above are considered too restrictive by most highway users.

Normally, highways should be designed so that the designated average running speeds can be maintained during the design hour, that is, when the design hour volume is using the highway.

Capacities in the following table are for highways constructed to high standards, i.e., 12-foot lanes, adequate shoulders, lateral clearances of about 6 feet or more, adequate stopping sight distance throughout, no trucks and no restrictive passing sight distance when the highway is 2-lane, two-way.

POSSIBLE AND DESIGN CAPACITIES OF HIGHWAYS CONSTRUCTED TO STANDARDS IN TERMS OF PASSENGER CARS PER HOUR

Type of Highway	Possible Capacity vph	Design capacity for average running speed of·		
		35-40	40-45	45-50
2-lane, two-way (total)	2000	1500	1150	900
Multilane (per lane)	2000	1500	1200	1000

Possible capacity shown in the preceeding chart is the maximum number of vehicles that can pass over a given section on a lane or roadway during a given period, usually one hour, under the prevailing roadway and traffic conditions, regardless of their effect in delaying drivers and restricting their freedom to maneuver.

Possible capacity should not be used as a criterion for design of facilities with uninterrupted flow, but in many cases its evaluation is useful.

Highways of the same general class and width may show considerable variation in the number of vehicles that can be handled due to a number of variable conditions. The more important ones affecting design capacity in rural areas are type of terrain, character of alignment and sight distance, composition of traffic, lane width, and degree of access control or roadside and intersectional interference. For a more detailed discussion refer to the Highway Capacity Manual (1965) and the AASHO Policy on Geometric Design of Rural Highways (1965).

The capacity of a roadway is materially effected when obstructions close to the pavement edge appear hazardous. If obstructions are less than 6' from the pavement edge, the values determined for design or possible capacity should be multiplied by the appropriate factor listed below.

CAPACITY REDUCTION FACTORS FOR RESTRICTIVE LATERAL CLEARANCE BETWEEN PAVEMENT EDGE AND OBSTRUCTION ON SHOULDER

(Applies to design or possible capacity values)

Clearance from pavement edge to obstruction, in feet	Capacity Reduction Factor			
	Obstruction on one side		Obstruction on both sides	
	Two-Lane Highway	Two Lanes in one direction of a four-lane highway	Two-Lane Highway	Two Lanes in one direction of a four-lane highway
6	1.00	1.00	1.00	1.00
5	0.98	1.00	0.96	0.99
4	0.96	0.99	0.92	0.98
3	0.93	0.98	0.86	0.97
2	0.91	0.97	0.81	0.94
1	0.88	0.95	0.75	0.90
0	0.85	0.90	0.70	0.81

The Table below shows design capacity values for uninterrupted flow on multilane rural highways for various conditions of terrain, lane width, and percentage of trucks. For freeways in suburban areas, where speeds lower than in strictly rural areas are acceptable, design capacity varies from about 750 to 1200 vph per lane. For rural expressways and freeways the range is from about 600 to 1000 vph. For major highways there is a likely variation of from 500 to 800 vph, depending on conditions.

DESIGN CAPACITY OF THROUGH TRAFFIC LANES ON MULTILANE RURAL AND SUBURBAN HIGHWAYS

Uninterrupted Flow

Width of lane in feet	Percent of trucks during peak hour	Design capacity, average per lane, in vph for					
		Freeways, Suburban		Freeways and expressways, rural		Major highways*	
		Terrain		Terrain		Terrain	
		Level	Rolling	Level	Rolling	Level	Rolling
12	0	1200	1200	1000	1000	800	800
12	10	1090	920	910	770	730	620
12	20	1000	750	830	630	670	500

NOTE: To obtain possible capacity multiply above values by 1.67 for suburban freeways and by 2 for rural expressways and major highways. For 11-foot traffic lanes reduce capacity by 3 percent, for 10-foot traffic lanes reduce capacity by 9 percent.

* The given values are representative of conditions where there is moderate interference from cross traffic and roadsides. Where there is heavy interference a reduction in these values may be appropriate.

Although the most useful expression of capacity for purposes of design is in vehicles per hour (DHV), it may be desirable to also consider capacity in terms of average daily traffic (ADT). The following two charts list the likely ranges of ADT capacity for uninterrupted flow. The first chart gives the capacity for 2 lane, 2-way rural highways. The second chart gives the capacity for 4-lane rural highways.

ADT Capacity of 2-Lane, Two-Way Highways in Rural Areas

Likely Ranges for Uninterrupted Flow

Terrain	K = Peak hour volume (two-way) as % of ADT	Capacity of 2-lane highways: two-way ADT volume in thousands when L-width of lane in feet					
		L=12		L=11		L=10	
		Design*	Possible+	Design*	Possible+	Design*	Possible+
Level	10	9 0-6 2	20-15	7.7-5 3	18-13	6 9-4.8	15-12
	12	7 5-5 2	17-13	6 4-4 4	15-11	5 8-4 0	13-10
	15	6.0-4 1	13-10	5 1-3 5	12- 9	4 6-3.2	11- 8
	18	5 0-3 4	11- 9	4 3-2.9	10- 8	3 8-2 7	9- 7
Rolling	10	8.0-3 5	20-11	6 9-3 0	18-10	6 2-2 7	15- 9
	12	6 7-2 9	17- 9	5 7-2 5	15- 8	5 2-2.3	13- 8
	15	5 3-2.3	13- 7	4 6-2.0	12- 7	4.1-1 8	11- 6
	18	4 4-1 9	11- 6	3 8-1.7	10- 5	3 4-1.5	9- 5

* Design capacity based on average running speed of 45-50 mph during design hour. For design capacity based on running speed of 40-45, multiply values shown by 1 3, for running speed of 35-40, multiply by 1 7.

+ Indicative of maximum volumes possible of attainment only with high density, slow and uniform operation, and with inability to pass: not to be considered for design.

NOTE: Capacity range results from different values of T(the percentage of trucks) and the percentage of length with sight distance restriction

In each case the higher value of the range is for T=0% and the lower value is for T=20%.
In each case for level terrain, the higher value of the range is for 0% sight restriction and the lower value is for 40%.
In each case for rolling terrain, the higher value of the range is for 40% sight restriction and the lower value is for 80%.

ADT CAPACITY OF 4-LANE RURAL HIGHWAYS

Uninterrupted Flow

K = peak hour volume (one-way) as % of ADT	D = directional distribution % one-way during peak hour	Average daily traffic volume in thousands when:											
		T=0				T=10				T=20			
		P=				P=				P=			
		800	1000	1200	1500	800	1000	1200	1500	800	1000	1200	1500
LEVEL TERRAIN, j=2													
10	60	27	33	40	50	24	30	36	45	22	28	33	42
	67	24	30	36	45	22	27	33	41	20	25	30	38
	75	21	27	32	40	19	24	29	36	18	22	27	33
12	60	22	28	33	42	20	25	30	38	19	23	28	35
	67	20	25	30	37	18	23	27	34	17	21	25	31
	75	18	22	27	33	16	20	24	30	15	19	22	28
15	60	18	22	27	33	16	20	24	30	15	19	22	28
	67	16	20	24	30	14	18	22	27	13	17	20	25
	75	14	18	21	27	13	16	19	24	12	15	18	22
18	60	15	19	22	28	13	17	20	25	12	15	19	23
	67	13	17	20	25	12	15	18	23	11	14	17	21
	75	12	15	18	22	11	13	16	20	10	12	15	19
ROLLING TERRAIN, j=4													
10	60	27	33	40	50	21	25	31	38	17	21	25	31
	67	24	30	36	45	18	23	28	35	15	19	22	28
	75	21	27	32	40	16	20	25	31	13	17	20	25
12	60	22	28	33	42	17	21	26	32	14	17	21	26
	67	20	25	30	37	15	19	23	29	12	16	19	23
	75	16	22	27	33	14	17	21	26	11	14	17	21
15	60	18	22	27	33	14	17	21	26	11	14	17	21
	67	16	20	24	30	12	15	18	23	10	12	15	19
	75	14	18	21	27	11	14	16	20	9	11	13	17
18	60	15	19	22	28	11	14	17	21	9	12	14	17
	67	13	17	20	28	10	13	15	19	8	10	12	16
	75	12	15	18	22	9	11	14	17	7	9	11	14

NOTE: P=Capacity per 12-foot lane per hour—base, passenger vehicles only

800: design capacity for major highway with roadside development

1000: design capacity for expressway with partial to full control of access

1200: design capacity for expressway with full control of access (freeway), suburban area

1500: design capacity for expressway with full control of access (freeway), urban area

j = Equivalent number of passenger vehicles for each truck

ADT capacity of 6-lane highways are approximately 1 5 times tabular values, of 8-lane highways about double tabular values

(B) CAPACITY OF INTERSECTIONS AT GRADE

At unsignalized intersections with low traffic volumes, it may be assumed that flow is uninterrupted on the through highway and delays are acceptable on the crossroad. For higher volume combinations, signal control should be assumed in geometric design (whether or not signalization is actually used) to assure proper arrangement and adequate number of lanes at the intersection. The following table may serve as a guide for the design of at grade intersections.

SUGGESTED DESIGN HOUR VOLUME COMBINATIONS FOR WHICH CONTROL SHOULD BE ASSUMED IN GEOMETRIC DESIGN OF RURAL INTERSECTIONS*

	Minimum DHV, two-way on		
2-lane through highway	400	500	650
Crossroad	250	200	100
4-lane through highway	1000	1500	2000
Crossroad	100	50	25

*These volumes have no relation to warrants for signalization, nor are they indicative of whether or not signalization should be used after the intersection is opened to traffic.

If the DHV combination at a given intersection is equal to or less than that shown in the table, no intersection capacity analysis is necessary. If the DHV combination is greater than that shown in the table, the intersection should be designed as if it were under signal control.

Capacity of signalized intersections can be evaluated by the use of the Highway Capacity Manual data and factors for various conditions. Capacity varies in accordance with the type of highway, pavement width, short term fluctuations in flow , proportions of trucks and turning movements, signal timing, etc. In design, the capacity of a signalized intersection is determined separately for the approach direction of travel on each intersection leg. Usually the predominant one-way approach movement on one highway and the predominant one-way approach movement on the other (intersecting) highway which occur during the design hour, jointly control the capacity and the design of the intersection.

A traffic lane at an intersection under signal control is available for moving vehicles only part of the time and its capacity per hour obviously is less than that on the portion of highway where the flow is uninterrupted. Design capacity per lane at signalized intersections generally is in the range of 400 to 700 vph, depending upon the amount of green time available and other conditions. Since lane capacity for uninterrupted flow on multilane highways is between 500 and 1200 vph, it is apparent that additional lanes at the intersection are required to bring the capacity through the intersection up to that of the highway elsewhere. Additional lanes may be required even when the design traffic volume on the highway is substantially below the uninterrupted flow capacity of that highway.

On 2-lane two-way highways in rural areas the design capacity frequently is less than 600 vph (both directions of travel) and such volumes often can be handled at signalized intersections without additional lanes. Added lanes may be needed where the distribution of total hourly traffic is more than two-thirds in the predominant direction, where turning movements are above normal, or where a large proportion of the signal cycle must be devoted to the movement of traffic on the crossroad. The added lanes should be continued for some distance beyond the intersection to permit traffic to merge into the normal through lanes after clearing the intersection.

(C) RAMP CAPACITY

The capacity of a ramp may be limited by that of the ramp proper, the entrance terminal, or the exit terminal, or by sections where ramp traffic is required to weave with other traffic. The entrance terminal in most cases limits the capacity. Design capacity of the ramp proper with single-lane operation may vary from 600 to 1500 vph. The following chart gives the design capacity of the ramp proper for various conditions.

DESIGN CAPACITY OF RAMP PROPER

Single-Lane Operation

Upgrade in percent	Ramp design capacity in vph when V=design speed and T=percentage of trucks during peak hour							
	V=20 mph or less				V=30 mph or more			
	T=0	T=10	T=20	T=30	T=0	T=10	T=20	T=30
0-2 (or downgrade)	1000	900	830	770	1500	1350	1250	1150
3-4	1000	830	710	620	1500	1250	1100	950
5 and over	1000	770	620	530	1500	1150	950	800

NOTES: (1) For loops having design speeds lower than 40 mph, design capacity of ramp proper should be reduced by 20 percent.

(2) For 2-lane operation, increase the tabular values up to nearly double. Possible capacity approximately 1.25 times above values.

ENTRANCE TERMINAL: At ramp entrance terminals capacity is governed by the design of the terminal and the type of traffic control utilized. Entrance terminal design should be compatible with the design features of the highway to which entry is being made. If the highway is a freeway the terminal should provide for merging of traffic streams at comparatively high speed, if the ramp terminal is at a highway without control of access it may be entirely proper that the entrance terminal be an intersection at grade comparable to other nearby intersections at grade along the route as would be the case for the crossroad terminal at a diamond interchange. In most instances freeway entrance terminals are designed for single-lane entrance although in special cases the design may be a 2-lane entrance.

For ramps entering free flowing roadways, as on freeways, about 1500 passenger cars per hour can merge in one lane without reducing the speed of traffic on the highway to less than about 35 mph, provided there is a long taper or acceleration lane and that sight distance is good. A value of 1200 passenger cars merging may be taken as a basis for determining the design capacity of a ramp entrance (with acceleration lane) in rural areas. In urban areas where speeds are lower the corresponding value is 1500 passenger cars per hour. These values include both the vehicles entering from the ramp and those on the outer lane of the through roadway. To determine the number of entering vehicles per hour that can merge with traffic on the highway, it is necessary to deduct from this hourly capacity value the through vehicles per hour likely to occupy the lane adjacent to the ramp, and to adjust further for the proportions of trucks involved. Formulas for determining the capacity at entrance terminals are outlined in the following table.

Capacity of Ramp Entrance to Highway (Merging)

A. SINGLE-LANE ENTRANCE - with acceleration lane

Rural $C = \dfrac{1200 - V_1\ (1+t_1)}{1 + t}$

Urban: $C = \dfrac{1500 - V_1\ (1+t1)}{1 + t}$

Where C=design capacity, vph from the ramp

V_1= volume of through traffic in lane adjacent to ramp, vph

t_1= trucks as a percentage of total through volume, divided by 100

t_1=trucks as a percentage of entering volume, divided by 100

See Highway Capacity Manual for procedure to estimate V_1 for various roadway and traffic conditions.

B. SINGLE-LANE ENTRANCE- with right lane from ramp continued onto highway beyond ramp as an added lane on highway. Capacity is that of single lane on ramp proper.

C. TWO-LANE ENTRANCE-major fork design with right lane from ramp continued onto highway beyond ramp as an added lane on highway, and ramp of adequate width to discharge two lines of vehicles.
C-sum of capacities of the two lanes-Right lane, use single-lane capacity on ramp proper, Left lane, use expression A above.

NOTE Capacity of ramp entrance may also be governed by the capacity of the highway beyond the ramp, i. e., the combined volume of entering and through traffic should not exceed the capacity of the highway section ahead. This type of check should always be made.

EXIT TERMINAL Design capacity of the ramp exit terminal, single-lane exit with deceleration lane, may be approximated as above but using values of 1300 in rural areas and 1600 in urban areas as combined through and off ramp volumes. These values also include equivalent number of passenger vehicles for each truck. The following formulas are used in determining the ramp exit capacity.

Capacity of Ramp Exit from Highway (Diverging)

A. SINGLE-LANE EXIT-with deceleration lane

$$\text{Rural:}\quad C- \quad \frac{1300 - V_1\,(1+t_1)}{1+t}$$

$$\text{Urban:}\quad C- \quad \frac{1600 - V_1\,(1+t_1)}{1+t}$$

Where C=design capacity, vph to the ramp
V_1= volume of through traffic in lane adjacent to ramp, vph
t_1= trucks as a percentage of through volume, divided by 100
t = trucks as a percentage of ramp volume, divided by 100

See Highway Capacity Manual for procedure to estimate V_1 for various roadway and traffic conditions.

B. SINGLE-LANE EXIT-with outer lane of highway continued onto ramp and number of lanes on highway reduced beyond ramp. Capacity is that of single lane on ramp proper.

C. TWO-LANE EXIT-major fork design with outer lane of highway continued onto ramp and the ramp of adequate width to receive two lines of vehicles. Capacity of right lane as in B above. Capacity of left lane as in A above.

V=VPH [illegible]

Where the number of through lanes on the main roadway is reduced beyond the exit point of a 2-lane exit ramp, the right lane of the ramp will have a capacity equal to a single lane on a ramp proper, but the capacity of the second lane is subject to the restrictions of the through lane second from the right edge being occupied with through vehicles. Its capacity, therefore, is deemed to be about the same as that of a single-lane ramp leaving a through highway which is not reduced in number of lanes. This may be calculated as the value "C" in section A of the above table. Two-lane exit ramps are not recommended unless the number of through lanes is reduced beyond the exit terminal. A reduction in number of through lanes beyond the terminal may be achieved without basically changing the number of through lanes by adding a comparatively short section of lane of full width in advance of and in addition to the usual speed change lane or taper.

(D) WEAVING SECTIONS

Weaving sections, which occur frequently at interchanges, enable one-way traffic streams to cross by merging and diverging maneuvers. Certain combinations of weaving traffic volume and length and width of weaving sections operate satisfactorily. Weaving sections often result in simple layouts and economies in interchange design. On the other hand, large volume weaving movements result in considerable friction and reduction in speed of traffic. Further, there is a definite limit to the amount of traffic that can be handled on a given weaving section without congestion.

Weaving sections are designed, checked, and adjusted so that design capacity is at least as great as the design volume. The capacity of a weaving section is dependent upon a number of factors, the most important of which are length, number of lanes, operating speed, and volumes in the individual movements. The established relations of these factors are shown in figures A and B. These figures are recommended as a basis for design. Figure A should be used where the weaving section is located on the through traffic lanes of a main rural highway and figure B where the weaving section is located on other than the through lanes of a main rural highway as on a rotary intersection having a large center island or on a collector-distributor road.

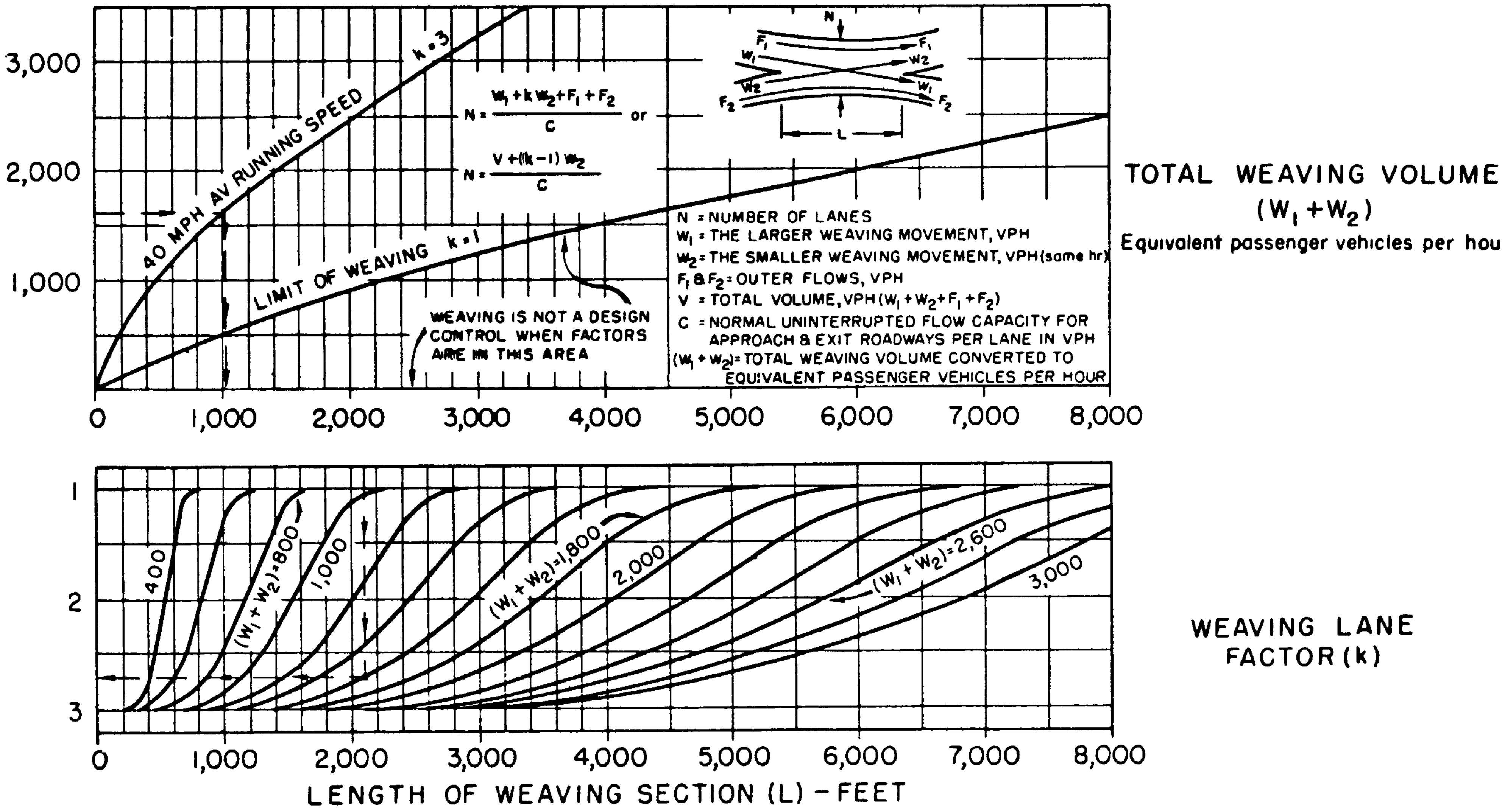
Generally in a design problem all variables except N, the number of lanes, are known. N is computed with the formula shown on the charts, all factors of which are known except K. The factor K is read from the lower chart by entering at the top with the actual length of weaving section, intercepting the curve for $(W_1 + W_2)$, the sum of the weaving traffic volumes, and reading K on the left. A check must be made to insure that the actual length of weaving section is greater than the minimum for K=3 which will permit traffic to operate at 40 mph in figure A and 30 mph in figure B. This length is read directly from the curve for K=3 on the upper chart. Incidentally, if the actual length of weaving section is so long that the intersection of $(W_1 = W_2)$ and (L) in the upper chart falls below the curve for K=1, weaving is not a factor in design.

An example is shown in figure A in which a total weaving volume of 1,600 $(W_1 + W_2)$, is to be accommodated in a proposed weaving section having a length of 2,100 feet. The value of K is determined in the lower chart By entering it with a length of weaving section of 2,100 feet and drawing a vertical line intersecting the line for $W_1 + W_2$ of 1,600 equivalent passenger vehicles, a K of 2.7 is obtained. This is used in the formula to determine N. The upper curve of figure A shows that for the given $W_1 + W_2$ a minimum length of 1,000 feet would be required which is well exceeded by the actual length.

The C value to be used with Figures A and B are

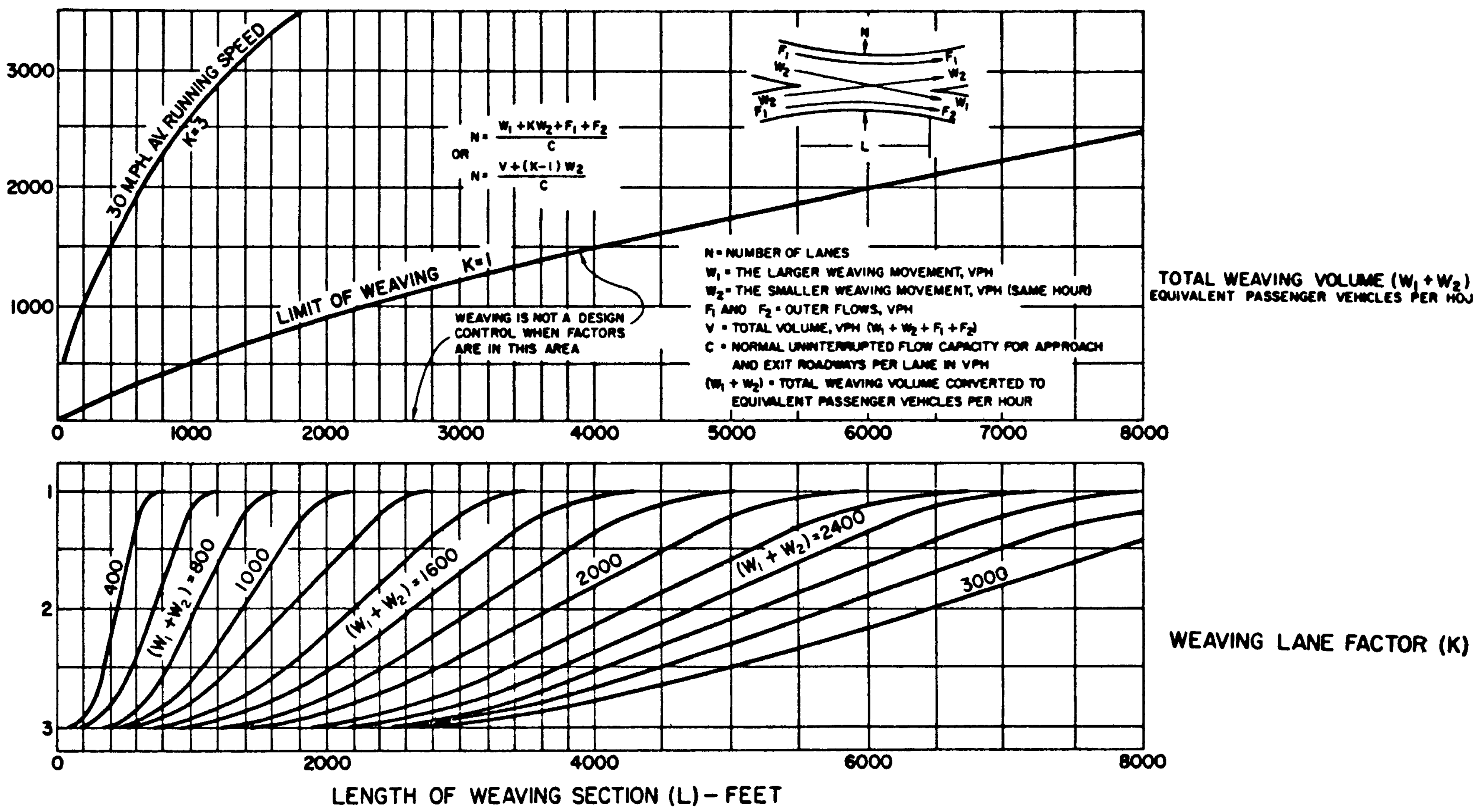
Fig. A - 1000 Equivalent passenger vehicle per hour for main rural highways where weaving takes place directly on the through pavement.

Fig. B - 1200 to 1500 equivalent passenger vehicles per hour should be used where weaving is off the through pavement, or on the through pavement where the weaving section is located in a suburban or urban area. The C to be used for rotary intersections varies from 800 to 1,200.



OPERATING CHARACTERISTICS OF WEAVING SECTIONS
FOR MAIN RURAL HIGHWAYS

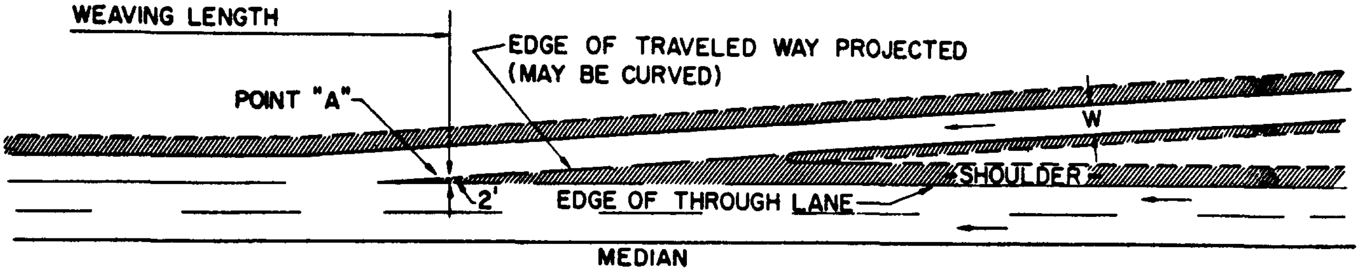
FIGURE A



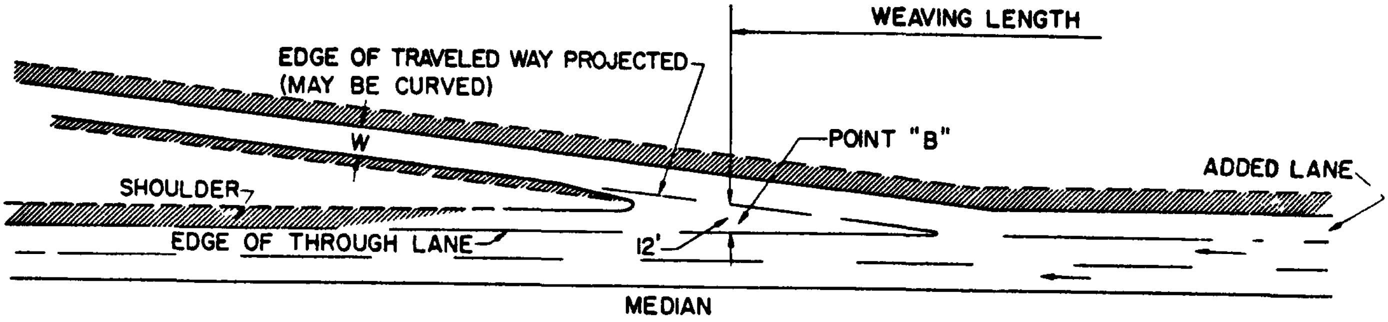
OPERATING CHARTERISTICS OF WEAVING SECTIONS FOR ROTARY INTERSECTIONS, COLLECTOR DISTRIBUTOR ROADS AND OTHER THAN MAIN RURAL HIGHWAYS

FIGURE B

The method of determining the terminal points for the measurement of the length of a weaving section is shown in sketch below.



ENTRANCE TERMINAL



EXIT TERMINAL

TERMINAL POINTS FOR MEASURING LENGTH OF WEAVING SECTION

CHAPTER 21

SIGHT DISTANCE

(A) STOPPING SIGHT DISTANCE

Sight distance at every point on a highway should be as long as can be justified economically and at least as long as indicated in this table

STOPPING SIGHT DISTANCE
(Based on height of eye of 3.75 feet and height of object 6 inches above road surface)

Design Speed, mph	30	40	50	60	65	70	75
Minimum Sight Distance, Feet	200	275	350	475	550	600	675

For comfort and appearance, vertical curve lengths should be not less than indicated in the following table. The length of vertical curve must never be less than three times the design speed of the highway.

L = KA
L = Minimum length of vertical curve
A = Algebraic difference of grades in percent

ROUNDED K VALUE FOR VERTICAL CURVES

Design Speed, mph	30	40	50	60	65	70	75
Minimum K Value for Crest Vertical Curves $K=S^2/1398$	28	55	85	160	215	255	325
Minimum K Value for Sag Vertical Curves $K=S^2/400+3.5\ (S)$	35	55	75	105	130	145	160

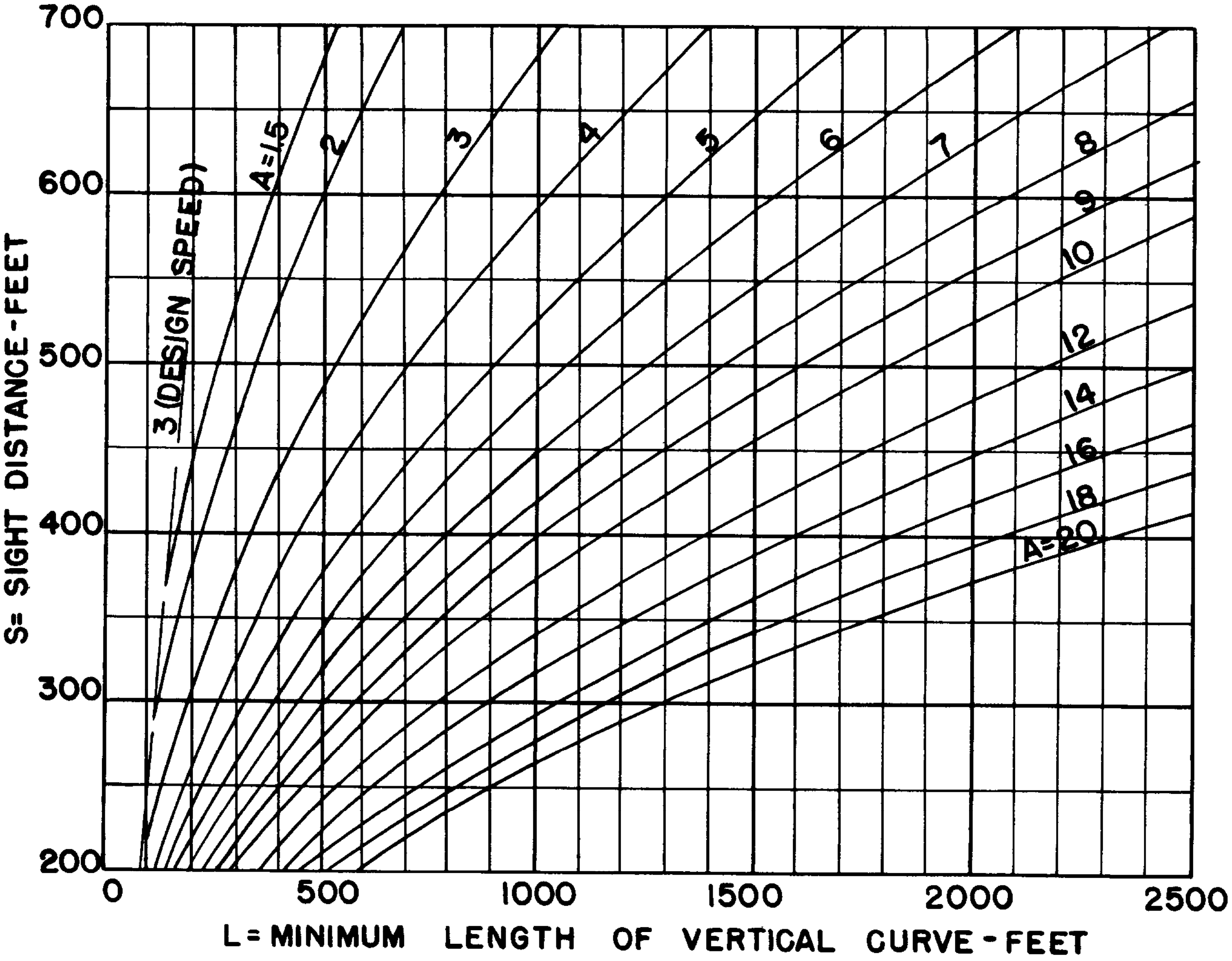
Values obtained from the charts or computed from the formula (L=KA) are minimum values and should be rounded upward when feasible.

EXAMPLE: When the maximum approach grades of 3% are used on an overpassing Interstate, a 1600 foot vertical curve should be used. Other lengths of vertical curve should be increased accordingly.

The minimum length of vertical curve to be used on major highways should be as follows

Design Speed, mph	50	60	70
Crest vertical curves	300'	400'	500'
Sag vertical curves	200'	300'	400'

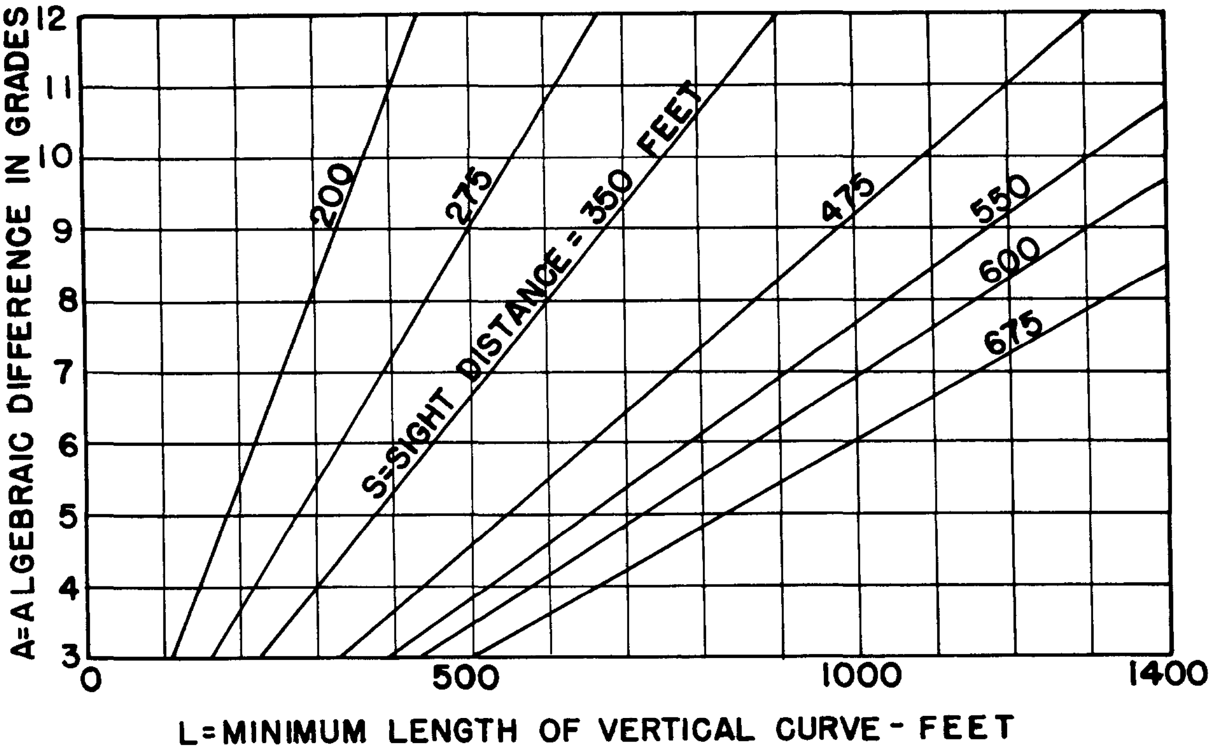
For aesthetic value on Interstate highways the preferable minimum lengths are 1000' for crest vertical curves and 800' for sag vertical curves.



STOPPING SIGHT DISTANCE - CREST VERTICAL
RELATION BETWEEN SIGHT DISTANCE, HIGHWAY
GRADES AND LENGTH OF VERTICAL CURVE

Lengths of vertical curves are computed from the formula $L = \frac{AS^2}{1398}$

A = Algebraic Difference in Grades, Percent
S = Sight Distance



HEADLIGHT SIGHT DISTANCE - SAG VERTICAL

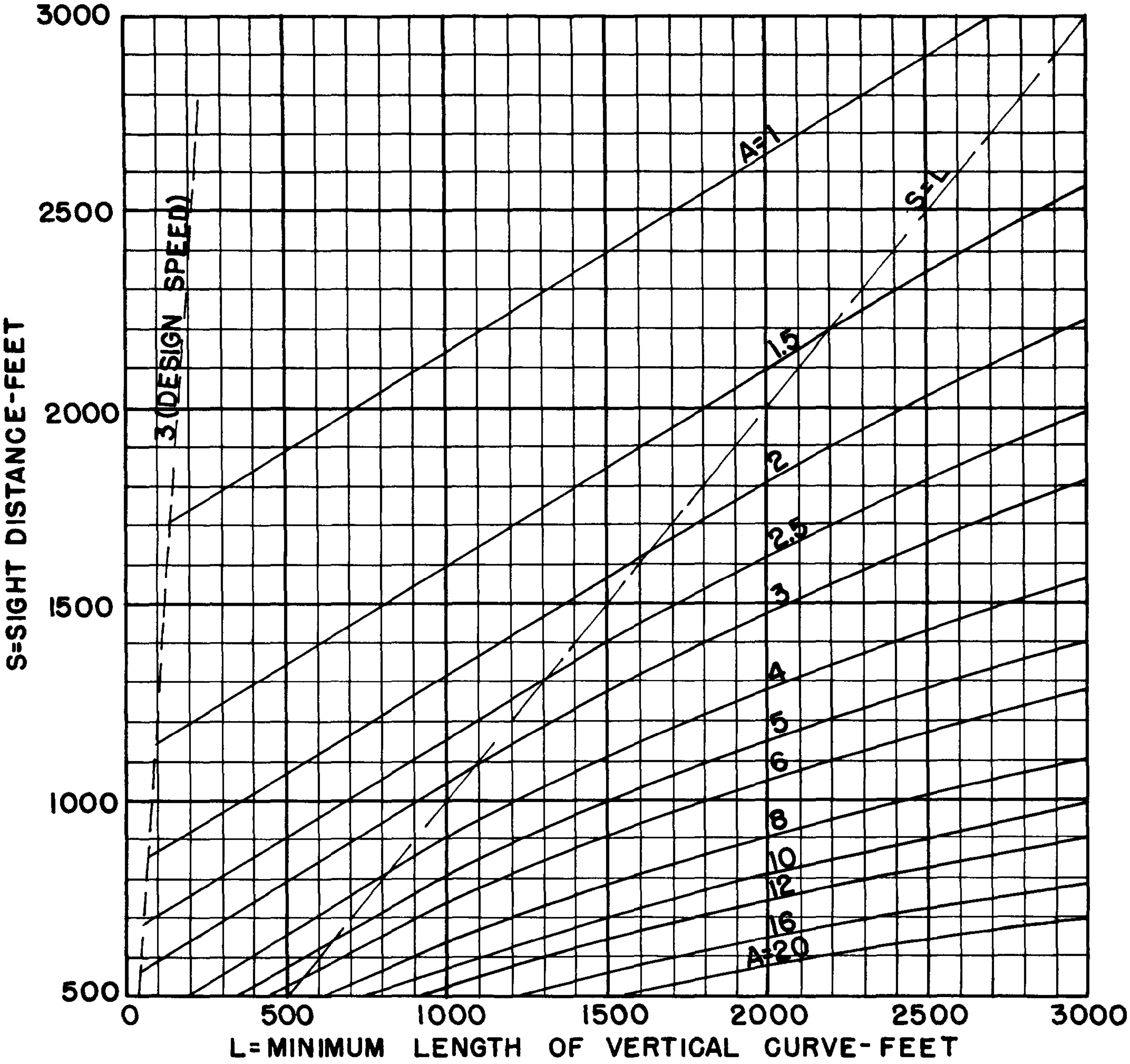
Lengths of vertical curves are computed from the formula $L = \frac{AS^2}{400 + 3.5(S)}$

(B) PASSING SIGHT DISTANCE

Passing sight distance for two-lane highways should be provided over as high a proportion of the highway length as feasible. Minimum passing sight distances are

PASSING SIGHT DISTANCE
(Measured from 3.75 feet height of eye to 4.5 feet
height of object above the road surface)

Design Speed, mph	30	40	50	60	65	70	75
Minimum Passing Sight Distance, Ft.	1100	1500	1800	2100	2300	2500	2600



PASSING SIGHT DISTANCE
RELATION BETWEEN SIGHT DISTANCE, HIGHWAY GRADES
AND LENGTH OF VERTICAL CURVE

The sight distance is computed from the following formulas

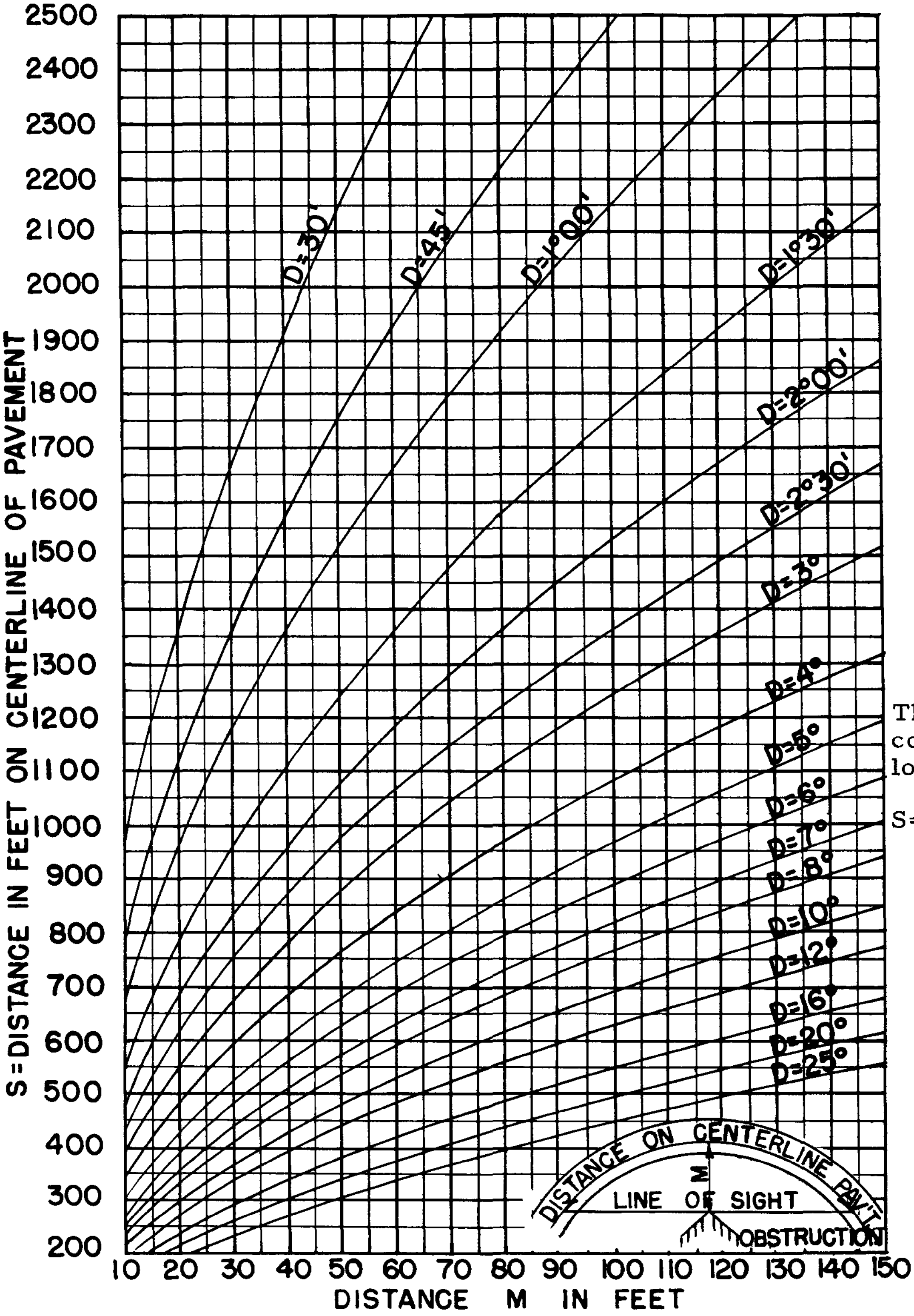
$S < L, \quad L = \frac{AS^2}{3295} \qquad S > L, \quad L = 2S - \frac{3295}{A}$

A = Algebraic Difference in Grades, Percent
S = Sight Distance
L = Length of Vertical Curve

(C) SIGHT DISTANCE ON HORIZONTAL CURVES FOR OPEN HIGHWAY CONDITIONS

The minimum stopping sight distance should be provided at all horizontal curves. Passing sight distances on curves are limited generally to those of very flat curvature .

This graph may be used for determining the horizontal sight distance on curves



The sight distance is computed from the following formula.

$$S = \frac{R}{28.65} \text{Cos}^{-1} \frac{R-M}{R}$$

HORIZONTAL SIGHT DISTANCE CHART

(D) SIGHT DISTANCE FOR TURNING ROADWAYS AT INTERSECTIONS

Passing sight distance is not a design control for two-lane two-way turning roadways at intersection because the roadway should be striped for no passing. Stopping sight distance measured from height of eye of 3 75 feet to an object 6 inches above the roadway surface should be provided in accordance with this table:

STOPPING SIGHT DISTANCE AN MINIMUM K
VALUES FOR TURNING ROADWAYS

Design Speed, mph	15	20	25	30	35	40
Minimum Stopping Sight Distance, Ft.	80	120	160	200	240	275
Minimum K - Value	5	10	18	28	40	55

The above stopping sight distances apply for both vertical and horizontal alignment. K values apply for both crest and sag vertical curves. The minimum length of vertical curve should not be less than three times the design speed.

ROADWAY DESIGN MANUAL

CHAPTER 22

SUPERELEVATION

In the design of highway curves it is necessary to establish the proper relationship between design speed and the curvature of the road. Superelevation rates have been established to allow drivers to comfortably travel the curves at the design speed.

(A) SUPERELEVATION FOR RURAL HIGHWAYS

The superelevation rates required for Florida rural roadways agree with those outlined in the AASHO publication entitled "A Policy on Geometric Design of Rural Highways", dated 1965. A maximum rate of 0.10 ft. per foot of roadway width is allowed. The State Road Department Index Drawing No. 5010-X entitled "Superelevation Details" contains a graph from which the desired rates can be determined. A reproduction of this index drawing is located at the end of this chapter

In addition to containing the noted graph, Index Drawing No. 5010-X outlines the required method for transitioning from the standard tangent roadway section to a superelevated section. The superelevation runoff rates shall conform to the following table

SUPERELEVATION RUN-OFF RATE FOR TWO-LANE PAVEMENT (RURAL)			
Design speed, mph	45-50	55-60	65-70
Maximum relative slope between profiles of edge of two-lane pavement and centerline	1:200	1:225	1:250

For pavements wider than two-lanes, the superelevation lengths should be:
Three-lane pavements 1.2 times the lengths indicated in the above table .
Four-lane undivided pavements 1.5 times the lengths indicated in the above table .
Six-lane undivided pavements 2.0 times the lengths indicated in the above table.

SUPERELEVATION OF RURAL DIVIDED HIGHWAYS

Rural divided highways in Florida normally have a median width of 20' or greater The profile grade points for the divided roadway section are the median edges of pavement.

The procedure for superelevating a rural divided roadway is outlined below.

1. The median is held in a horizontal plane and the two pavements rotated separately about the median edges.
2 The length of runoff is determined independently for each roadway.
3 The location of the beginning and end of the runoff transition relative to the end of the horizontal curve is determined independently for each roadway.
4. The table for the "Superelevation Runoff Rate for Two-Lane Pavement (Rural) " is applicable to a 4-lane divided roadway (two lanes each direction).

5 The Factors noted below the table for increasing the runoff lengths are applicable to the number of lanes for each roadway of the divided section. Example A 6-lane divided roadway (3 lanes each direction) requires a runoff length 1.2 times the length required for a 2-lane pavement.

At the end of this chapter are two example solutions for the superelevation runoff design of multi-lane roadways. Figure A represents the design for a 6-lane pavement with median, Figure B, an 8-lane pavement with median.

(B) SUPERELEVATION OF MUNICIPAL ROADWAYS

Determining the Superelevation design for municipal roadways is usually much more difficult than for rural sections. Each municipal project should be examined individually to determine if the proposed superelevated section will satisfactorily tie to the existing development outside the limits of construction. Reduction of the desired superelevation rate is economically justifiable if access to these developments would otherwise be impossible.

The maximum rate of superelevation for municipal sections is 0.05 foot per foot of roadway width. This value is only one-half of the maximum rate of 0.10 ft. per ft. recommended for rural roadways. While the rate of superelevation of curves on rural roadways is designed to neutralize the centrifugal force, in urban areas a fair amount of side thrust is tolerable.

State Road Department Index Drawing 5075-X contains a graph from which the desired municipal superelevation rates can be determined. A reproduction of this drawing is located at the end of this chapter. Also indicated in the index are details showing the desired method for developing the superelevation section and the runoff transition. The superelevation runoff rates shall conform to the following table

SUPERELEVATION RUNOFF RATE FOR TWO-LANE PAVEMENT (MUNICIPAL) *

Design Speed, MPH	30	40	50
Maximum Relative Slope (Between Profiles of Edge of Two Lane Pavement and Centerline)	1:100	1:125	1:150

*Where multilane municipal sections are constructed the runoff length should be increased by the same factors as shown for rural pavement.

(C) SUPERELEVATION TRANSITIONS

A superelevation transition or runoff is the general term denoting the length of pavement needed to accomplish the change in cross slope from a normal crown section to the fully superelevated section, or vice versa The transition length varies with the design speed and the superelevation rate. Details for designing the superelevation transition are shown on Standard Index Drawings Nos. 5010-X and 5075-X.

(D) SUPERELEVATION TRANSITION BETWEEN REVERSE CURVES

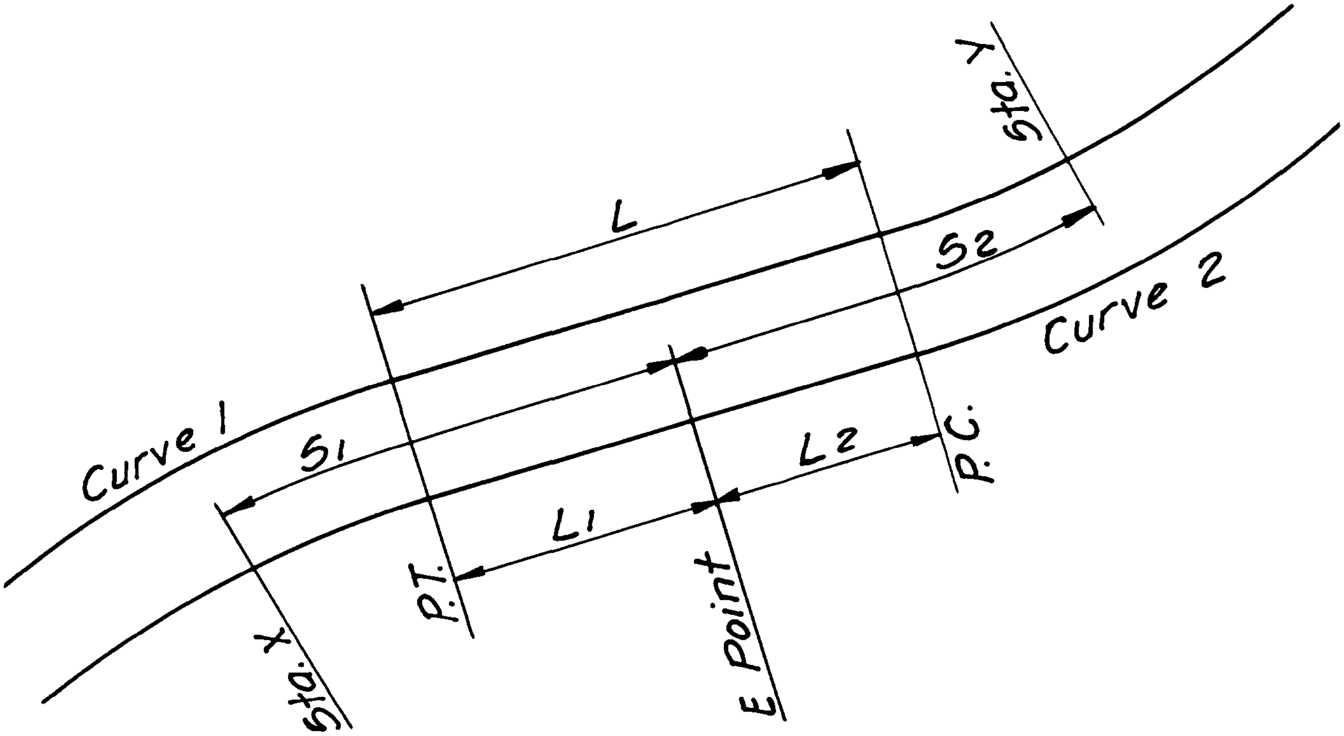
When designing reverse curves, it is desirable that the tangent distance between the curves be of sufficient length to develop the full transition **required for** each **curve** The minimum desirable tangent distance is determined in the following manner

a The transition length (L) is determined for each curve

b 20% of the transition (2L) is located on the appropriate curve, 80% (8L) is located on the tangent

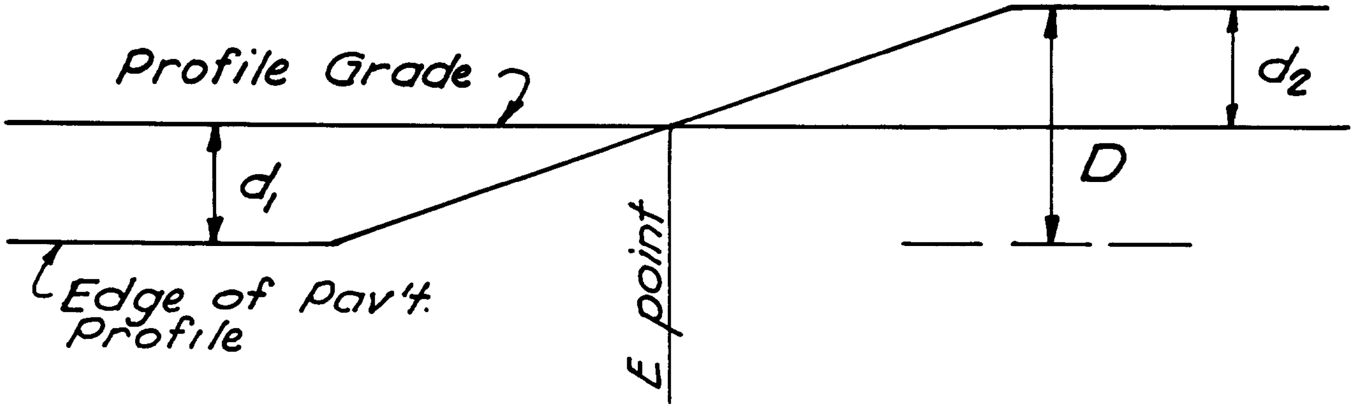
c The minimum tangent distance is the sum of 8L from the transition for each curve

Where the alignment is governed by other design factors, it is sometimes impossible to develop the standard transition between reverse curves The following example illustrates the recommended procedure when a substandard design is necessary



PLAN

See next page for profile sketch



PROFILE

DEFINITIONS

L = Actual tangent length between curves
Z = Normal required tangent length
R = Runoff rate
d_1 = Total rise or fall for Curve 1
d_2 = Total rise or fall for Curve 2
D = Total rise or fall for both curves ($d_1 + d_2$)
S_1 = Transition length for Curve 1
S_2 = Transition length for Curve 2

PROCEDURE

(1) $S_1 = d_1 x R$, $S_2 = d_2 x R$
(2) $Z = .8 (S_1 + S_2)$
(3) If Z is equal to or less than L, use the normal 80% - 20% treatment.
(4) If Z is greater than L, use the ratio d_1 is to D as L_1 is to L. Determine L_1.
(5) Station of E Point = Station of P. T. (Curve 1) + L_1
(6) Station X = Station E - S_1
(7) Station Y = Station E + S_2
(8) If L = 0 use PRC as E point and do steps (6) and (7).

The "broken back" arrangement of curves (short tangent between two curves in the same direction) should be avoided. This hazardous alignment can easily be eliminated. A single curve can be designed to make the total angular change in direction. This design usually results in a flatter curve than would be possible for either of the "broken back" curves.

On minor secondary roads, due to topography, the use of compound circular curves are sometimes necessary. When this condition exists, the superelevation transition between the curves should be similar to the design used for reverse curves.

(E) SUPERELEVATION OF CLIMBING LANES

Along a tangent roadway section, the cross slope of a climbing lane is usually a continuation of the cross slope of the adjacent through traffic lane. When the section is superelevated the cross slope of the climbing lane need not be increased by the same rate as the through lane. Vehicles using this extra lane can be expected to travel at a lower speed, therefore a lower superelevation rate is desirable. When determining the superelevation rate for the climbing lane, caution should be exercised. The difference in the pavement cross slope of the climbing lane and the adjacent through lane should not be so great as to cause discomfort to vehicles passing between these lanes. The maximum allowable slope difference is 0.04 ft. per foot.

See Chapter 23 for a discussion of the locations where Climbing Lanes are required.

(F) SUPERELEVATION FOR CURVES AT INTERSECTIONS

1. Superelevation Rates

At intersections, the superelevation rate is not as critical as for through roadways. Within an intersection curve, drivers anticipate the sharper curvature and accept operation with higher side thrust than normally allowed on open highway curves. Of course, it is desirable to provide as much superelevation as practical on intersection curves, particularly where the curve is sharp and on a downgrade. Unfortunately, the development of a desirable superelevation rate is often prevented by the control of the allowable cross slope difference at the turning roadway terminals. The following table gives a range of allowable superelevation rates for different design speeds and radii. The radii shown in the chart refer to the design at the inner edge of the curved pavement.

SUPERELEVATION RATES FOR INTERSECTION CURVES *

Radius, Feet	Superelevation Rates, Foot per Foot for Design Speeds MPH, of					
	15	20	25	30	35	40 #
50	.02-.10	-	-	-	-	-
90	.02-.07	.02-.10	-	-	-	-
150	.02-.05	.02-.08	.04-.10	-	-	-
230	.02-.04	.02-.06	.03-.08	.06-.10		
310	.02-.03	.02-.04	.03-.06	.05-.09	.08-.10	
430	.02-.03	.02-.03	.03-.05	.04-.07	.06-.09	.09-.10
600	.02	.02-.03	.02-.04	.03-.05	.05-.07	.07-.09
1000	.02	.02-.03	.02-.03	.03-.04	.04-.05	.05-.06
1500	.02	.02	.02	.02-.03	.03-.04	.04-.05
2000	.02	.02	.02	.02	.02-.03	.03-.04
3000	.02	.02	.02	.02	.02	.02-.03

* Rates in the upper one half or one third are preferred.

For design speeds greater than 40 MPH, use values for open highway conditions .

Where radii greater than the minimum for the design speeds are used, the intersection curve should be superelevated less than the maximum rate to effect a balance in design. An example where the radius is greater than that required for the design speed is outlined below

a. A ramp intersects a through roadway with a 310' radius curve and an acceleration lane.
b. The cross slope on the through roadway is 0.02 ft. per ft.
c. The allowable cross slope on the ramp would therefore be 0.07 per ft. at the terminal. (0.02+0.05, the allowable cross slope difference)
d. The intersecting curve must be designed for 30 MPH or less.

(2) Superelevation Runoff

The principals of superelevation runoff discussed earlier in this chapter apply generally to intersection curves. Due to the characteristics of the turning roadway at intersection curves, a higher rate of cross slope change is allowed at these locations. Values as high was 0.08 ft. per foot may be used on turning roadways without undue distortion in appearance or hazard in operation

The rate of cross slope change on intersection curves, as on open highways, should vary with the design speed. The higher rotation rates should be confined to narrow pavements and sharply curved alignment. Values used for design are listed in the following table.

DESIGN RATES OF CROSS-SLOPE CHANGE FOR CURVES AT INTERSECTIONS *

Design Speed for Curve, mph	15-20	25	30	35 #
Change in superelevation rate (ft. per ft.) Per Station	.08	.07	.06	.05
Per 25 feet Length	.02	.017	.015	.012

*The Superelevation rate may be varied up to 25% above or below the tabulated values, the lower rates being applicable to wide pavements and the higher rates to very narrow pavements.

#Rates shown for 35 mph are permissible for higher design speeds.

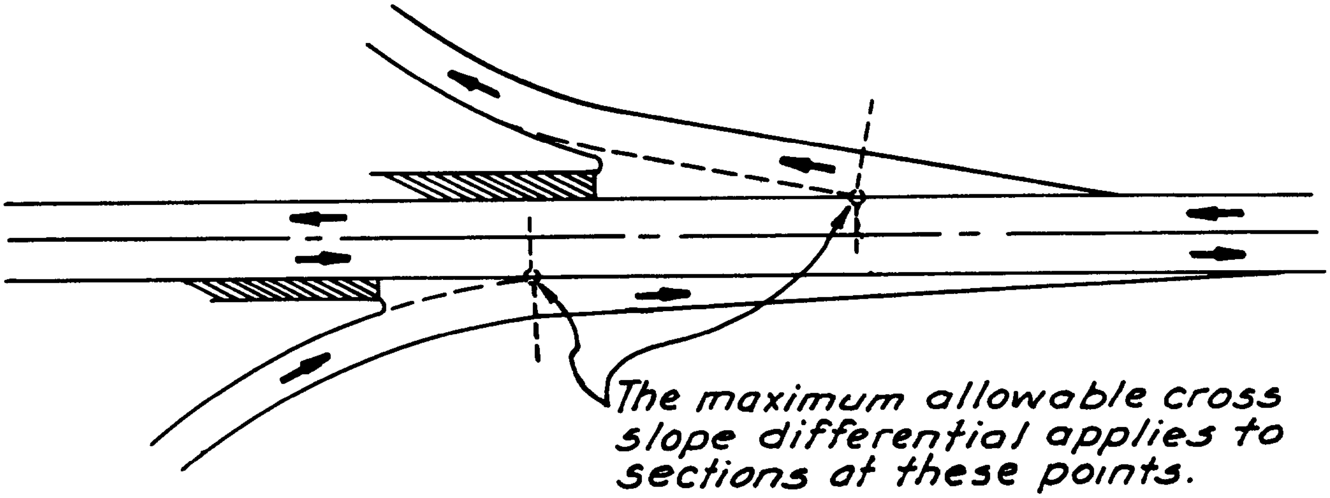
(3) Superelevation at Turning Roadway Terminals

Where the turning roadway intersects the through pavement many factors control the development of a superelevated section. Normally it is impossible to obtain the desired superelevation rate on the turning roadway until the intersecting pavements are completely divided.

In Florida, the allowable superelevation within the terminal area of the intersecting roadways is usually determined by the cross slope difference between the through roadway and the turning roadway. The following table and sketch outline the allowable cross slope difference at the crossover crown line. The crossover crown line is the ridge formed between the through pavement and the auxiliary pavement.

CROSS SLOPE AT INTERSECTIONS: MAXIMUM ALGEBRAIC DIFFERENCE AT CROSSOVER CROWN LINE

Design Speed of Exit or Entrance Curve, mph.	Allowable Difference in Cross Slope at Crown Line, ft. per ft.
15 to 20	.05 - .08
25 to 30	.05 - .06
35 and over	.04 - .05



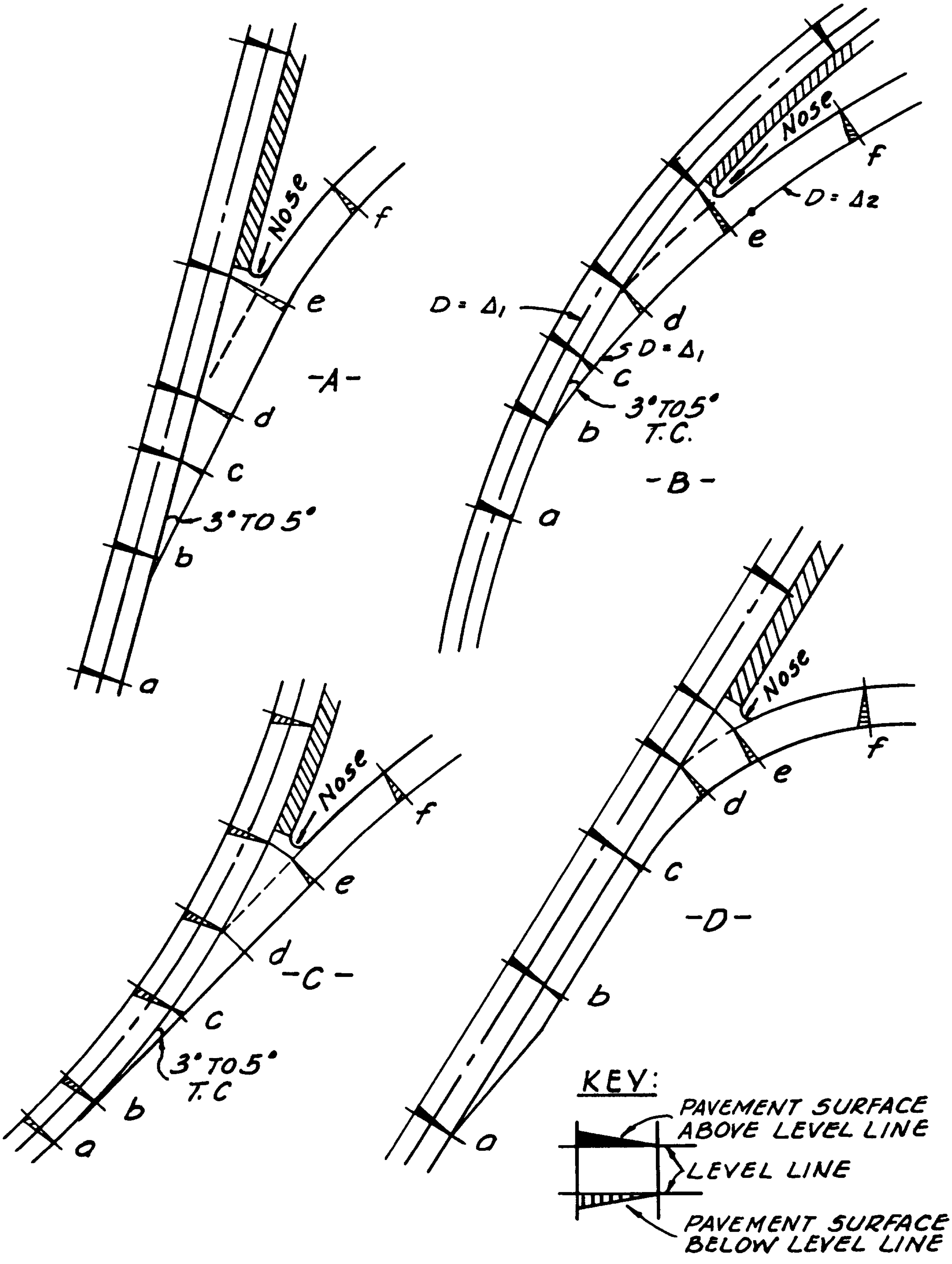
In the sketch on the following page, there are illustrated four schemes for the development of superelevation of turning roadway terminals. Figure A illustrates the variation in cross slope where a turning roadway exits from a through road which is on tangent. The normal slope of the through pavement can usually be maintained until the full width of the turning roadway is reached (Point d). Beyond that point the superelevation of the turning roadway is developed by gently warping the pavement.

Figure B is a similar illustration for the condition where the through pavement and the turning roadway curve in the same direction. Beyond the angular "take off" the turning roadway should be curved at approximately the same degree as the through pavement, compounding with a sharper curve (if desirable) beyond the terminal "nose". The superelevation rate for the through pavement can usually be maintained until the full width of the turning roadway is reached (point d). The superelevation rate is increased beyond that point as required for the sharper curve.

A less favorable situation occurs when the joining facilities curve in opposite directions as in Fig. C. Due to the superelevation of the through pavement, it may sometimes be impossible to slope the auxiliary pavement opposite to that of the through lanes. The figure illustrates a case where a moderate superelevation rate is used on the through pavement. The rate of cross slope on the auxiliary pavement is gradually reduced until some superelevation can be introduced before reaching the terminal "nose". The majority of the superelevation must be gained beyond the nose.

Figure D illustrates the development of superelevation when a speed change lane is proposed parallel to the through roadway. A portion of this added lane is used to develop the superelevation runoff from the turning roadway.

The four schemes shown in the sketch illustrate only exit conditions. The development of superelevation at entrance terminals are similarly designed.



DEVELOPMENT OF SUPERELEVATION
AT TURNING ROADWAY TERMINALS

(4) Example Problem

As an example, consider a condition similar to Figure D in the sketch shown on the preceding page. Assume the turning roadway has a radius of 430' corresponding to a design speed of 40 MPH

(a) From the table entitled "Superelevation Rates for Intersecting Curves", the maximum superelevation rate for the 430' radius curve is between 0.09 and 0.10.

(b) The change in cross slope rate allowed along the auxiliary pavement is 0.013 per 25 feet of length (See table entitled "Design Rates of Cross Slope Change for Curves at Intersections")

(c) The maximum allowable cross slope difference is 0.05 at point "d" (See table entitled "Cross Slope at Intersection. Maximum Algebraic Difference at Crossover Crown Line")

(d) The cross slope of the through pavement is 0.02 foot per foot The maximum allowable cross slope of the auxiliary pavement at point "d" is therefore 0.07 ft. per foot.

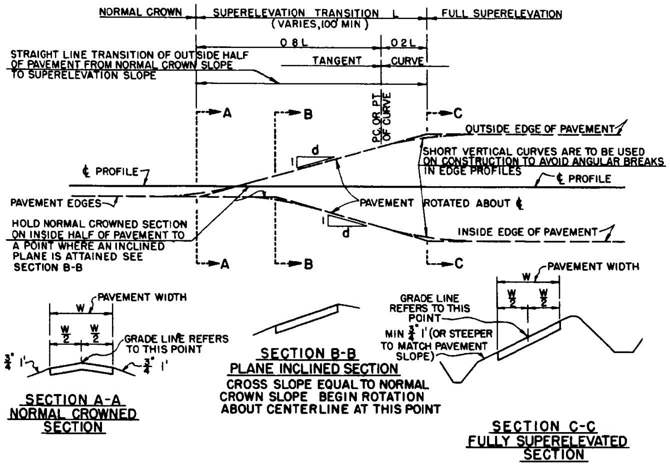
(e) Considering the allowable change in cross slope discussed in (b) above, it is determined that the full superelevation rate of 0.10 can be developed on the turning roadway 60' beyond point "d".

(f) To transition to the normal cross slope of 0.02 ft. per foot on the speed change lane, the cross slope rate must be reduced by 0.05 ft. per ft back of point "d" The runoff length back of this point is therefore 100'.

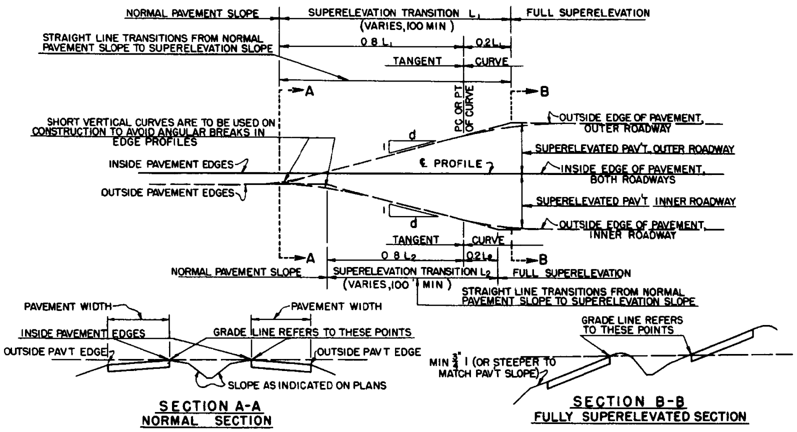
(g) The total superelevation runoff length is 160', with 100' back of point "d" and 60' beyond point "d" A check should be made to determine if the transition exceeds the minimum allowable length (See Index 5010-X). The minimum allowable transition length is 100', therefore the design is satisfactory.

(h) Knowing the control points determined above, the profile for the auxiliary pavement relative to the through roadway can be developed. The profile should be plotted to a vertical scale large enough to enable direct reading of necessary elevations.

Mathematical Vertical Curves are not always practical at intersections but the profile curves can be plotted readily with a spline or irregular curve templates. The final profile may not precisely produce the selected cross slopes at the control points but this difference is not serious if the cross slope change is progressive and within the design limits. The principal criterion is the development of smooth edge profiles that do not appear distorted to the driver.



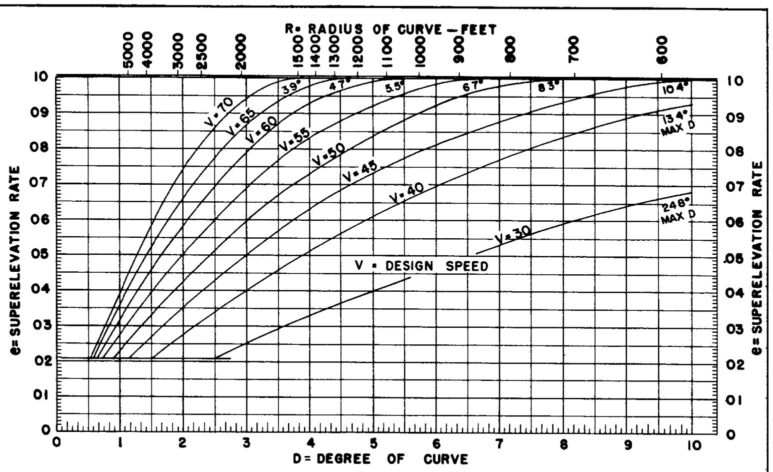
2-LANE OR 4-LANE PAVEMENT, NO MEDIAN



4-LANE PAVEMENT WITH MEDIAN

DETAIL OF TRANSITION FROM NORMAL CROWNED SECTION TO SUPERELEVATED SECTION

THESE TRANSITION DETAILS ARE TO APPLY IN ALL CASES, EXCEPT AT CURVES OF INSUFFICIENT LENGTH, INSUFFICIENT TANGENT LENGTH BETWEEN CURVES, P C C S OR P R C S, IN WHICH CASE THE DETAILS OF THE TRANSITIONS ARE TO BE INCLUDED IN THE DETAIL PLANS



DESIGN SUPERELEVATION RATES $e_{MAX} = 0\,10$

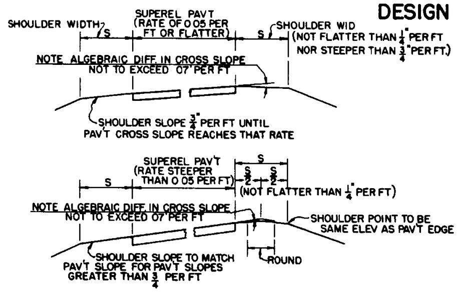
GENERAL NOTES FOR SUPERELEVATION

1 USE NORMAL SECTION WITH NO SUPERELEVATION FOR CURVES UP TO 0°-20 (0°-14 FOR DESIGN SPEEDS OF 70 MPH)

2 WHEN THE DEGEE OF CURVE IS 0°-21 OR GREATER (0°-15′ FOR DESIGN SPEEDS OF 70 MPH) AND IS IN THE RANGE OF THE HORIZONTAL PORTION OF THE CURVE, SUPERELEVATE AT THE NORMAL CROSS SLOPE RATE OF 1/4" PER FOOT OR AS INDICATED BY THE CURVE FOR THE APPROVED DESIGN SPEED

3 THE LENGTH OF SUPERELEVATION TRANSITION IS TO BE DETERMINED BY USING A RELATIVE SLOPE OF PAVEMENT EDGE TO PROFILE GRADE GIVEN IN THE TABLE BELOW, EXCEPT THAT THE MINIMUM LENGTH OF TRANSITION SHALL BE 100 FT

4 FOR CURVES IN MUNICIPAL AREAS, SEE INDEX NO 5075-X



DETAILS OF SHOULDER CONSTRUCTION WITH SUPERELEVATION

NOTES

SHOULDER ON HIGH SIDE A SHOULDER SLOPE OF 3/4 1 DOWNWARD FROM THE EDGE OF PAVEMENT WILL BE MAINTAINED UNTIL A 0 07' PER FT BREAK IN SLOPE AT THE PAVEMENT EDGE IS REACHED DUE TO SUPERELEVATION OF THE PAVEMENT AS THE PAVEMENT SUPERELEVATION INCREASES THE 0 07 PER FT BREAK IN SLOPE WILL BE MAINTAINED AND THE SHOULDER FLATTENED UNTIL THE SHOULDER SLOPE REACHES THE MINIMUM OF 1/4" PER FT DOWNWARD FROM THE EDGE OF PAVEMENT ANY FURTHER INCREASE IN PAVEMENT SUPERELEVATION WILL NECESSITATE SLOPING THE INSIDE HALF OF THE SHOULDER TOWARD THE PAVEMENT AND THE OUTER HALF OUTWARD, BOTH AT 1/4" PER FT

THESE SLOPES WILL BE HELD WITH FURTHER INCREASE IN PAVEMENT SUPERELEVATION UNTIL THE MAXIMUM BREAK OF 0 07' PER FT AT THE PAVEMENT EDGE IS AGAIN REACHED THIS MAXIMUM BREAK WILL THEN BE HELD AND SHOULDER SLOPES STEEPENED WITH ADDITIONAL SUPERELEVATION

SHOULDER ON LOW SIDE MAINTAIN 3/4" PER FT DROP ACROSS INSIDE SHOULDER UNTIL PAVEMENT CROSS SLOPE REACHES 3/4 PER FT FOR PAVEMENT CROSS SLOPES GREATER THAN 3/4 PER FT, SHOULDER TO HAVE SAME SLOPE AS PAVEMENT

THESE DETAILS APPLY TO BOTH PAVED AND GRASSED SHOULDERS

SLOPE RATIOS FOR SUPERELEVATION TRANSITIONS

DESIGN SPEED, M P H	45-50	55-60	65-70
1 d	1 200	1 225	1 250

STATE ROAD DEPARTMENT OF FLORIDA
ROADWAY PLANS DEPARTMENT

SUPERELEVATION DETAILS

REVISIONS	
Dates	Descriptions
5 58 h w	RETRACED
9 61 L H	SUPER TRANS. RATE REV TO CONFORM TO AASHO
5-65 hfw	Rev for 1/4" Cross Slope
1-67 MJT	REVISED S E CHART

ROAD NO	COUNTY	PROJECT NO

	Names	Dates
Detailed by		
Checked by		
Quantities by		
Checked by		
Traced by		

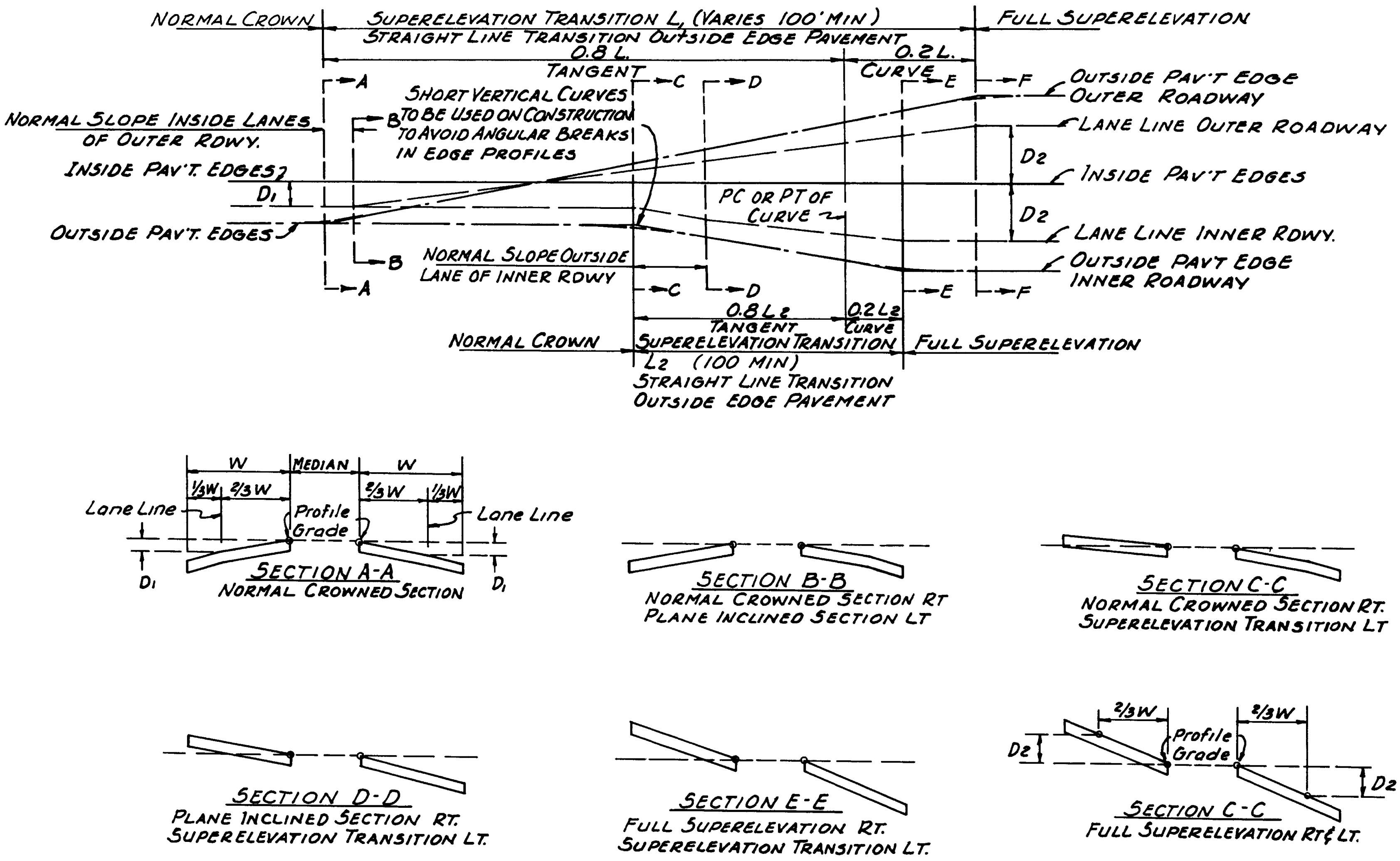
Recommended For Approval by OHRegister
Engineer of Plans

APPROVED BY
State Highway Engineer

Drawing No. 1 OF 1

Index No. 5010-F

3-22-11



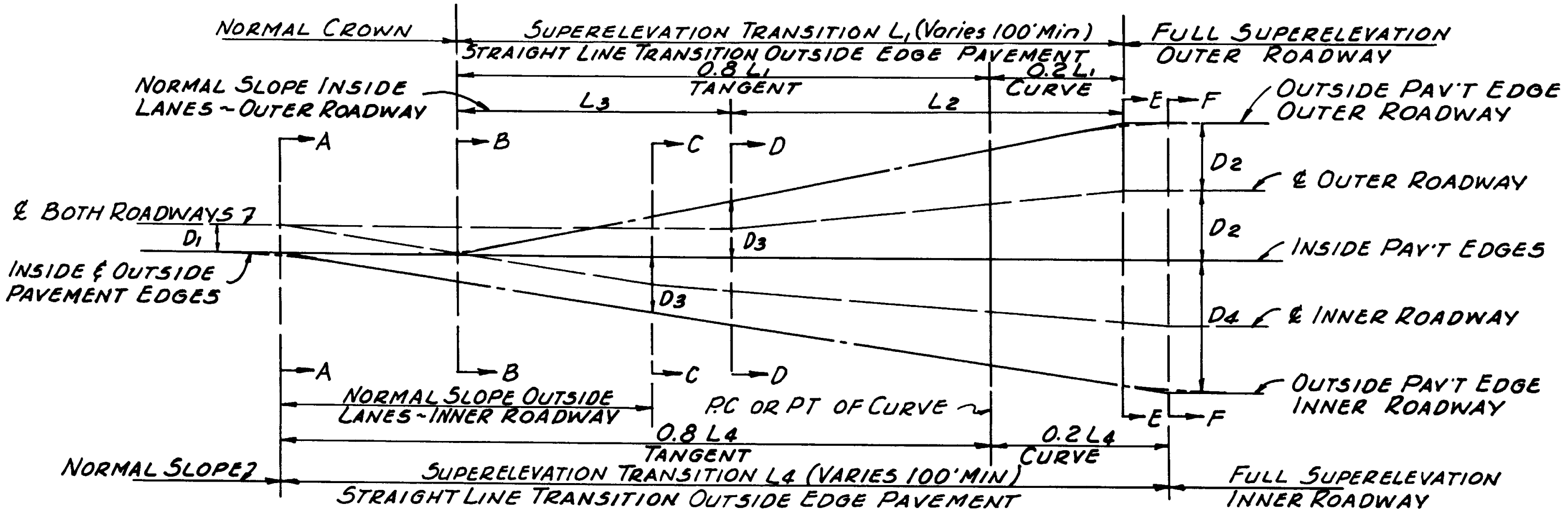
$L_1 = S \times (D_1 + D_2) \times 1.2$
$L_2 = S \times (D_2 - D_1) \times 1.2$

6 LANE PAVEMENT WITH MEDIAN

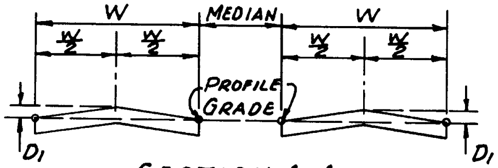
MEDIAN SHOULDER SLOPES AND OUTSIDE SHOULDER SLOPES ARE TO CONFORM TO DETAILS SHOWN ON INDEX Nº 5010

Figure A

3-22-12

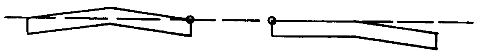


NOTE: FOR ROADWAYS WITH PROFILE GRADE AT ℄ OF ROADWAY USE DIAGRAM FOR 4 LANE PAVEMENT, NO MEDIAN INDEX Nº 5010



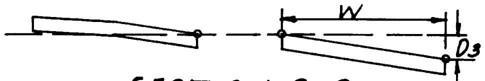
SECTION A-A

NORMAL CROWNED SECTION



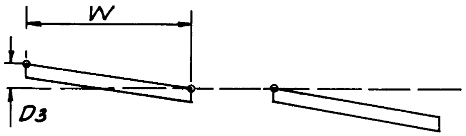
SECTION B-B

NORMAL CROWNED SECTION LT
SUPERELEVATION TRANSITION RT.



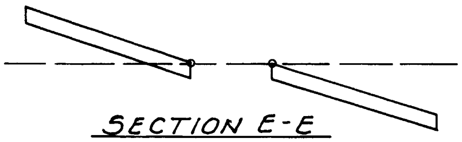
SECTION C-C

SUPERELEVATION TRANSITION LT.
PLANE INCLINED SECTION RT.



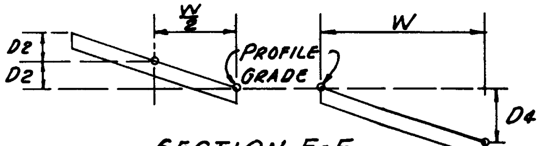
SECTION D-D

PLANE INCLINED SECTION LT.
SUPERELEVATION TRANSITION RT.



SECTION E-E

FULL SUPERELEVATION LT
SUPERELEVATION TRANSITION RT.



SECTION F-F

FULL SUPERELEVATION RT. ¢ LT.

$L_1 = L_2 + L_3$
$L_2 = 5(D_2 - D_1) \times 15$
$L_3 = L_2 \div (2D_2 - D_3)$
$*L_4 = 5 \times D_4$
$*L_4 = 5(D_1 + D_2) \times 15$

8 LANE PAVEMENT WITH MEDIAN

* Compute both and use shorter length

Figure B

3-22-13

FED. ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.			

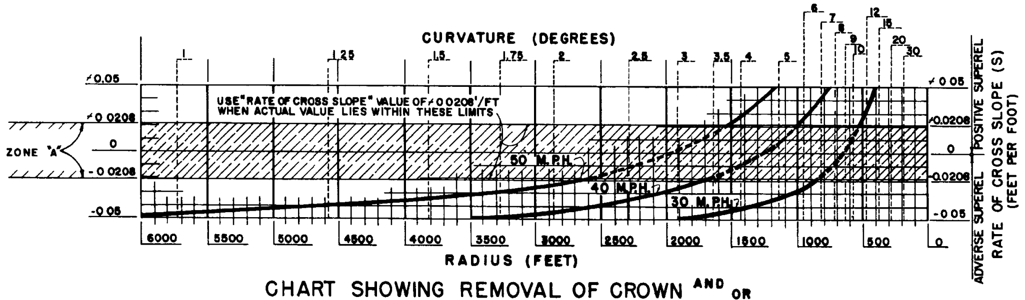
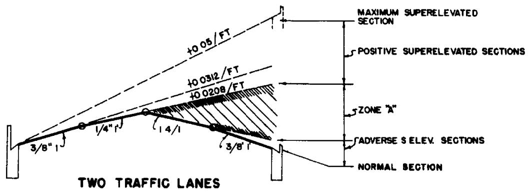
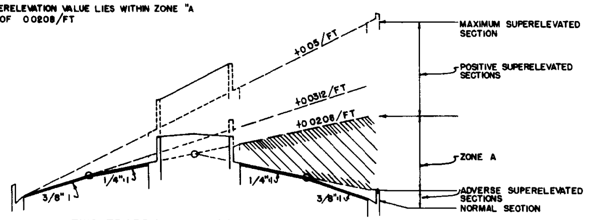


CHART SHOWING REMOVAL OF CROWN AND OR SUPERELEVATON NECESSARY FOR CURVATURE AT VARIOUS DESIGN SPEEDS

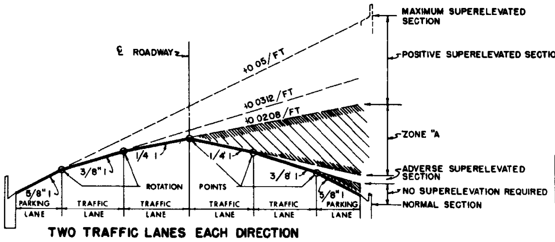
NOTE WHEN THE ACTUAL SUPERELEVATION VALUE LIES WITHIN ZONE "A USE A POSITIVE RATE OF 0.0208/FT



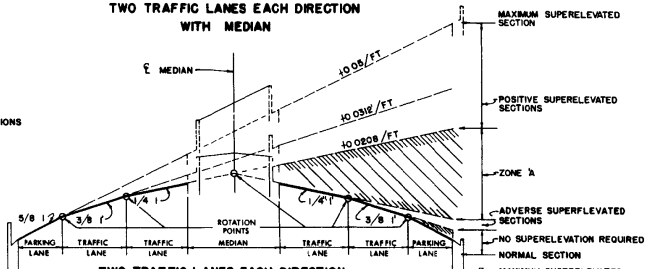
TWO TRAFFIC LANES EACH DIRECTION



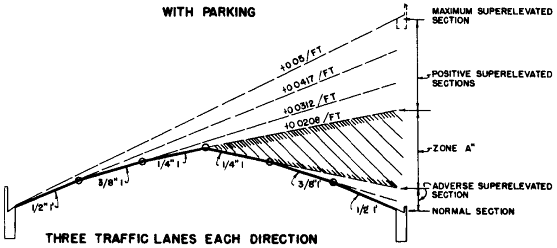
TWO TRAFFIC LANES EACH DIRECTION WITH MEDIAN



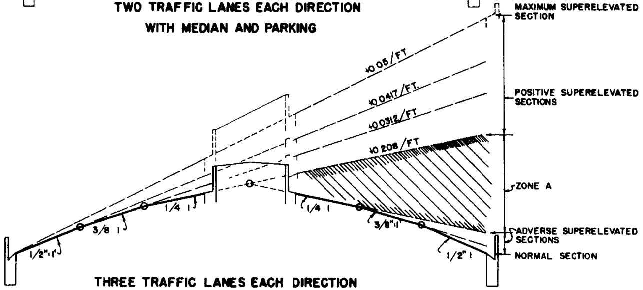
TWO TRAFFIC LANES EACH DIRECTION WITH PARKING



TWO TRAFFIC LANES EACH DIRECTION WITH MEDIAN AND PARKING



THREE TRAFFIC LANES EACH DIRECTION



THREE TRAFFIC LANES EACH DIRECTION WITH MEDIAN

GENERAL NOTES FOR SUPERELEVATION

1 MAXIMUM RATE OF SUPERELEVATION (IN MUNICIPAL CONSTRUCTION) SHALL BE 0.05' PER FOOT

2 SUPERELEVATION SHALL BE OBTAINED BY ROTATING THE PLANE SUCCESSIVELY ABOUT THE BREAK POINTS OF THE SECTION UNTIL THE PLANE HAS ATTAINED A SLOPE EQUAL TO THAT REQUIRED BY THE CHART SHOULD THE ROTATION TRAVERSE THE ENTIRE SECTION AND FURTHER SUPERELEVATION BE REQUIRED, THE REMAINING ROTATION OF THE PLANE SHALL BE ABOUT THE LOW EDGE OF THE INSIDE TRAVEL LANE

ADVERSE SUPERELEVATION OF SECTIONS WITH PARKING LANES.
NO SUPERELEVATION WILL BE REQUIRED WHEN THE MAXIMUM ADVERSE SUPERELEVATION RATE IS GREATER THAN THE NORMAL SLOPE OF THE TRAFFIC LANE ADJACENT TO THE PARKING LANE

3 WHEN POSITIVE SUPERELEVATION IS REQUIRED, THE SLOPE OF THE GUTTER ON THE HIGH SIDE SHALL BE A CONTINUATION OF THE SLOPE OF THE SUPERELEVATED PAVEMENT

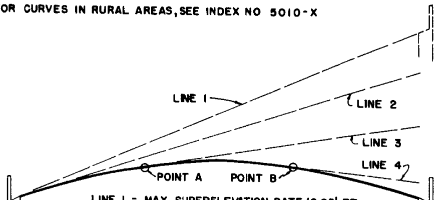
4 IN CONSTRUCTION, SHORT VERTICAL CURVES SHALL BE PLACED AT ALL ANGULAR PROFILE BREAKS WITHIN THE LIMITS OF THE SUPERELEVATION TRANSITION

5 MINIMUM GUTTER GRADES WITHIN THE LIMITS OF THE SUPERELEVATION TRANSITION SHALL BE 0.2%

6 THE VARIABLE SUPERELEVATION TRANSITION LENGTH "L" SHALL HAVE A MINIMUM VALUE OF 50 FEET FOR DESIGN SPEEDS UNDER 40 MPH AND 75 FEET FOR DESIGN SPEEDS OF 40 MPH OR GREATER

7 MUNICIPAL SECTIONS HAVING LANE ARRANGEMENTS DIFFERENT FROM THOSE SHOWN, BUT COMPOSED OF A SERIES OF PLANES, SHALL BE SUPERELEVATED IN A SIMILAR MANNER.

8 FOR CURVES IN RURAL AREAS, SEE INDEX NO 5010-X



LINE 1 - MAX. SUPERELEVATION RATE (0.05' FT
LINE 2 - SLOPE OF PARABOLA AT INSIDE EDGE OF PAVT
LINE 3 - POSITIVE SUPERELEVATION RATE LESS THAN MAX SLOPE OF PARABOLA.
LINE 4 - ADVERSE SUPERELEVATION.

VALUES OBTAINED FROM THE CHART ARE ALSO APPLICABLE TO A PARABOLIC CROWN SECTION WHEN THIS TYPE SECTION IS USED, SUPERELEVATION IS ESTABLISHED BY ROTATING A TANGENT ABOUT THE ARC OF THE PARABOLIC CROWN UNTIL THE DESIRED SLOPE IS ATTAINED (POINTS A & B ON SKETCH) THE NORMAL PARABOLIC CROWN WILL BE MAINTAINED OUTSIDE THE LIMITS OF THE PLANE THUS FORMED.

SUPERELEVATION OF PARABOLIC SECTION

STATE ROAD DEPARTMENT OF FLORIDA
ROADWAY PLANS DEPARTMENT

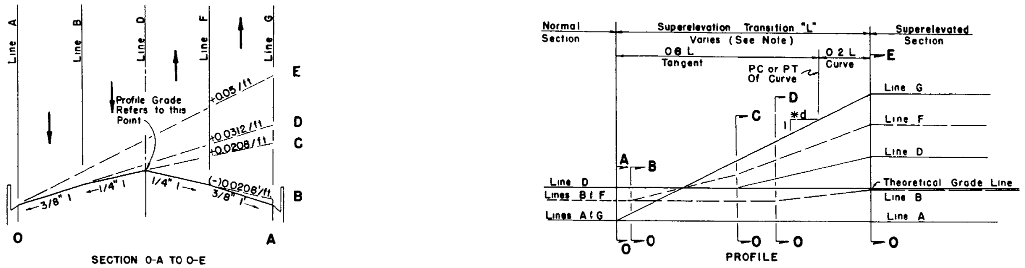
SUPERELEVATION DETAILS FOR MUNICIPAL CONSTRUCTION

REVISIONS		ROAD NO	COUNTY	PROJECT NO
Dates	Desc ptions			

	Name	Dates	
Detailed by	W L B	2-66	Recommended For Approval by Eng neer of Road Design APPROVED BY Asst. S te ighway Engineer
Checked by	R L O	12-66	
Quant te by			
Checked by			Drawing No 1 OF 2
T aced by	C D R	1-67	Ind No 5075-A

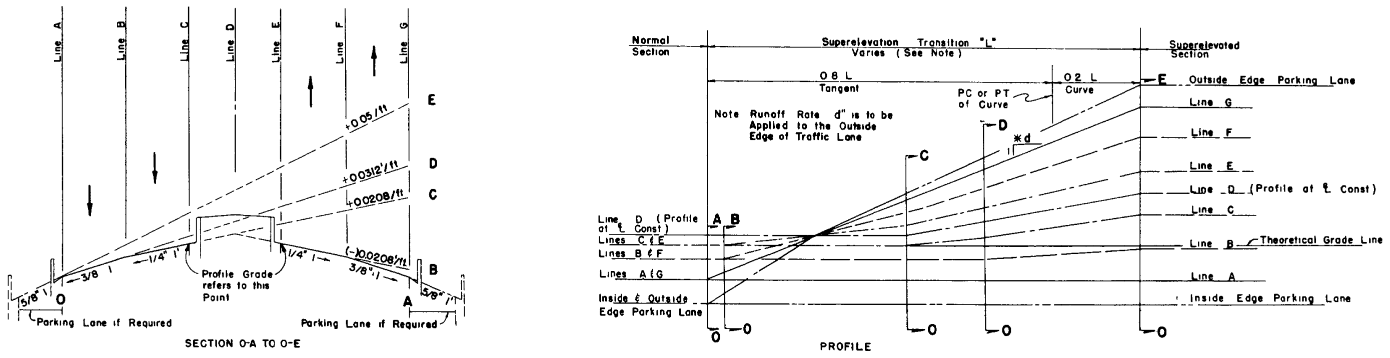
3-22-14

FED ROAD DIV No	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA			



DETAIL OF SUPERELEVATION TRANSITION FOR TWO TRAFFIC LANES EACH DIRECTION

LINE	DESCRIPTION
A	INSIDE TRAFFIC LANE
B	INSIDE LANE LINE
C	INSIDE MEDIAN EDGE PAVEMENT
D	℄ CONSTRUCTION
E	OUTSIDE MEDIAN EDGE PAVEMENT
F	OUTSIDE LANE LINE
G	OUTSIDE TRAFFIC LANE



Note Runoff Rate "d" is to be Applied to the Outside Edge of Traffic Lane

DETAIL OF SUPERELEVATION TRANSITION FOR TWO TRAFFIC LANES EACH DIRECTION WITH MEDIAN AND PARKING

*d (SLOPE RATIO)	
30 MPH	1 100
40 MPH	1 125
50 MPH	1 150

NOTE THE SECTIONS AND PROFILES SHOWN ON THIS SHEET ARE EXAMPLES OF THE SUPERELEVATION TRANSITIONS SIMILAR SCHEMES SHOULD BE USED FOR ROADWAYS HAVING DIFFERENT SECTION DESIGNS

STATE ROAD DEPARTMENT OF FLORIDA
ROADWAY PLANS DEPARTMENT

SUPERELEVATION DETAILS FOR MUNICIPAL CONSTRUCTION

REVISIONS	
Dates	Description

ROAD NO	COUNTY	PROJECT NO

	Names	Dates
Detailed by	W L B	2-66
Checked by	R L O	12-66
Quantities by		
Checked by		
Traced by	C.D P	1-67

Recommended For Approval by
Engineer of Road Design
APPROVED BY
State Highway Engineer

Drawing No	Index No
2 OF 2	5075-A

3-22-15

ROADWAY DESIGN MANUAL

CHAPTER 23

CONTROLS FOR HORIZONTAL AND VERTICAL ALIGNMENT

(A) GENERAL CONTROLS FOR HORIZONTAL ALIGNMENT

(1) Alignment should be as directional as practical, consistent with topography, and should follow the natural contour in a flowing line where feasible and consistent with desired sight distances and travel distances.

(2) Flat curves rather than sharper curves are desirable

(3) The standard of alignment adopted for a particular section of highway should extend throughout the section with no sudden changes from easy to sharp alignment

(4) Curves should be of such length that the appearance of a kink will be avoided.

(5) When practical, high fills should have tangent or flat curvature alignment.

(6) For compound curves, the sharper curvature should be not more than 1 5 times the flatter curvature.

(7) Reverse curvature without tangents must be avoided.

(8) Broken-back curve arrangements must not be used.

(9) Curvature and grades should be in proper balance Steep grades with flat curvature or flat grades with excessive curvature should be avoided. A logical design is a compromise between the two conditions.

(10) Vertical curvature when properly combined with horizontal curvature generally results in a more pleasing appearance.

(11) Sharp curvature should not be introduced at or near a crest in the grade.

(12) Only flat horizontal curvature should be introduced at or near the low point of of a sag in grade.

(13) Horizontal and vertical alignments should be as flat as practical on approaches to intersections. If possible, intersections should be located in a sag rather than on a crest

(B) GENERAL CONTROLS FOR VERTICAL ALIGNMENT

(1) A smooth grade line with gradual changes, consistent with the terrain and type of highway, should be provided.

(2) A "hidden-dip" in the profile grade must be avoided, if practicable.

(3) A broken-back line must be avoided.

(4) On long steep grades, the grade should be flattened near the top of the ascent if possible

(5) Where moderate to steep grades approach an intersection, the gradient should

be reduced through the intersection if feasible, possibly to the extent of steepening the grade on the approach.

(C) COMBINATION OF HORIZONTAL AND VERTICAL ALIGNMENT

(1) Horizontal curvature should be as flat as practical at intersections.

(2) On divided highways, if practical, the median width should be varied, allowing separate profile grades and alignments for the two roadways resulting in design and operational advantages of separate roadways. (See controls for horizontal and vertical alignment).

(D) GRADE CONTROLS

In general, for main highways, these relations between maximum grades and design speed shall apply.

MAXIMUM GRADES/DESIGN SPEED					
Design speed, mph	30	40	50	60-65	70
Maximum Grade (other than Interstate) percent	6-8	5-7	4-6	3-6	3-5
Interstate			5	4	3

(E) CLIMBING LANES

In all cases where practical and justified by warrants for two-lane highways where critical lengths of grade cannot be avoided, climbing lanes should be constructed where the grade results in a speed reduction for trucks to a speed more than 15 mph below the average running speed of the highway corresponding to the design speed. The chart at the end of this chapter is used in determination of truck speed reduction.

Climbing lanes should be 10-12 feet wide, with contrasting color, and with an adjacent four-foot minimum width shoulder.

See Chapter 22 for a discussion of the superelevation of climbing lanes.

(F) VERTICAL CURVES

Vertical curves are required when the algebraic difference of the intersecting grades equal or exceed·

a. 0.50% for rural roadways,
b. 1.0% for municipal roadways

On Interstate and major high speed primary roads, vertical curves are required at all points of intersecting grades where the maximum curve correction at the vertex is 0.05 foot or greater.

The required minimum lengths for vertical curves in Florida are

(a) For sag vertical curves - the length required for the sight distance based on the design speed (with absolute minimum lengths of 200', 300' and 400' for design speeds of 50, 60 and 70 miles per hour respectively).

(b) For crest vertical curves - the length required for the sight distance based on the design speed (with absolute minimum lengths of 300', 400' and 500 for design speeds of 50, 60 and 70 miles per hour respectively).

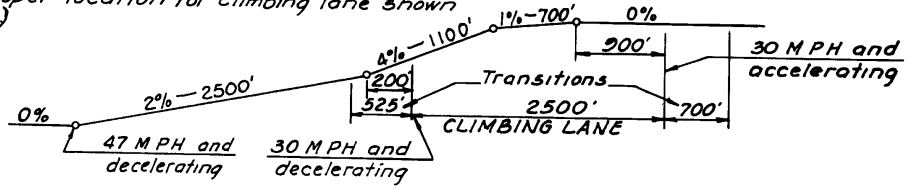
Determining the minimum lengths of vertical curves is only the starting point in establishing the final curve length. The designer should analyze the vertical alignment to determine if a more pleasing grade is possible by increasing the lengths of the vertical curves.

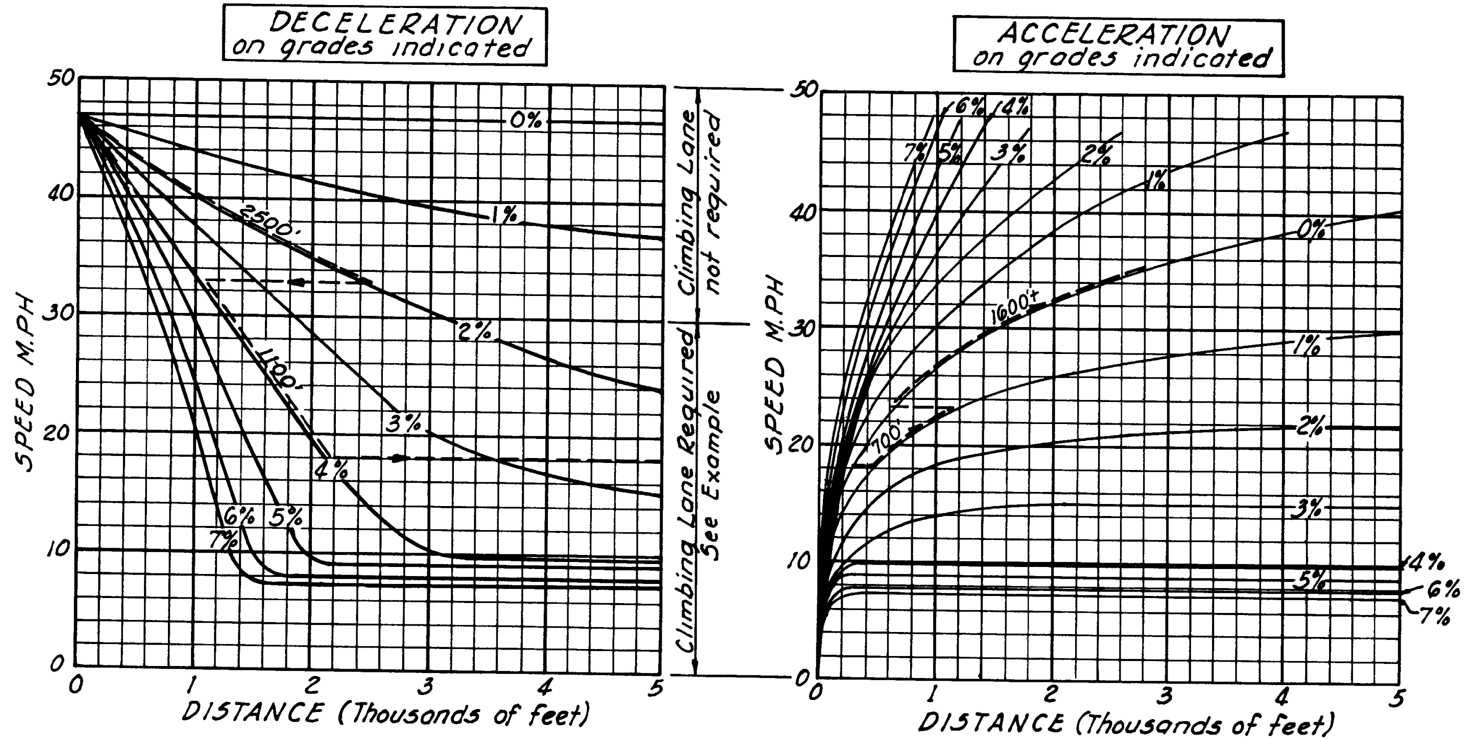
See Chapter 21 for a discussion of the relationship of sight distance and vertical curve length.

SPEED - DISTANCE CURVES
ESTIMATED FOR A TYPICAL HEAVY TRUCK OPERATING ON VARIOUS GRADES

EXAMPLE OF USE OF CURVES

(Dashed lines on graph indicate steps taken in finding proper location for climbing lane shown on sketch)





ROADWAY DESIGN MANUAL
CHAPTER 24
GENERAL DESIGN ELEMENTS

(A) PAVEMENT CROSS SLOPE ON TANGENTS

Rates of cross slope should be as low as possible consistent with the expected accuracy of construction, structural stability and adequate drainage See Typical Sections 1 through 20 for recommended rates and treatment

(B) TRAFFIC LANE WIDTHS

These lane widths for through traffic are provided

Interstate and other Divided Highways	12 feet
Two Lane Highways and City Streets	11 to 12 feet
Low Volume Highways	10 to 11 feet

(C) SHOULDERS

1 Outside Shoulders

Appropriate width usable shoulders should be provided on all highways where the cost will not prohibit their construction The shoulder cross slope rate generally should be 3/4 inches per foot They should be of sufficient stability to provide a haven for disabled vehicles in all kinds of weather and should contrast in color and texture with through traffic lanes.

In general, usable shoulders with a minimum width of ten feet are desirable for all types of highways, however, narrower widths may be indicated for low volume highways or if dictated by economic considerations This is a guide for selection of shoulder widths

MINIMUM USABLE SHOULDER WIDTHS (2LANE RURAL)

DHV	Shoulder Width
Less than 100	6' - 8'
100 - 400	8' -10'
400 and over	10' -12'

The width given is to the intersection of the side slope and the sholder slope

2. Median Shoulders

On four-lane divided highways having wide medians and side slopes 4:1 or flatter, the recommended usable width for a median shoulder is 8 feet. Where side slopes are greater than 4:1, and guardrail is to be used, the recommended median shoulder width is 10 feet. This design will provide continuity of usable shoulder width.

On divided highways having 3 or more lanes in each direction, a driver in the lane nearest the median may have difficulty maneuvering to the right-hand shoulder. Consequently a full width median shoulder of 8 to 10 feet is desirable for multilane highways having 6 lanes or more.

When the pavements of a divided highway are at different levels, the left shoulder assumes greater importance, because drivers have a sense of insecurity where a narrow shoulder is coupled with a downward side slope. The recommended usable left shoulder is 8 feet for 4:1 or flatter slopes and 10 feet for slopes steeper than 4:1.

See Typical Sections 17 and 19 for proposed treatment of shoulders on the Interstate system.

(D) ROADWAY SIDE SLOPES AND DITCHES

In general, side slopes shall conform with these rates:

Fill Height	Rate of Slope
0' - 10'	6:1
10' - 16'	4:1
16 and over	2:1 with shoulder curb

Ditch back slopes shall be 4:1 if right-of-way width permits.

(E) GUARDRAIL

Guardrail will be constructed on all high fills, regardless if curb and gutter is to be constructed. Guardrail protection will also be provided at roadside obstructions and hazards, such as endwalls, deep canals, signs, light posts, bridge approaches, etc. On divided highways, median guardrail will be installed at bridge approaches and other hazardous locations.

Guardrail details and installation diagrams are outlined in Standard Drawing, Index No. 2300-X. It should be emphasized that the installation diagrams represent only the minimum requirements. The designer is responsible for determining if additional guardrail should be provided for safety.

(F) CURBS

Curbs are provided generally for five purposes:

(1) Curb and gutter. This construction (Standard Drawing, Index No. 1915-X) consists of a combination curb and waterway and is indicated for construction on municipal projects at the outer edge of the pavement and, in the case of superelevated divided highway projects, on the inside edge of the outer roadway. Where it is placed at the edge of a traffic lane, the face of the curb should be offset 1.5 feet from the lane line.

(2) Mountable Curb This is a low, easily mounted curb (Standard Drawing, Index No 5080-X, Type B) and is used only to outline channelizing islands at intersections It should not be indicated for construction adjacent to other types of curbs

(3) Median Curb This is a barrier type curb (Standard Drawing, Index No 5080-X) provided to outline raised medians and is used in conjunction with traffic lanes The face of the curb should be offset 1 5 feet

(4) Barrier Curb. This construction is used only for protection at bridge piers or other special construction that may be subject to impact by a vehicle out of control

(5) Shoulder Gutter. This is a shallow gutter section (Standard Drawing, Index No. 5073-X) constructed at the shoulder line on high roadway fills. It is designed to channelize the runoff from the roadway pavement. Drainage Inlets will be constructed in conjunction with this gutter.

(G) SIDEWALKS

Sidewalks should be indicated in conjunction with highway construction at locations of community development such as schools, businesses, industrial plants, etc , where the need is apparent Where sidewalks are built along a rural highway, they should be well removed from the traveled way

Justification for the construction of sidewalks depends upon the vehicle-pedestrian hazard, which is governed chiefly by the volume of pedestrian and vehicular traffic, their relative timing, and the speed of vehicular traffic Sidewalks may be required on one or both sides of the highway. Traffic volume-pedestrian warrants for sidewalks along highways are not established. The designer should study the conditions which can be expected at locations of community development and determine if sidewalk construction is justified.

(H) MEDIANS

Medians shall be as wide as practical dependent upon the availability of right-of-way and the balance with other elements of the section Median width transitions should be obtained by use of flowing curved alignment. Forced alignment should be avoided

The median shoulder slope on tangent sections is 5/8" 1' and the median ditch slope is preferably 6·1 and not steeper than 4·1

Median curbs shall be provided for all medians which are not of sufficient width to allow an adequate drainage ditch within the median Curbs shall be offset 1 5 feet from the through traffic lane. The minimum horizontal clearance on the left side must be maintained in medians where guardrail or bridge piers are constructed.

Medians are provided on all multi-lane highways except in cases where right-of-way costs would absolutely prohibit their construction, in which case every effort should be made to obtain the necessary right-of-way adjacent to intersections for the construction of left-turn storage lanes.

Medians should contrast in color and texture with the through traffic lanes

(I) PARKING

For open highway conditions in rural areas, shoulders are provided usually for emergency parking The demand is light and an occasional parked vehicle should present no particular hazard if the shoulder is of such width as to provide adequate clearance between the distressed vehicle and the through traffic lane

In municipal sections, however, the abutting property owners severely demand that continuous street parking be provided for the benefit of their clients and customers Enormous additional costs for right-of-way and construction generally result

Existing right-of-way in a great many instances will be of adequate width for construction of the necessary through traffic lanes and walks with suitable utility strips Adding the street parking lanes results in unjustified and excessive expenditures for land takings, building demolishing or adjustment, severence damages, etc This cost must be passed on to the general public

Acquisition of sufficient land with equivalent parking capacity, a short distance away from the highway, should cost much less Savings resulting from construction of a lower type of paving on the parking area than on the highway should be appreciable.

Parking lanes along the highway result in these undesirable situations--significant decrease in street capacity, slower operating speeds, increased hazard and significant increase in expenditure of funds

Consequently, every effort should be made to eliminate on-street parking, and through community effort, establish off-street parking areas resulting in over-all benefits

ROADWAY DESIGN MANUAL

CHAPTER 25

DESIGN ELEMENTS FOR TWO-LANE HIGHWAYS

Use this table as a guide in establishing minimum widths of paving for two-lane roads

MINIMUM WIDTH PAVING, TWO-LANE ROADS					
DESIGN SPEED	50 to 250 CURRENT ADT	250 to 400 CURRENT ADT	100 to 200 DHV	200 to 400 DHV	400 & over DHV
30	20	20	20	22	24
40	20	20	22	22	24
50	20	20	22	24	24
60	20	22	22	24	24
70	20	22	24	24	24

Use this table as a guide in selection of the cross section elements and right-of-way widths for a two-lane highway

CROSS SECTIONAL ELEMENTS TWO-LANE HIGHWAY			
Cross Section Element	Dimensions in Feet for Indicated Type of Highway		
	Low	Intermediate	High
Paving	18 - 20	20 - 24	24
Usable Shoulder	6 - 8	8	10 - 12
Roadway	28 - 36	36 - 40	44 - 48
Border	18 - 25	20 - 30	25 - 35
Right-of-way	66 - 80	80 - 100	100 - 120

If it appears in the planning stage for two-lane highways that the estimated traffic volume within 10 to 20 years will exceed the design capacity of the facility, the initial two lanes should be patterned and positioned for ultimate four-lane development. This future improvement should also be considered when selecting the design elements for the proposed cross section. Right-of-way for the ultimate four lanes should be obtained initially if practical.

ROADWAY DESIGN MANUAL

CHAPTER 26

DESIGN ELEMENTS FOR DIVIDED HIGHWAYS

A divided highway should have a barrier median width preferably not less that 16 feet if left turn storage lanes are to be provided at intersections. The narrower widths are applicable generally to low-speed urban projects, and wider medians, preferably 40 feet or more, should be provided in high speed rural sections. In cases where guardrail or Bridge Piers are constructed in the median, the minimum horizontal clearance must be maintained.

A uniform width median is not necessary, a varying width median effected by the use of flat curvature is more desirable in appearance and could result in construction economies in cases of steep cross sectional slopes which could dictate separate roadway grades.

Design guides for the cross-sectional elements and right-of-way widths for four-lane highways are given in this table

CROSS SECTIONAL ELEMENTS FOUR LANE HIGHWAYS

Cross Section Element	Dimensions in Feet		
	Restricted Right-of-way	Intermediate Width Right-of-way	Desirable Width Right-of-way
Pavements	2 @ 24	2 @ 24	2 @ 24
Usable Shoulders	8 Lt., 10 Rt.	10 Lt. & Rt.	10 Lt., 12 Rt.
Median Width	7 - 16	20 - 30	40 - 80
Border, Each	12 - 15	25 - 40	50 - 80
Right-of-Way	90 - 110	140 - 180	200 - 300

The cross sectional elements selected should result in a balanced section. Any necessary reduction due to insufficient right-of-way should be first in the border area, then in the median. Pavement and shoulder width reduction should be considered as a last resort.

ROADWAY DESIGN MANUAL

CHAPTER 27

INTERSECTION DESIGN ELEMENTS

All elements of the intersection shall be able to accommodate the type and amount of traffic to which it is expected to be subjected.

(A) ALIGNMENT AND PROFILE

Approach alignment to intersections should be as straight as possible and the angle of crossing as near 90 degrees as practical. Realignment of one or both of the intersecting roads should be considered if the angle of intersection is less than 60 degrees. Intersecting angles above 60 degrees produce only a small reduction in visibility, and often do not warrant crossroad realignment closer to 90 degrees.

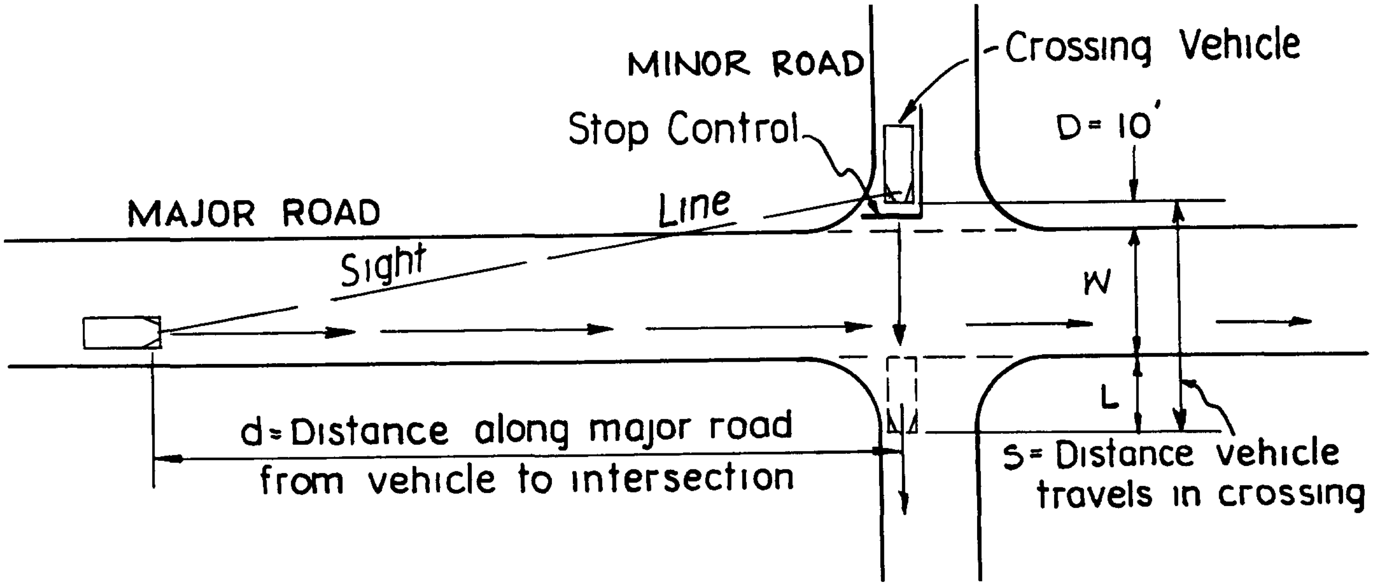
Grades on the intersection legs used by stopped vehicles should be as flat as feasible. Approach grades should not exceed 6 percent and desirably should be less than 3 percent. The grade line of the major highway should be carried through the intersection as a smooth profile and the crossroad grade adjusted to it. In cases of two intersecting highways of approximately equal importance, the grades of each should be carried through the intersection with smooth profiles, especially if the crossing is signalized.

(B) STOP CONTROL ON MINOR ROAD

All intersections on Florida highways are either stop or signal controlled, and, therefore, sight distances will not be considered for intersections having no stop or signal control.

However, in cases where a minor road intersects a major road with a stop condition on the minor road, sight distances do apply, it is necessary that the vehicle driver on the minor road have sufficient sight distance along the major highway to allow crossing from a stopped position before a vehicle, coming into view after he has started, reaches the intersection.

This sketch illustrates required sight distance and method of determination·

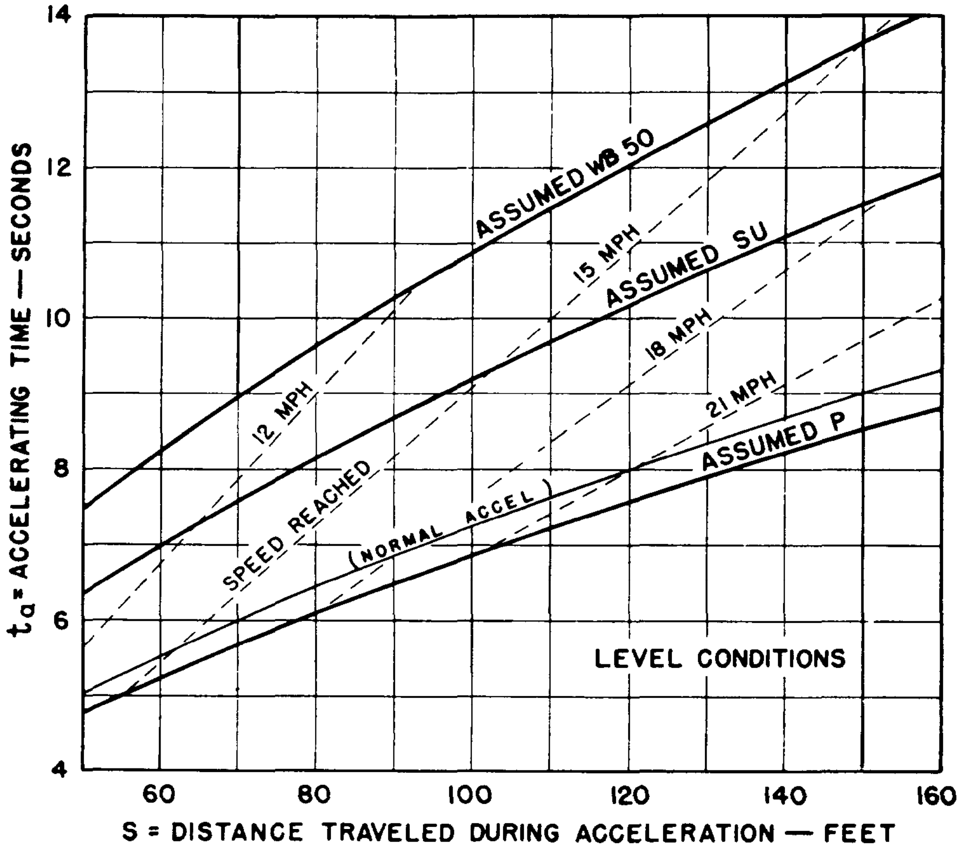


To obtain the necessary sight distance along the major highway

(1) Determine the distance (S) the crossing vehicle must travel in order to clear the intersection,

S = D + W + L
D = distance from near edge of pavement to front of stopped vehicle (Assumed as 10').
W = width of pavement along path of crossing vehicle (ft.)
L = overall length of vehicle (P=19', SU=30', WB-40=50', WB-50=55')

(2) Knowing the travel distance to clear the intersection, the time (ta) for completing the maneuver is determined from the graph below.



SIGHT DISTANCE AT INTERSECTIONS *
DATA ON ACCELERATION FROM STOP

*For WB-40 design vehicles, use WB-50 curve.

(3) The sight distance required to allow the design vehicle to cross the intersection is computed from the following formula

$d = 1.47\ V\ (J + t_a)$
d = minimum sight distance along the major highway (ft.)
V = design speed of major highway (MPH)
J = Driver reaction time (Assumed as 2 sec.)
t_a = Maneuver time determined from the graph.

The sight distance (d) is measured along the actual path of travel along the major highway.

The results determined from the above formula should be checked against the proposed roadway horizontal and vertical alignment. These checks can be made graphicly on the plan sheets. The following checks are necessary

a. The sight distance along the major roadway should be tested against the vertical alignment. The distance is measured from the height of eye of 3.75' to the top of object 4.5' above the pavement.

b. At times it will be impossible to provide a desirable intersection angle in the range of 90 degrees. The effects of proposed skewed intersections on the sight distance should be determined. The "W" value used in the formula (S=D+W+L) should be increased to reflect the skew angle.

c. The horizontal curvature of the major roads may alter the design of the intersection. A visual check will be necessary to determine if any obstructions block the line of sight.

d. If a median is wide enough to accommodate a crossing vehicle, the complete crossing may be made in two maneuvers, stopping if necessary, in the median.

The required sight distance should be adjusted accordingly. (For median widths less than "L" the median width should be included as part of the "W" value.)

e. The crossroad approach grades may alter the acceleration time for the crossing maneuver. The ratios to be applied to the t_a values taken from the graph are tabled below.

Design Vehicle	FACTOR, BASED ON CROSSROAD GRADE RATE				
	-4%	-2%	0%	+2%	+4%
P	0.7	0.9	1	1.1	1.3
SU	0.8	0.9	1	1.1	1.3
WB-50	0.8	0.9	1	1.2	1.7

(C) STOP CONTROL AND SIGHT DISTANCE AT DIAMOND RAMP TERMINALS

Diamond Ramp Terminals at crossroads should be designed as normal intersections. Sight distance requirements as outlined in the preceding sub-chapter should be maintained.

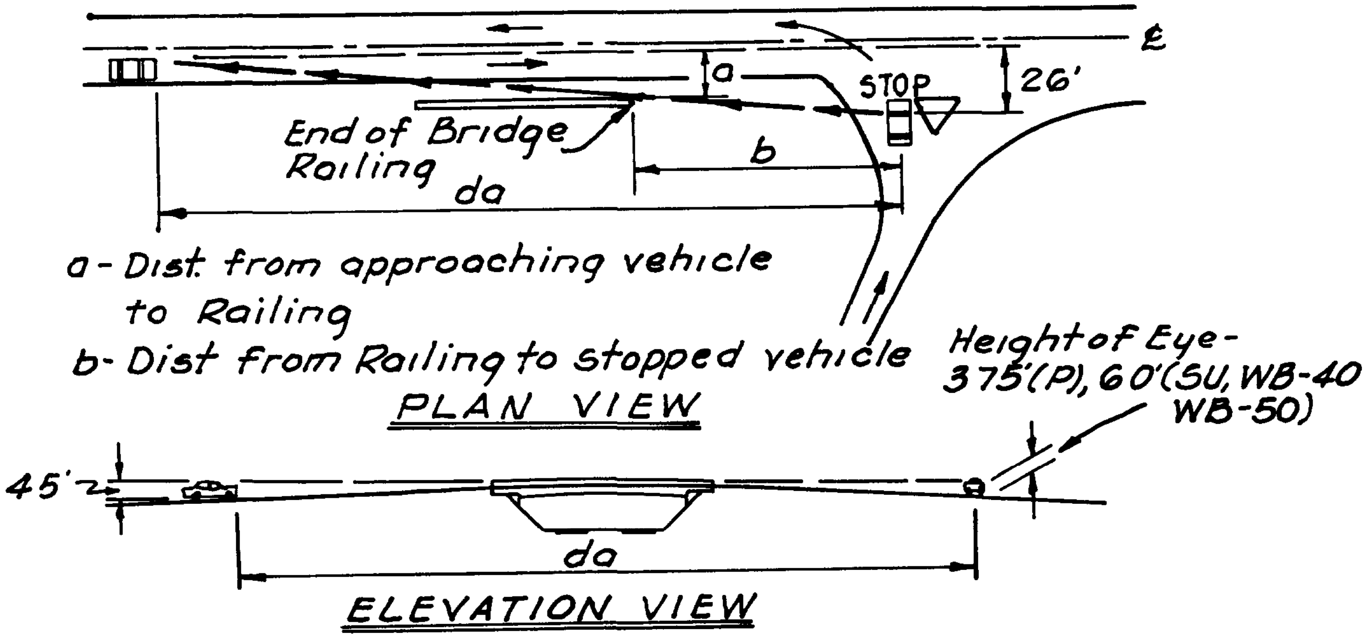
Two design features not normally found in other intersections must be considered in the design of ramp terminals.

1. The ramps at diamond interchanges are one-way so that no complete crossing of the major road is involved. (Only left turn movements).

2. There is invariably a structure in the immediate vicinity which may restrict the sight distance.

The only difference between the ramp terminal and the ordinary at-grade intersection is the time and distance traveled by vehicles negotiating the left turn, rather than crossing the highway. The "W" value considered in the formula (S=D+W+L) should reflect the distance traveled along the turning path of the design vehicle while making the left turn The formulas, tables, and graphs discussed in the preceding subchapter may be used in determining the sight distance at ramp terminals.

The sight distance tests are somewhat different for ramp terminals than for normal crossroads. The following sketch illustrates the methods for checking the horizontal and vertical sight distance when the crossroad overpasses the freeway. Vertically the distance is measured from a height of eye of 3.75' for "P" vehicles, and 6.00' for SU, WB=40, WB=50 vehicles, to an object 4.5 feet high. Horizontally, a check should be made to insure that there is sufficient sight distance past the bridge parapet.



MEASUREMENT OF SIGHT DISTANCES AT DIAMOND RAMPS

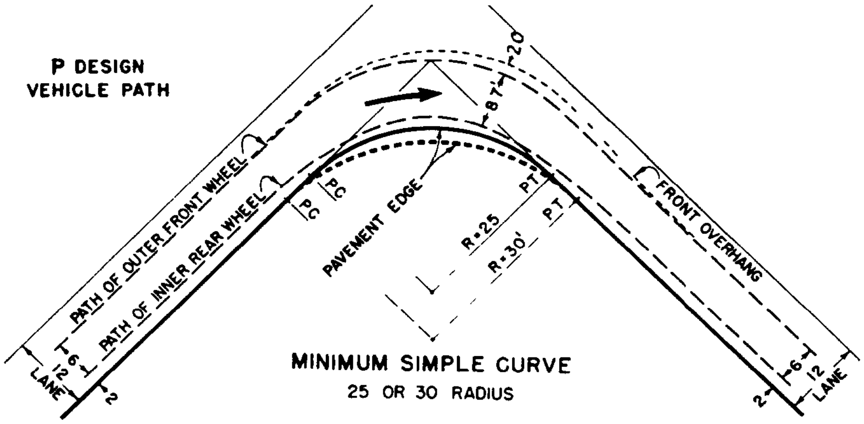
When the freeway overpasses the crossroad similar checks should be made. In this case the bridge abutment or columns instead of the end of the parapet must be cleared.

The designer should locate the ramp terminals to provide the desirable crossing sight distances. Upon testing the preliminary design, if the sight distance is insufficient, any one, or a combination of, the following solutions may be considered.

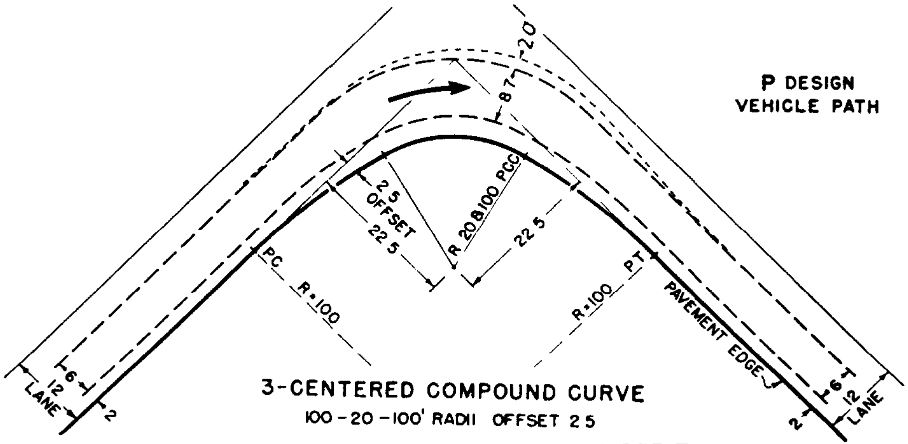
1. Relocate the ramp terminals farther from the structure.
2. Increase the vertical curve lengths.
3. Increase the lateral clearance at the structure.
4. Signalize the intersection.

(D) MINIMUM EDGE OF PAVEMENT DESIGN FOR TURNS

The following illustrations show recommended minimum edge of pavement designs for 90 degree right turns. The designs for P, SU, WB-40, and WB-50 design vehicles are illustrated. In the design of the edge of pavement for the minimum path of a given design vehicle, it is assumed that the vehicle is properly positioned within the traffic lane at the beginning and end of turn, i. e., 2 feet from the edge of pavement on the tangents approaching and leaving the intersection. The layouts are patterned to fit the minimum design vehicle paths which are attainable at low speeds, less than 10 MPH.



MINIMUM SIMPLE CURVE
25 OR 30 RADIUS

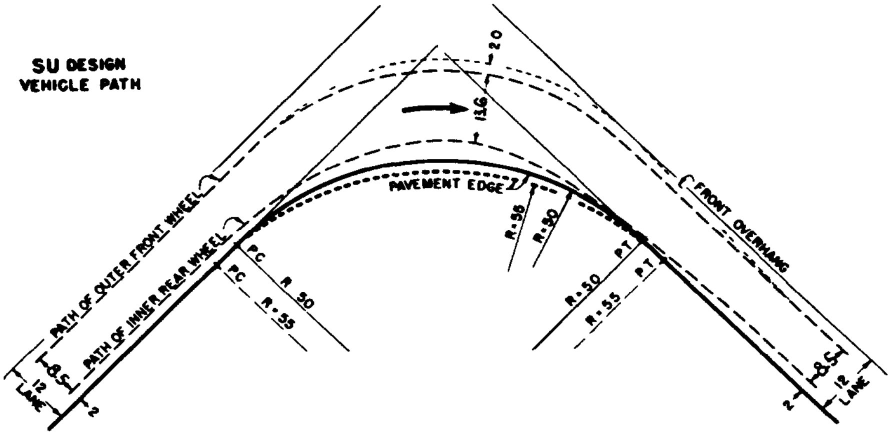


3-CENTERED COMPOUND CURVE
100-20-100' RADII OFFSET 2.5

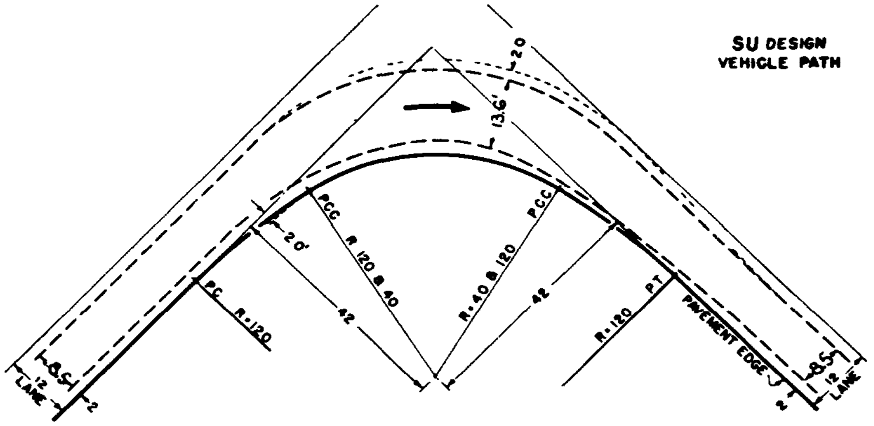
EDGE OF PAVEMENT CURVE FOR 90-DEGREE TURN

MINIMUM DESIGNS FOR PASSENGER VEHICLES

Single Unit Trucks & Buses



MINIMUM SIMPLE CURVE
50 OR 55 RADIUS

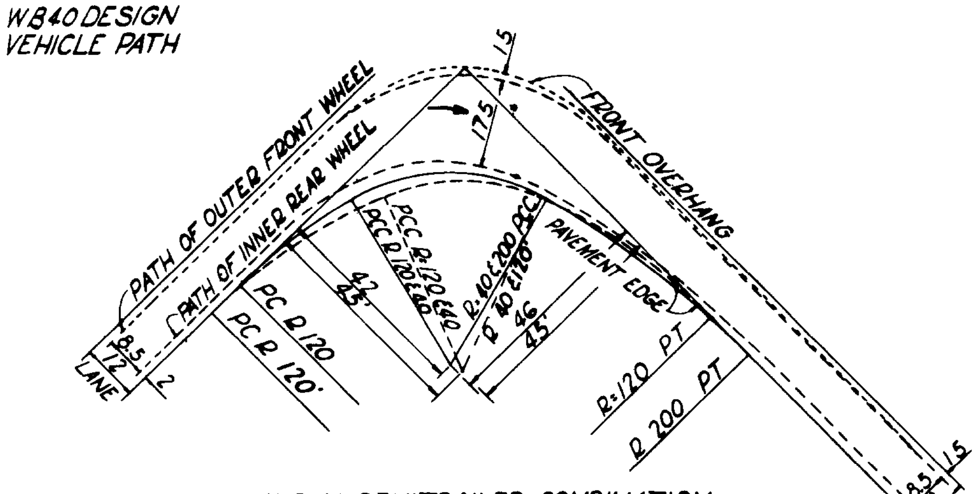


3-CENTERED COMPOUND CURVE
120-40-120 RADII OFFSET 2.0

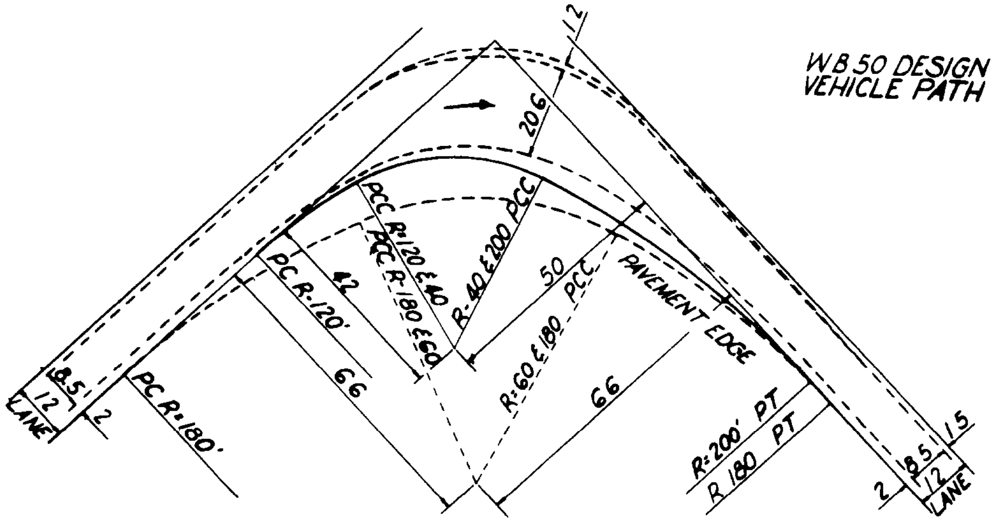
EDGE OF PAVEMENT CURVE FOR 90-DEGREE TURN
MINIMUM DESIGNS FOR SINGLE-UNIT TRUCKS AND BUSES

In an operational sense the compound curve design is much preferred over the simple arc because it better fits the minimum path of the inner rear wheel for SU vehicles. The illustrations indicate that 12' traffic lanes approach and leave the intersection. If 10' or 11" lanes are used the SU vehicle will encroach on the adjacent lane. To prevent this unfavorable condition, edge of pavement radii larger than the minimum indicated would have to be used.

Semitrailer Combination



WB 40 SEMITRAILER COMBINATION
3-CENTERED COMPOUND CURVE 120-40-200 RADII, OFFSET 2 AND 6
OR 120-40-120, OFFSET 5



WB 50 SEMITRAILER COMBINATION
3 CENTERED COMPOUND CURVE 120 - 40 - 200 RADII, OFFSET 2 AND 10
OR 180 - 60 - 180, OFFSET 6

EDGE OF PAVEMENT CURVE FOR 90 DEGREE TURN
MINIMUM DESIGNS FOR SEMITRAILER COMBINATIONS

The asymmetrical arrangement of the 3-centered compound curves (shown as solid lines in the illustrations) closely fit the minimum paths of design semitrailer combinations. Symmetrical arrangements (shown dashed in the illustrations) will also accommodate the design vehicles when turning on their minimum paths.

The symmetrical design is preferred for design because it better accommodates the maneuvers of smaller vehicles, particularly passenger cars, which make up a large percentage of the traffic volume.

CHOICE OF MINIMUM DESIGN

To design an intersection for the largest vehicle expected to be encountered can sometimes be very uneconomical. Where large trucks will be encountered only occasionally, encroachment onto other traffic lanes may be permitted. If the designer determines that a design vehicle less than the maximum is desirable, he should analyze the likely paths and encroachments that will result when a turn is made by vehicles larger than those for which the design is made. This analysis is necessary to determine if the larger trucks can satisfactorily maneuver the turn while remaining on the pavement surface.

The three minimum edge of pavement designs for turns may be considered for the following conditions

P - for minor intersections on parkways, intersections on minor roads and at intersections of low volume, local roads with major highways.

SU- for rural highway intersections of moderate volumes, for important intersections on major highways use in conjunction with speed change lanes if percentage of trucks is appreciable.

WB-40 & WB-50 - for intersections handling large volumes of this size combinations.

OBLIQUE-ANGLE TURNS

Of course, all intersections encountered will not provide an angle of turn of 90 degrees. The following table outlines suggested minimum designs for various angles of turn.

The angle of turn is the angle through which a vehicle travels in making a turn, it is measured from the extension of the tangent on which a vehicle approaches, and the corresponding tangent on the intersecting road to which the vehicle turns. The designs shown in the table are those suggested to fit the sharpest turn of the design vehicle. Other designs may be used satisfactorily. The use of tapers with simple curves is another method for designing the edge of pavement of turns at intersections.

Where 3-center compound curves are recommended in the table, only the preferred symmetrical design is outlined.

MINIMUM EDGE OF PAVEMENT DESIGNS FOR TURNS AT INTERSECTIONS
(SPEEDS LESS THAN 10 MPH)

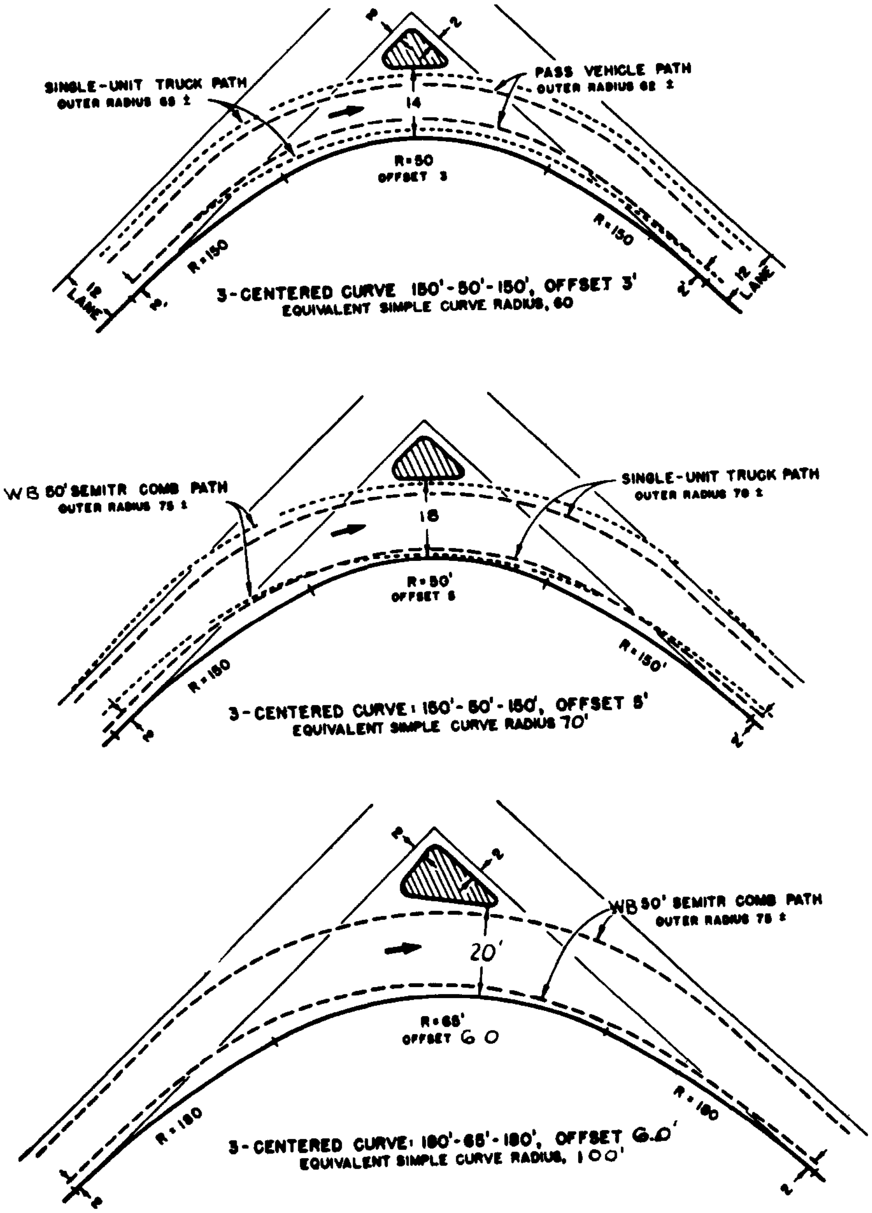
Design Vehicle	Angle of Turn Degrees	Simple Curve Radius, Feet	3-Centered Compound Curve		Angle of Turn Degrees	3-Centered Compound Curve	
			Radii (feet)	Offset (feet)		Radii (feet)	Offset (feet)
P	30	60	-	-	105	100-20-100	2.5
SU		100	-	-		100-35-100	3.0
WB-40		150	-	-		100-35-100	5.0
WB-50		200	-	-		180-45-180	8.0
P	45	50	-	-	120	100-20-100	2.0
SU		75	-	-		100-30-100	3.0
WB-40		120	-	-		120-30-120	6.0
WB-50		170	200-100-200	3.0		180-40-180	8.5
P	60	40	-	-	135	100-20-100	1.5
SU		60	-	-		100-30-100	4.0
WB-40		90	-	-		120-30-120	6.5
WB-50		-	200-75-200	5.5		160-35-160	9.0
P	75	35	100-25-100	2.0	150	75-18-75	2.0
SU		55	120-45-120	2.0		100-30-100	4.0
WB-40		85	120-45-120	5.0		100-30-100	6.0
WB-50		-	150-50-150	6.0		160-35-160	7.0
P	90	30	100-20-100	2.5	180	50-15-50	0.5
SU		50	120-40-120	2.0	U-Turn	100-30-100	1.5
WB-40		-	120-40-120	5.0		100-20-100	9 5
WB-50		-	180-60-180	6.0		130-25-130	9.5

CORNER ISLANDS

Where the inner edges of pavement for right turns at intersections are designed to accommodate semitrailer combinations, or where the design permits passenger cars to turn at speeds of 15 MPH or more, the pavement area at the intersection may become excessively large for proper control of traffic. To avoid this condition, a corner island should be provided to form a separate turning roadway. Such an island is desirable for·

a. Guiding both the through and turning traffic to the proper channels.
b. Locating Signs.
c. Providing refuge for pedestrians.

The smallest island that should be considered is one having an area of approximately 50 square feet (preferably 75 Sq. Ft.) with each leg 8' (preferably 12') long out-to-out after rounding of the corners. The following illustrations show the minimum design to fit these conditions for turning roadways having right turns of 90 degrees.



DESIGNS FOR TURNING ROADWAYS WITH MINIMUM CORNER ISLAND
90-DEGREE RIGHT TURN

OBLIQUE-ANGLE TURNS WITH CORNER ISLANDS

Minimum design dimensions of oblique-angle turns are shown in the following table. Asymmetric 3-centered compound curves and straight tapers with a simple curve can also be used without significantly altering the width of pavement or corner island size.

MINIMUM EDGE OF PAVEMENT DESIGNS FOR TURNING ROADWAYS
SPEEDS OF 15 MPH OR ABOVE

Angle of Turn Degrees	Design Classification	3-Centered Compound Curve		Width of Lane (feet)	Approx. Size of Island (sq. ft.)
		Radii (feet)	Offset (feet)		
75	A	150-75-150	3.5	14	60
	B	150-75-150	5.0	18	50
	C	180-90-180	3.5	20	50
90	A	150-50-150	3.0	14	50
	B	150-50-150	5.0	18	80
	C	180-65-180	6.0	20	125
105	A	120-40-120	2.0	15	70
	B	100-35-100	5.0	22	50
	C	180-45-180	8.0	30	60
120	A	100-30-100	2.5	16	120
	B	100-30-100	5.0	24	90
	C	180-40-180	8.5	34	220
135	A	100-30-100	2.5	16	460
	B	100-30-100	5.0	26	370
	C	160-35-160	9.0	35	640
150	A	100-30-100	2.5	16	1400
	B	100-30-100	6.0	30	1170
	C	160-35-160	7.1	38	1720

A - primarily passenger vehicles, permits single unit turn with deficient clearances.

B - adequate for SU, permits WB-50 turn with slight encroachment on adjacent lanes.

C - adequate for WB-50.

(E) RADII-SPEED COMBINATIONS AT INTERSECTIONS

The Radii-Speed combinations were determined from studies of the relationship between speed and side friction factors on curves at intersections. For additional information, see Chapter 22 for a discussion of superelevation for curves at intersections.

MINIMUM RADII FOR PAVEMENT EDGE BASED ON DESIGN SPEED

Design turning speed, mph	15	20	25	30	35	40
Minimum Radius	50	90	150	230	310	430

(F) COMPOUNDING CIRCULAR CURVES AT INTERSECTIONS

At intersections it is often advantageous to compound circular curves in effecting desirable shapes at turning roadways, particularly for "loop" ramps at interchanges. A maximum ratio of 2 is permitted for the difference in the radii of the compound curves. Where feasible, a lesser difference in radii should be used, a desirable maximum ratio is 1.75.

In a series of curves of decreasing radii, each curve should be long enough to enable the driver to decelerate at a reasonable rate. Minimum and desirable lengths are shown in the following table.

MINIMUM ARC LENGTHS FOR CURVES FOLLOWED BY A CURVE OF ONE-HALF RADIUS, OR PRECEEDED BY CURVE OF DOUBLE RADIUS*

Radius, ft.	100	150	200	250	300	400	500
Length of arc, ft.							
Minimum	40	50	60	80	100	120	140
Desirable	60	70	90	120	140	180	200

* These values would also apply to the acceleration condition when travel is from the sharper to the flatter curve.

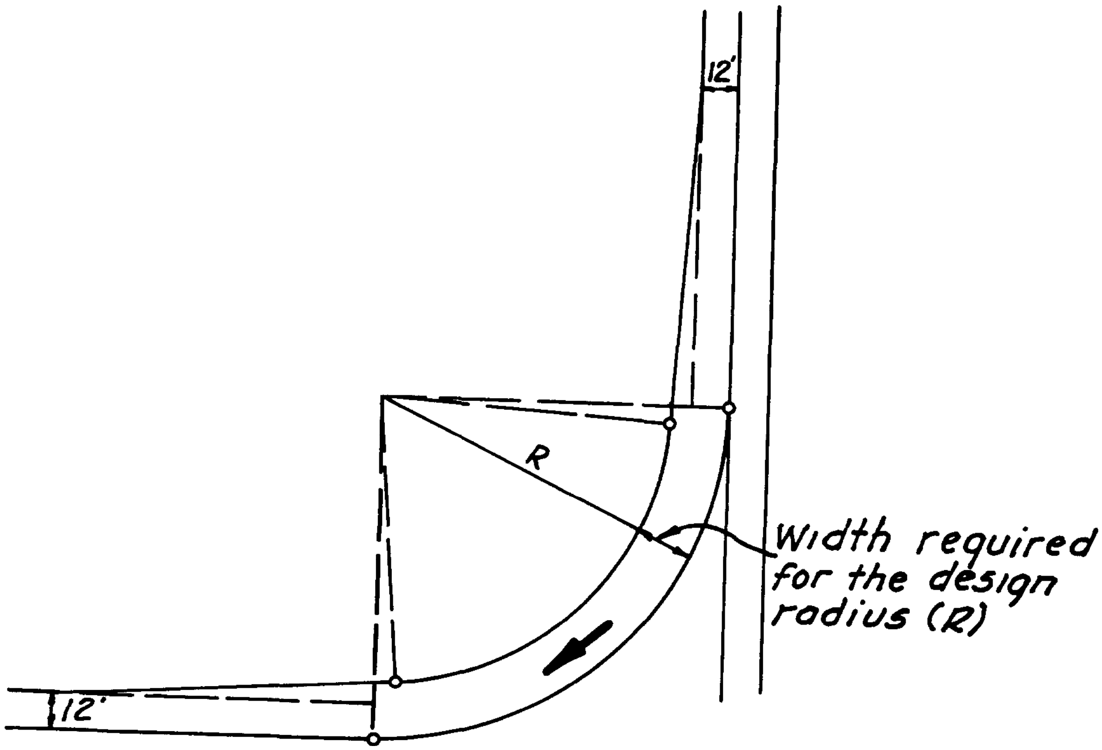
(G) PAVEMENT WIDTHS FOR TURNING ROADWAYS

The table shown on the next page outlines the design pavement widths for turning roadways. The design widths are classified for three types of operation noted as Case I, II and III. In each category the required width of pavement depends jointly upon the size of the design vehicle and upon the curvature of the turning roadway. The table is a practical design guide for intersection pavements, considering combinations of separate design vehicles.

Widths shown for Case I are used for minor turning movements and for moderate turning volumes where the connecting roadway is relatively short. The chance of a vehicle breakdown is remote under these conditions but one of the pavement edges preferably should have a mountable curb or be flush with the shoulder.

Standard Index No. 5073-X, "Standard Details for Ramp Terminals, " details the pavement width requirements for ramps at interchanges.

The following sketch illustrates the desired method for developing the additional widening at turning roadways.



DESIGN WIDTHS OF PAVEMENT FOR TURNING ROADWAYS

Radius on inner edge of pavement (feet)	Pavement Width in Feet								
	Case I One-lane, one-way operation - no provision for passing			Case II One-lane, one-way operation-with provision for passing a stalled vehicle			Case III Two-lane operation - either one-way or two-way		
				Design Traffic Condition					
	A	B	C	A	B	C	A	B	C
50	18	18	23	23	25	29	31	35	42
75	16	17	19	21	23	27	29	33	37
100	15	16	18	20	22	25	28	31	35
150	14	16	17	19	21	24	27	30	33
200	13	16	16	19	21	23	27	29	31
300	13	15	16	18	20	22	26	28	30
400	13	15	16	18	20	22	26	28	29
500	12	15	15	18	20	22	26	28	29
Tangent	12	15	15	17	19	21	25	27	27
	Width Modification Regarding Edge of Pavement Treatment								
No paved shoulder	None			None			None		
Mountable curb	None			None			None		
Barrier curb.									
one side	Add 1'			None			Add 1'		
two sides	Add 2'			Add 1'			Add 2'		
Paved shoulder, one or both sides	None			Deduct paved shoulder width, minimum roadway pavement width as under case I			Deduct 2' where paved shoulder is 4' or wider		

Traffic Condition A - predominately passenger with some consideration for SU vehicles (Small volume of trucks).

Traffic Condition B - SU governs design with some consideration for semi-trailers (Moderate volume of trucks, 5% to 10% of total traffic).

Traffic Condition C - WB40 & WB50 vehicles govern design (high volume of trucks).

(H) SPEED CHANGE LANES

A speed change lane is an auxiliary lane, including tapered area, primarily for the acceleration or deceleration of vehicles entering or leaving the through traffic lane. The preferred design for speed change lanes at interchange terminals is illustrated in Standard Index Drawing No. 5073-X, "Standard Details for Ramp Terminals."

Acceleration and deceleration lanes should be provided at important intersections on high speed, high volume highways and at minor intersections if the absence of such lanes would result in undue forced speed reduction of a significant amount of through traffic.

Where speed and traffic conditions permit, the directional type of speed change lane, consisting of a long taper, is preferred. When parallel lanes are constructed as speed change lanes, they should be at least 10 feet and preferably 12 feet in width. The full highway shoulder width is not necessary adjacent to speed change lanes.

DECELERATION LANES

Deceleration Lanes should be designed to provide a clear indication to the driver of the point of departure from the through lanes. A definite angular departure is recommended.

A tapered deceleration lane, departing from the through lane at an angle of 4 or 5 degrees, provides a direct path to the intersecting ramp or roadway. This design can be used for the majority of Florida's interchanges and intersections.

A parallel additional lane, combined with a flat angle, may be desirable for the connection to an exit ramp or roadway where the following conditions exist

a. Exceptionally heavy traffic volumes requiring a 2-lane exit ramp or roadway.
b. An abnormally large number of trucks.
c. The design speed of the exit ramp or roadway requires that additional deceleration length be provided.

ACCELERATION LANES

The recommended design for acceleration lanes in Florida is a uniform taper, 50:1 on Interstate highways and from 20:1 to 50 1 on other major highways. The minimum allowable pavement width at the beginning of the taper is 12'.

At intersections with high volume roads, long acceleration lanes are desirable to enable entering vehicles to merge with the through traffic without being required to stop or reduce speed unduly. When designing the intersection, the designer should determine if an acceleration lane length greater than the minimum requirement is necessary to satisfactorily merge the traffic.

The merging length is that portion where the acceleration lane is contiguous to the through traffic lane and, depending upon the design, it may be nearly all or only a small part of the length of the acceleration lane. The combined volume on the through lane and a single lane joining ramp (acceleration lane) that merge cannot exceed 1000 to 1200 equivalent passenger vehicles per hour at stop and go speeds, or about 1500 such vehicles if the design is such that speeds of 35 MPH or more can be maintained by the merging vehicles. If merging speeds in the desired range of 35 to 40 mph are to be maintained, the condition is nearly the same as a weaving section and a merging length of 300 to 600 feet is necessary. With a shorter merging length, it may be possible to accomplish the merging of comparatively high volumes but the merging speeds will be lower.

CHARTS

The following two charts outline (1) the minimum design lengths for speed change lanes and (2) necessary adjustments of the lengths due to the grade.

DESIGN LENGTHS OF SPEED CHANGE LANES
Flat Grades - 2 Percent or Less

Design speed of turning roadway curve, mph		Stop condition	15	20	25	30	35	40	45	50
Minimum curve radius, feet			50	90	150	230	310	430	550	690
Design speed of highway mph	Length of taper, feet	Total length of DECELERATION LANE, including taper, feet. All main highways								
40	190	325	300	275	250	200	-	-	-	-
50	230	425	400	375	350	325	275		-	-
60	270	500	500	475	450	425	400	325	300	-
65	290	550	550	525	500	475	450	375	325	
70	300	600	575	550	550	525	500	425	400	350
Design speed of highway mph	Length of taper, feet	Total length of ACCELERATION LANE, including taper, feet:								
40	190	-	325	250	225	-	-	-	-	-
50	230	-	700	625	600	500	400	-	-	-
60	270	-	1125	1075	1000	900	800	600	400	-
70	300	-	1550	1500	1400	1325	1225	1000	825	575

RATIO OF LENGTH OF SPEED CHANGE LANE ON GRADE TO LENGTH ON LEVEL

DECELERATION LANE

Design Speed of Highway mph	Ratio	
All	3 -4% upgrade 0.9	3 - 4% downgrade 1.2
All	5 - 6% upgrade 0.8	5 - 6% downgrade 1.35

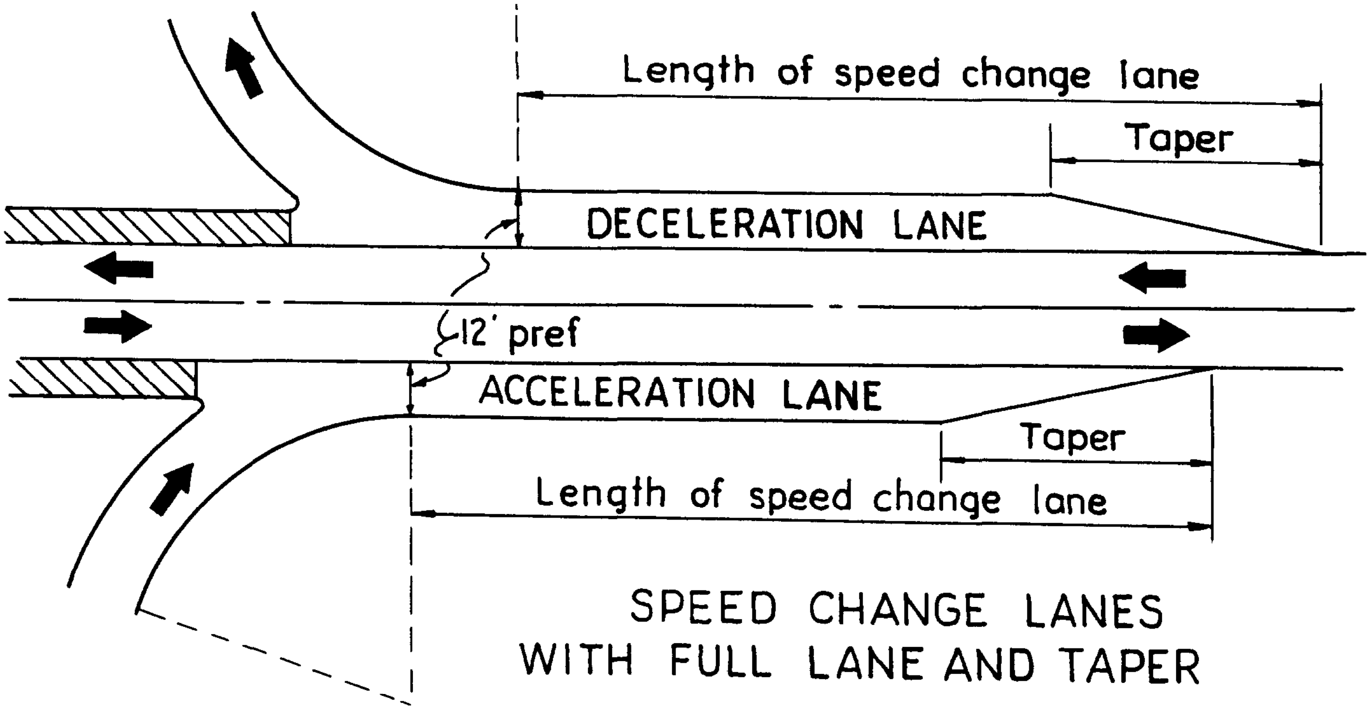
Ratios in this table multiplied by the values in the preceding table give the length of speed change lane for the respective grade.

ACCELERATION LANE

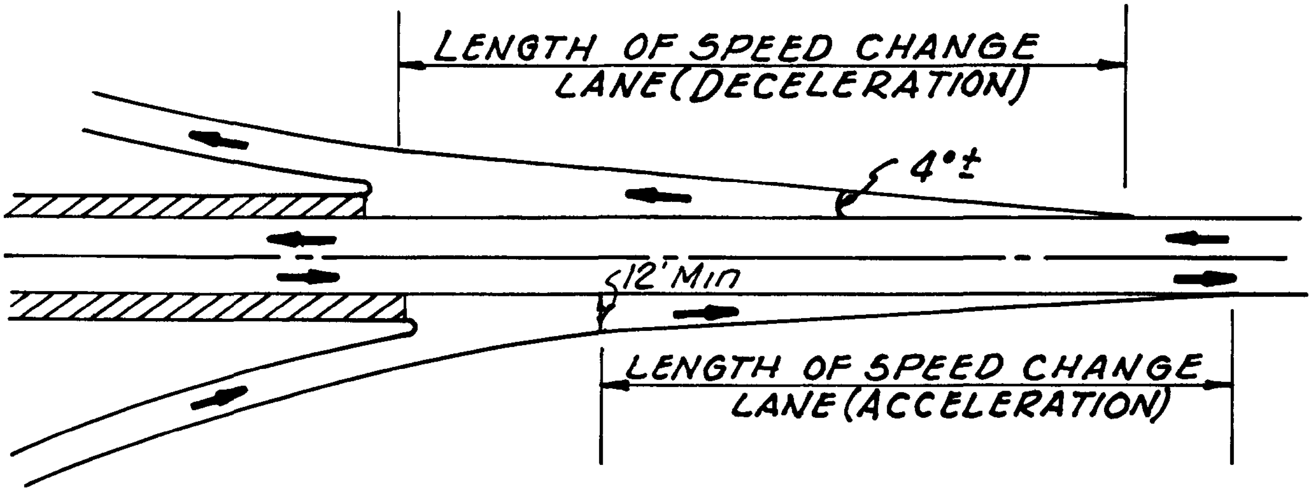
Design Speed of Highway mph	Design Speed of Turning Roadway, mph				
	20	30	40	50	All speeds
	3-4% upgrade				3-4% downgrade
40	1.3	1.3	-	-	0.7
50	1.3	1.4	1.4	-	0.65
60	1.4	1.5	1.5	1.6	0.6
70	1.5	1.6	1.7	1.8	0.6
	5-6% upgrade				5-6% downgrade
40	1.5	1.5	-	-	0.6
50	1.5	1.7	1.9	-	0.55
60	1.7	1.9	2.2	2.5	0.5
70	2.0	2.2	2.6	3.0	0.5

SKETCHES

The following sketches illustrate the measurement of speed change lanes.



SPEED CHANGE LANES
WITH FULL LANE AND TAPER



SPEED CHANGE LANES
WITH TAPER ONLY

(I) DESIGN FOR LEFT TURN MOVEMENTS

Control Radii for Left Turns

The design control radii for left turning vehicles shall be

LEFT TURN CONTROL RADII			
Control Radius, feet	40	50	75
Design Vehicles Accommodated.			
Predominant	P	SU	WB-40
Occasional	SU	WB-40	WB-50

Left Turn Storage Lanes

On Florida's major highways, left turn storage lanes are provided at all major intersections, if practical. The required storage lengths required for unsignalized intersections are tabled below. Signalization will alter these requirements, therefore the necessary lengths should be determined by analyzing each intersection individually.

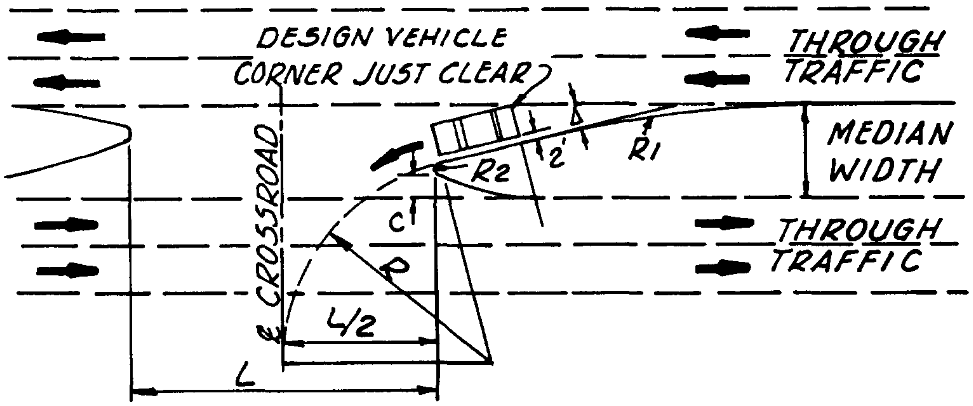
LENGTH OF LEFT TURN STORAGE					
DHV of Turning Vehicles	30	60	100	200	300
Required Storage Length, feet	25	50	100	175	250

A left turning volume of 200 vph or more cannot complete the turn without difficulty unless the volume of the opposing through traffic during the same hour is 800 vph or less. When turning volumes exceed this range, a special design or traffic signal control should be considered.

In municipal areas, the development of the left turn lane will be in accordance with Standard Index Drawing No. 5080-X. In rural areas, the standard speed change lanes (discussed in subchapter "H") should precede the storage lane, if practical

Left Turns Without Storage Lanes

On high speed divided highways in rural areas it is very dangerous to make left turn movements without providing a refuge area for the turning vehicle. At some intersections, the quantity of left turn traffic will not justify the expense of an added storage lane. If the left turn traffic (DHV) is less than 30 vph, the designs detailed below are recommended.



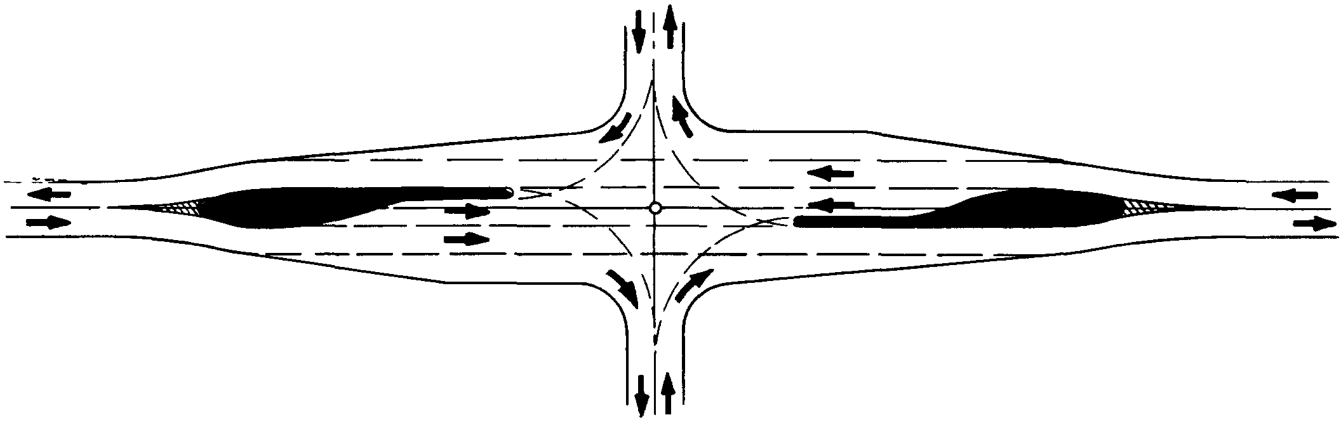
Median width (Ft.)			DIMENSIONS FOR DESIGN VEHICLE											
			P			SU			WB 40			WB 50		
C=2'	C=4'	C=6'	Δ Deg.	R_1 Ft.	L Ft.	Δ Deg.	R_1 Ft.	L Ft.	Δ Deg.	R_1 Ft.	L Ft.	Δ Deg.	R_1 Ft.	L Ft.
17	19	21	6.2	310	86									
18	20	22	9.6	310	80									
20	22	24	17.0	200	68	6.9	310	85						
22	24	26				11.0	310	78	6.4	310	86			
24	26	28				15.5	310	71	8.8	310	82	7.9	310	83
26	28	30				20.2	160	63	11.2	310	78	10.0	310	80
28	30	32							13.7	310	74	12.4	310	76
30	32	34							16.3	250	70	14.6	310	72
32	34	36										17.0	230	68

Note Revised figures based on 8.5 feet width of trucks
Preferably use C=6 feet. $R_1 = 310$ feet assumed as maximum, larger value may be used.

The designs shown above are not applicable to medians less than 17 feet. For medians wider than 36', the same basic design may be followed, using a larger offset "C" and a larger nose radius "R_2."

Left Turn Storage on Two-Lane Highways

Storage for left turn movements can be developed on undivided two-lane highways as illustrated in this sketch



(J) CHANNELIZING ISLANDS

Islands should be provided for effective channelization at intersections in cases where the size would be adequate. They should be raised and outlined by a mountable curb (Refer to Standard Drawing, Index No. 5080-X).

The minimum size of islands should be 50 square feet, preferably 75 square feet in area, 8 to 12 feet on the side if triangular and 4 feet wide with a 12 to 20-foot length if elongated Divisional islands or separators introduced at intersections on high speed highways should be a minimum of 100, preferably several hundred, feet in length.

In cases of islands of appreciable size, satisfactory channelization may be effected by curb delineation of the island noses only, grassing and plantings in the island will produce the necessary contrast

Island curbs should be offset two feet from the through traffic lane where no curb is provided on the approach pavement Noses should have radii of two feet and the approach noses offset six feet from the through traffic lane and three feet from the turning lane If preceded by an auxiliary lane, the nose offset from the through traffic lane should be 8 to 12 feet

(K) MEDIAN OPENINGS

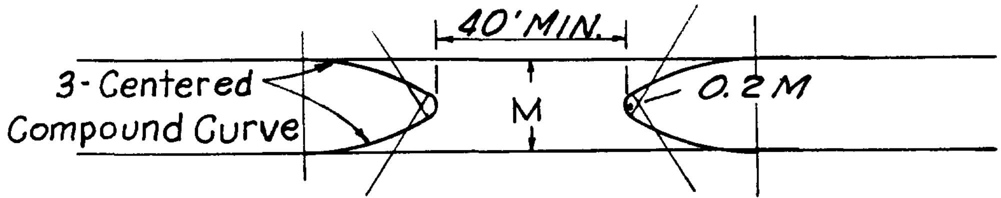
On divided highways with no limitation of access, median openings with left turn storage, and speed change lanes where appropriate and practical, are indicated for construction at all public roads and streets which are open and in use Median openings are also provided at major business sites and public service facilities Examples of such locations are drive-in theaters, shopping centers (which provide for off-street parking for a minimum of 100 cars), hospitals, schools, industrial complexes and cemeteries (industrial complexes refers to a large plant or installation which generates a great amount of traffic, not a series of individual businesses along the highway) No opening listed above, except where absolutely necessary, shall be spaced at a distance less than 330' from any other opening.

Between these required openings, intermediate openings are provided (a) approximately evenly spaced at intervals as near and not over one-half mile apart in rural areas devoid of development, (b) in rural type development approximately evenly spaced at intervals as near but not over 1,320 feet apart and (c) in urban type development approximately evenly spaced at intervals as near but not over 660 feet apart. Spacing as set forth above shall be measured from center to center of median openings. Factors of drainage may dictate exact locations of opening.

Median openings for city streets are to conform to details on Standard Drawings, Index No 5080-X It is seldom possible to provide speed change lanes for municipal construction due to the proximity of adjacent dedicated streets They are, therefore, not considered in this type construction except in special cases.

Intermediate median openings between intersections serve only as U-turn facilities. Regardless of the median width, the length of opening between median noses is 40 feet and the opening is designed for U-turns from both directions. Openings in medians 15 feet or less in width have semi-circular noses. For wider median widths, the noses are of the bullet type with these design radii

Median Width Ft. M	3-Centered Compound Curve Radii, Ft.
15 to 30	50 - 0.2M - 50
30 to 60	75 - 0.2M - 75
60 to 80	120 - 0.2M -120



SKETCH ILLUSTRATING ABOVE VALUES

(L) EXIT AND ENTRANCE TERMINALS FOR RAMPS AND ROADWAY JUNCTIONS

Exit and entrance ramp terminal treatment shall conform to details in Standard Drawing, Index No. 5073-X. At a major highway fork, the nose offset from each road is six feet. Where applicable, minimum taper lengths shall be in accordance with this table

MINIMUM LENGTH OF TAPER BEYOND AN OFFSET NOSE Through Traffic Lane Side	
Design Speed of Highway, mph	* Length of nose taper, feet, per foot, of nose offset
40	9
50	11
60	13
70	15

*Distance is measured along the lane line.

Pavement narrowing on turning roadways for widths wider than one lane to one-lane widths should be effected in a length at least ten, preferably 15, times the width reduction.

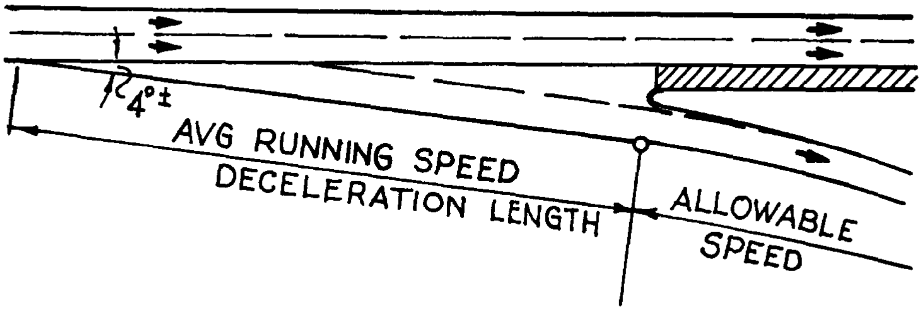
Design features of a ramp should conform to those of turning roadways, such as radii, curvature, cross slope, width, superelevation, shoulders, curbs, sight distance, etc. It generally is necessary to restrict speeds on loops to about **30** mph due to travel distance and available space.

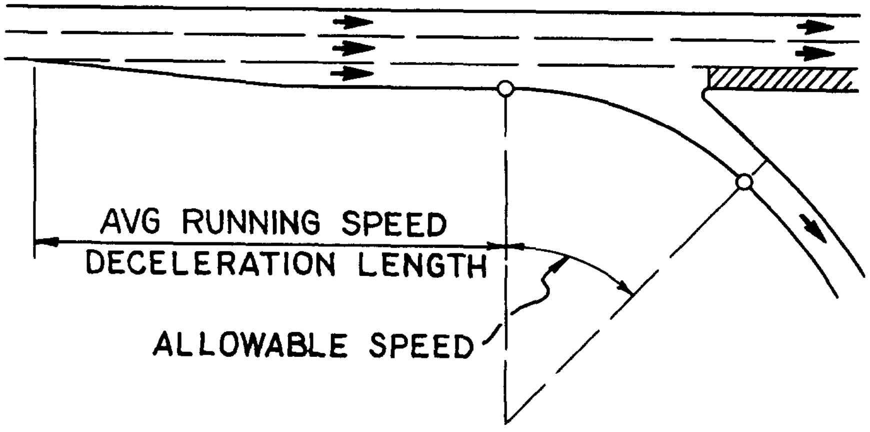
Ramps should be provided with adequate speed change elements. Gradients should be limited to 4 to 6% and lesser if heavy truck volume is high. Down grades up to 9% are allowable under extreme conditions if absolutely necessary.

GUIDE VALUES FOR RAMP DESIGN SPEED AS RELATED TO HIGHWAY DESIGN SPEED

Highway design speed, mph	30	40	50	60	65	70
Ramp design speed (mph)						
Desirable	25	35	45	50	55	60
Minimum	15	20	25	30	30	30
Corresponding minimum radius (Feet)						
Desirable	150	300	550	690	840	1040
Minimum	50	90	150	230	230	230

Desired speeds at critical points on ramps are illustrated in these sketches.





(M) RIGHT-OF-WAY

Prior to preliminary lay-out designs for intersections, complete information relative to existing right-of-way at the intersection site should be obtained and plotted and every effort made to provide an acceptable design within these limits. If additional right-of-way is necessary, it should be confined to the most economical takings. Of course, the primary concern is to provide a safe and adequate intersection design that will handle the expected traffic for many years in the future.

ROADWAY DESIGN MANUAL

CHAPTER 28

RECOMMENDATIONS FOR THE DESIGN OF LIMITED ACCESS HIGHWAYS & FREEWAYS

Chapters IX and X of the AASHO publication "A Policy on Geometric Design of Rural Highways, 1965" discusses the design of Interchanges and Intersections Every designer should familiarize himself with the contents of these chapters

In this Design Manual, it is intended to furnish additional information to assist the designer in preparing plans for Florida highways The procedures for (1) determining the desired design, (2) gaining necessary approvals, and (3) finalizing the design are discussed

(A) TYPES OF INTERCHANGES

The diamond type interchange is usually more economical than other types which could be used, and is the design most easily understood by the public Wherever conditions permit, this design should be used.

In the preliminary stages of design, it is impossible to propose diamond interchanges at all locations Traffic demands or terrain features may dictate a different interchange scheme. The designer should evaluate each case to determine the design that will adequately handle the anticipated traffic and provide the necessary safety features.

Other interchange types commonly used in Florida are the partial cloverleaf, the directional, the trumpet, and the wye (Y). The full cloverleaf interchange is not recommended for high density highways because of the unfavorable weaving conditions introduced between the loop ramps. If this type interchange is proposed, collector-distributor roads should be considered

(B) TRAFFIC ANALYSIS

Before selecting the interchange type, it is necessary to analyze the through and turning movements between the ramps and the intersecting roadway The analysis enables the designer to determine·

1 The number of lanes on the intersecting roadway.

2. The feasibility of providing left turn movements to and from the intersecting roadway

3. The requirements for signalization of the ramp intersections

Signal control should be considered for the ramp-crossroad intersections For an additional discussion of the capacity of at grade intersections refer to Chapter 20 of this manual.

The "Highway Capacity Manual, 1965" discusses the capacity analyses necessary for at-grade intersections These methods are recommended for studying ramp intersections in urban areas For interchanges located in rural areas, a simplified method has been developed for the analyses of the ramp-crossroad intersections When making the capacity analyses, schematic layouts of the intersections should also be prepared. These designs, prepared in conjunction with the capacity studies, will insure an adequate number of lanes at the intersections, a suitable arrangement of turning roadways, etc., regardless of whether signal control is initially used or not. In rural areas, particularly, it is preferable that signalization not be provided unless necessary at the time of opening to traffic An example problem of the simplified capacity analysis is located at the end of this chapter

For the Interstate Highway System and other Major Highways, a traffic strip map will normally be prepared Shown on the strip map will be the design traffic for the project being designed, crossroads where separations are proposed, and the through and turning movements at interchanges. Upon approval by the State Road Department and the Bureau of Public Roads, the traffic shown on the strip map may be used for design A sample traffic strip map is located at the end of this chapter

(C) APPROVALS REQUIRED DURING DESIGN STAGES

Design criteria for the interchanges and crossroads must be approved before the design proceeds beyond the preliminary stages From the design traffic data, the cross sectional elements of the crossroads and the concept of the interchanges can be determined

After this initial study, a field inspection should be scheduled to consider the proposed criteria relative to the existing terrain features At this time prints should be available showing the project centerline alignment, the crossroad alignment, the existing topography, the preliminary interchange studies and the cross sections. During the field review, the designer should decide:

1. Which road should overpass at the proposed separations.
2. Where proposed additional lanes on the cross roads should be constructed relative to the existing centerline
3. If any existing railroads, buildings, etc., may change the interchange concept.
4. If crossroad relocations will be necessary to provide an improved angle of crossing at the separations or diminish property damage

Using the information from both the traffic data and the field review as a guide, design criteria for the main roadway and crossroads will be selected. These criteria will be furnished to the designer after necessary approvals are granted by the BPR, if Federal Aid is involved. The designer may then proceed with his preliminary layouts and studies.

Preliminary layouts of the proposed interchanges and separations including profiles, must be approved before proceeding with the final design. Either the District Offices or the Road Design Section in Tallahassee will be assigned to supervise the project Necessary submittals should be made to the supervisory office. There they will be checked for traffic capacity, design procedure, and concept. Additional submittals may be requested before approval is granted.

Normally before the designer begins his design, the highway centerline alignment already has been established. Too often in the past, this alignment has been accepted without question. The designer should study the alignment relative to the terrain, subsoil condition, high water control, and profile grade, making improvements where necessary.

On divided highways, it is not always desirable to maintain a constant median width throughout the limits of the project. A variable median width and independent profile grades for each roadway are often both economically and aesthetically desirable in rural areas.

By spreading the roadways, the designer is able to.

1 Better fit the natural terrain conditions

2 Bypass undersirable features, such as sink holes, muck pockets, etc

3 Maintain the natural growth in the median.

4 Reduce borrow requirements by eliminating the normal median ditch in those areas where an embankment design is necessary

5 Provide a relief from the constant roadway section

When the designer has established the preliminary alignment and profile, a second field review should be scheduled All aspects of the design, including alignment, profile grade, and drainage, will be considered at this review After studying the proposed data relative to the existing conditions, the State Road Department and Bureau of Public Roads will approve the preliminary design, or offer recommendations for improvements Additional field reviews may be necessary before the final design is approved

When the final plans are completed, they should be submitted to the Road Design Section of the Department for review Upon the completion of the review, the plans normally will be returned to the designer for any corrections that are necessary Before acceptance of these corrected plans, they will again be reviewed by Road Department personnel

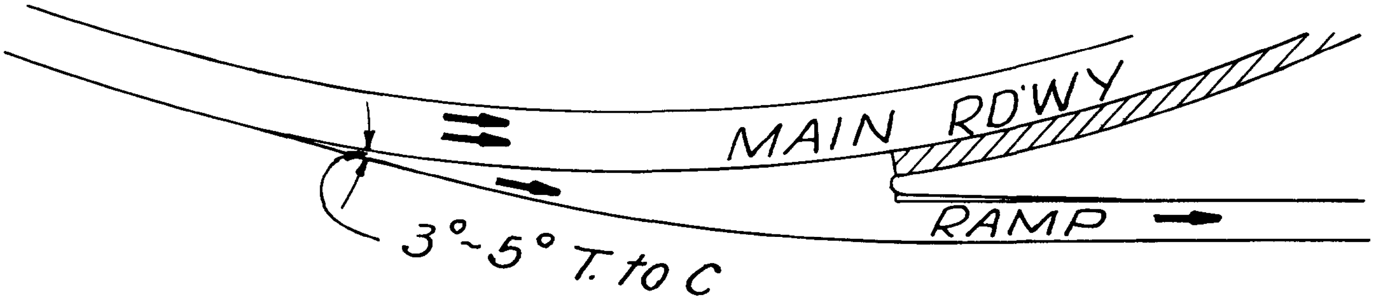
(D) POLICY FOR CROSSROAD CONSTRUCTION AT INTERCHANGES

Wherever practical, the interstate or major highway will overpass the cross road at interchange locations This design allows for the conservation of right-of-way as well as providing the necessary sight distance at the ramp intersections with the crossroads Overpassing the cross road with the major facility should not be accepted as the criterion for all interchanges Features special to a particular location may dictate the reverse design

At diamond interchanges where terrain conditions justify, consideration should be be given to taking the cross road over the major facility Careful study will be necessary to properly locate the ramp-cross road intersections See Chapter 27 for a detailed discussion of "Sight Distance at Ramp Terminals".
(For the remainder of this chapter, the discussions will consider only those cases where the interstate or major highway overpasses the cross road)

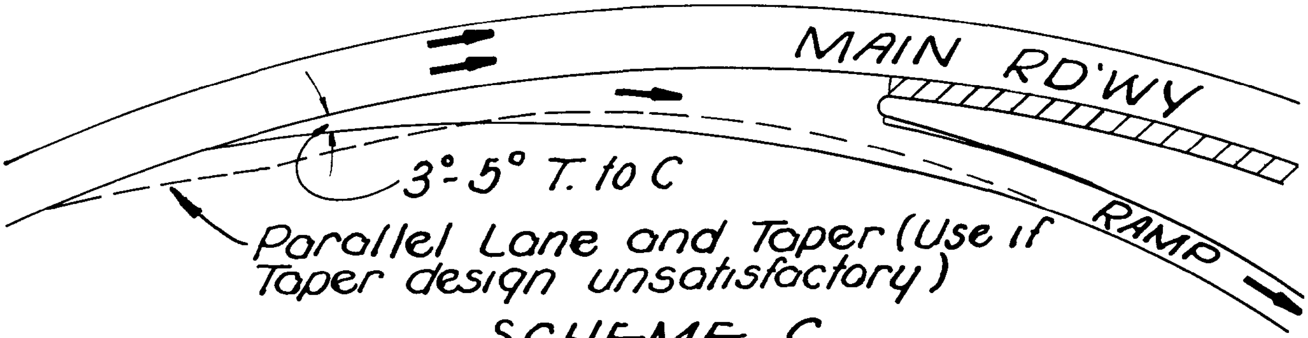
(E) RAMP TERMINALS AT INTERCHANGES

Standard Drawing, Index No 5073-X details the preferred ramp terminal designs for Florida Highways. The index considers only the condition where the ramps intersect the through lanes at a tangent section For those cases where the terminals are located on a curved section, the following designs are suggested

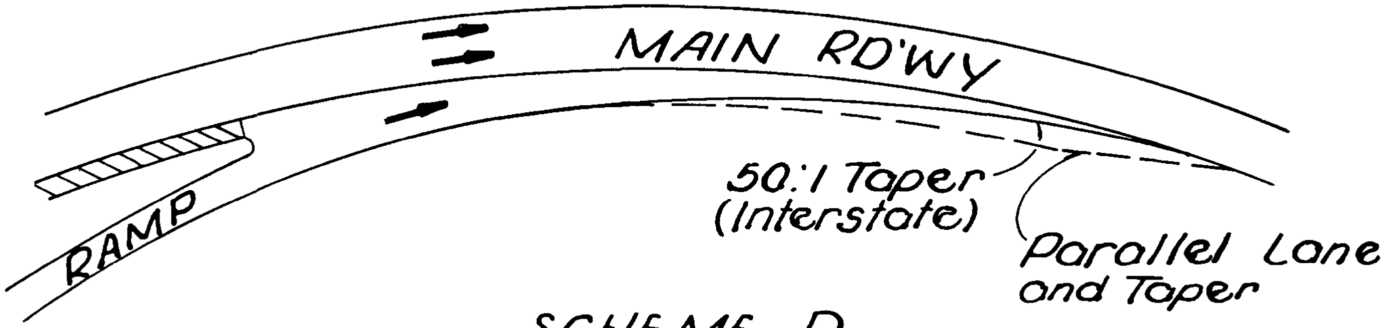


SCHEME A

SCHEME B



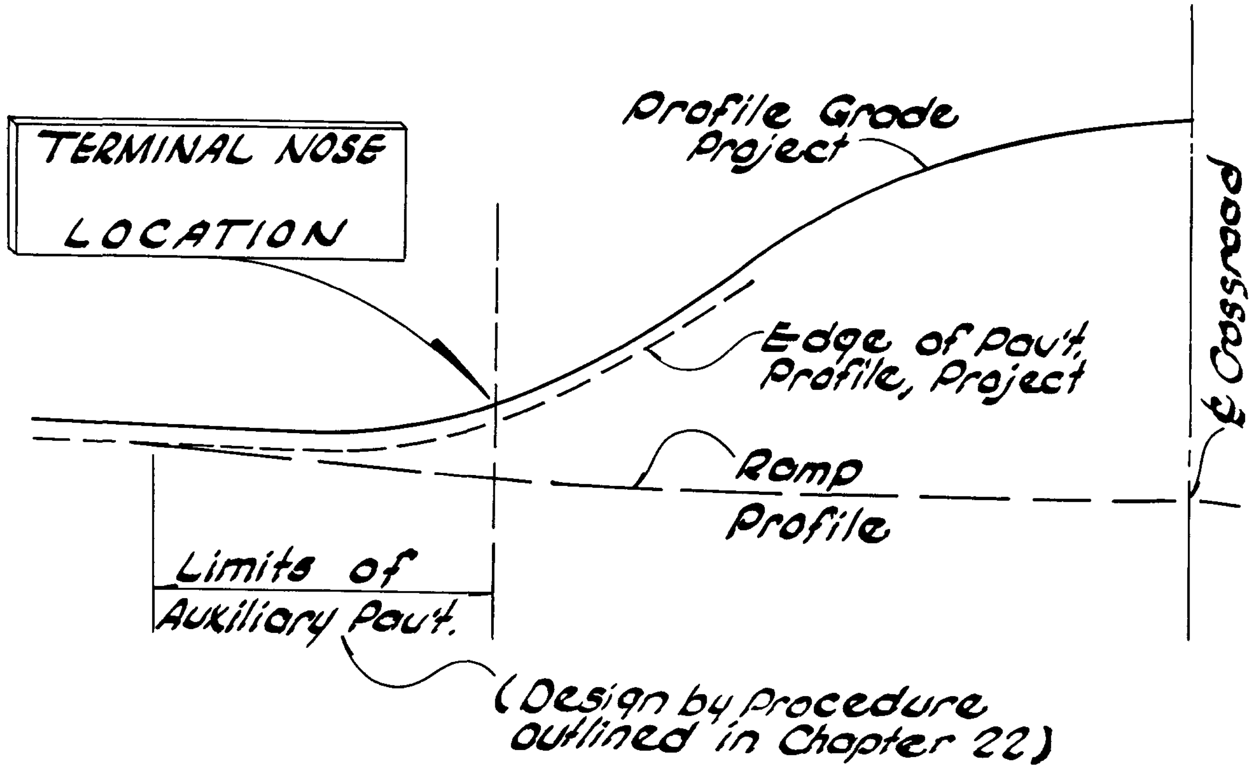
SCHEME C



SCHEME D

The development of the profile grades at the ramp terminals has been thoroughly discussed in Chapter 22 under the heading "Superelevation at Turning Roadway Terminals " By following the procedure outlined in that discussion, the designer can determine the relationship between the profiles of the through roadway and the ramps

Where diamond-type ramps are constructed, every effort should be made to provide a smooth connecting profile at the ramp terminals The following sketch details the preferred method for locating the ramp terminals relative to the profile grade of the through roadway



The terminal nose should be located at such a point on the sag vertical curve so as to avoid or minimize a dip in the ramp pavement edge profile The reverse must also be considered, the nose should not be located so high on the vertical curve that an obvious "hump" in grade will result The terminals for Diamond Interchanges can normally be located by this method without difficulty

When other types of interchanges are proposed, it is usually impossible to locate all the terminals as discussed above Alignment features such as loop design, directional connections, etc , will dictate the proper terminal locations

At most terminal locations, a curve is introduced on the ramp either within or just outside the limits of the auxiliary pavement This curve should be as "flat" as conditions will permit A flat ramp curve will provide easier transition to or from the speed-change lane, and will allow a smoother development of the edge of pavement profile

(F) RAMP INTERSECTIONS AT CROSSROADS

The desired locations for the ramp intersections at the crossroads may be determined from a combination of the following conditions·

1 Provide sufficient sight distance to safely turn from the ramp to the crossroad (See Chapter 27 for discussion)

2 Provide sufficient lateral clearance at median piers when developing storage lanes on the cross roads

3 Provide sufficient storage length for the design traffic turning from the cross road to the ramps

The conditions outlined above will establish the minimum distance that the ramp intersections may be located from the major facility In urban areas, it will usually be desirable to design for these minimum conditions Where right-of-way can be obtained more economically in rural areas, it is preferred to spread the ramps to provide a more open design

(G) DESIGN TO DISCOURAGE WRONG-WAY ENTRY AT RAMP INTERSECTIONS

Wrong-Way entry at ramp intersections can be practically eliminated if the designer considers three basic steps in his design These steps are·

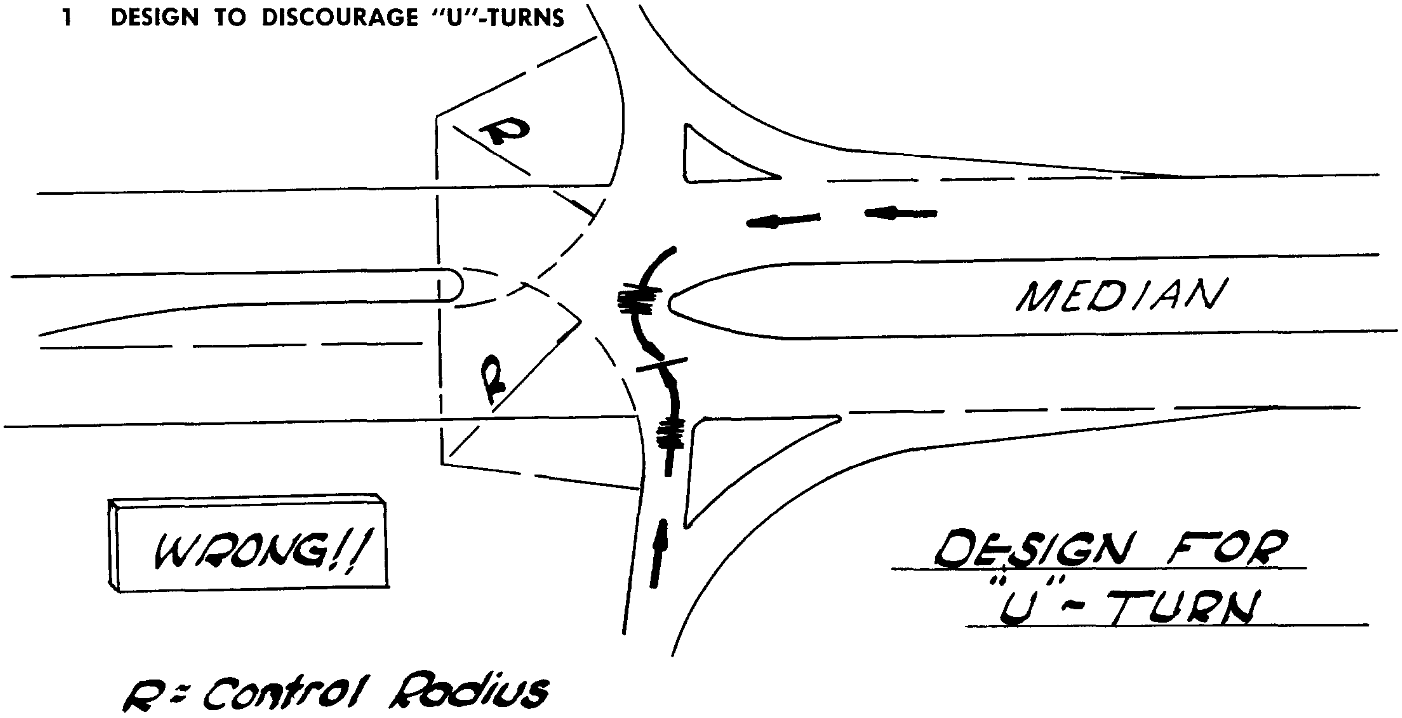
1 Discourage "U" - Turns on the cross road at ramp intersections

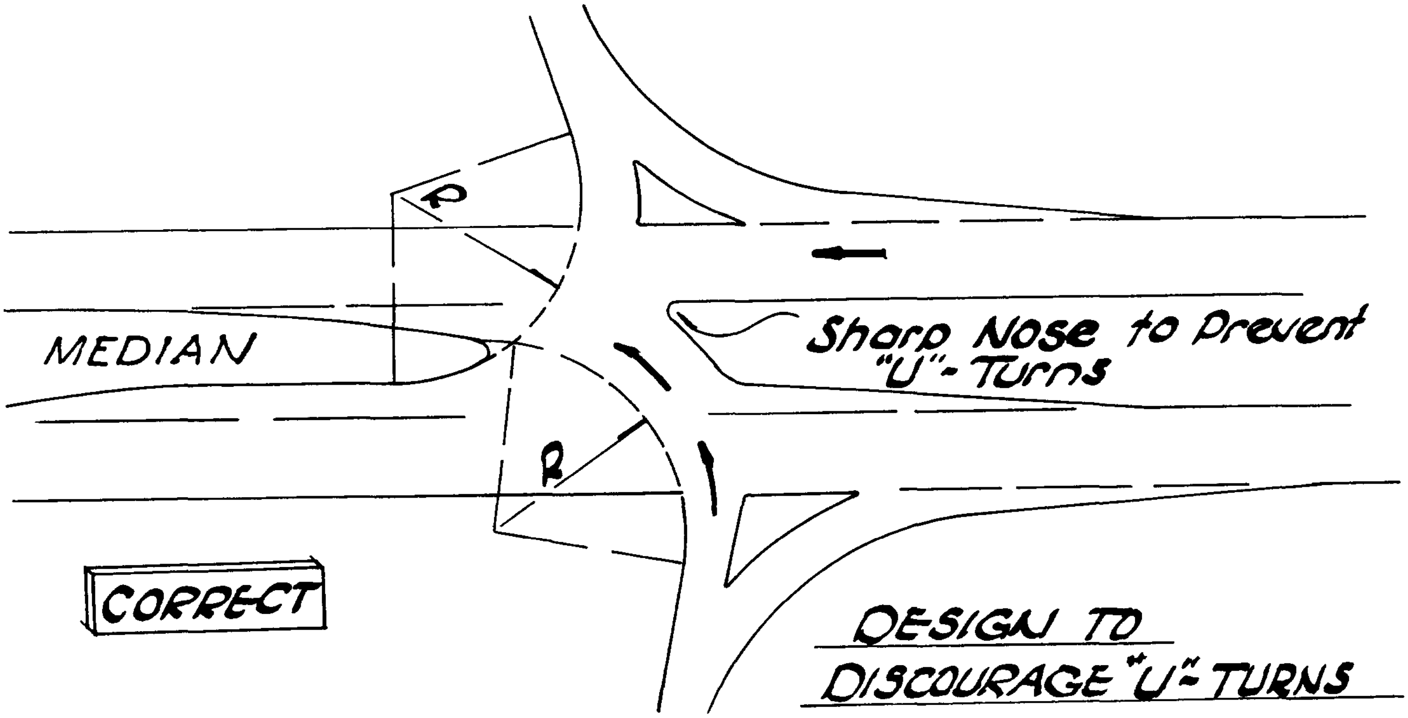
2 Design the ramp intersections where it will be extremely difficult to enter the improper ramp

3 Provide a median on the cross road and directional islands on the ramps

The following sketches illustrate the wrong way and the preferred way for designing ramp intersections

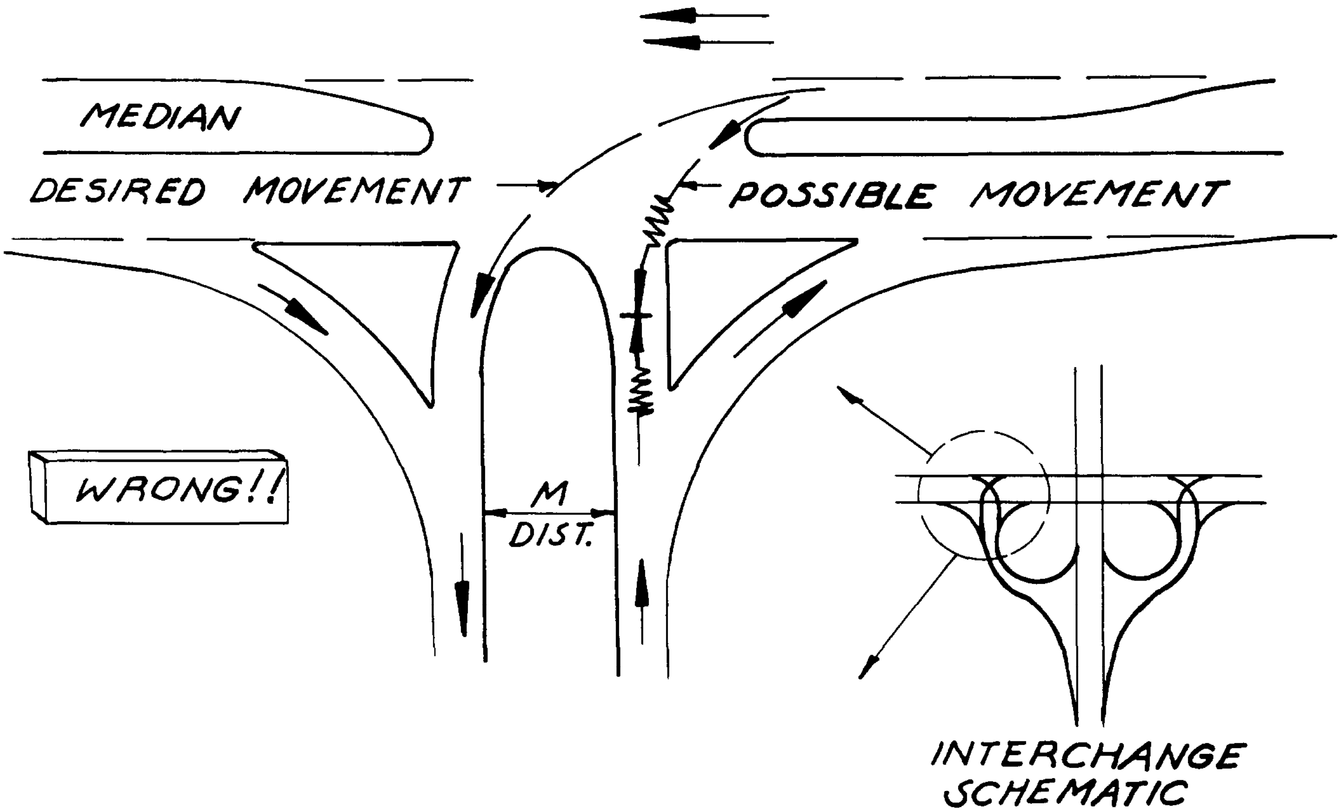
1 DESIGN TO DISCOURAGE "U"-TURNS

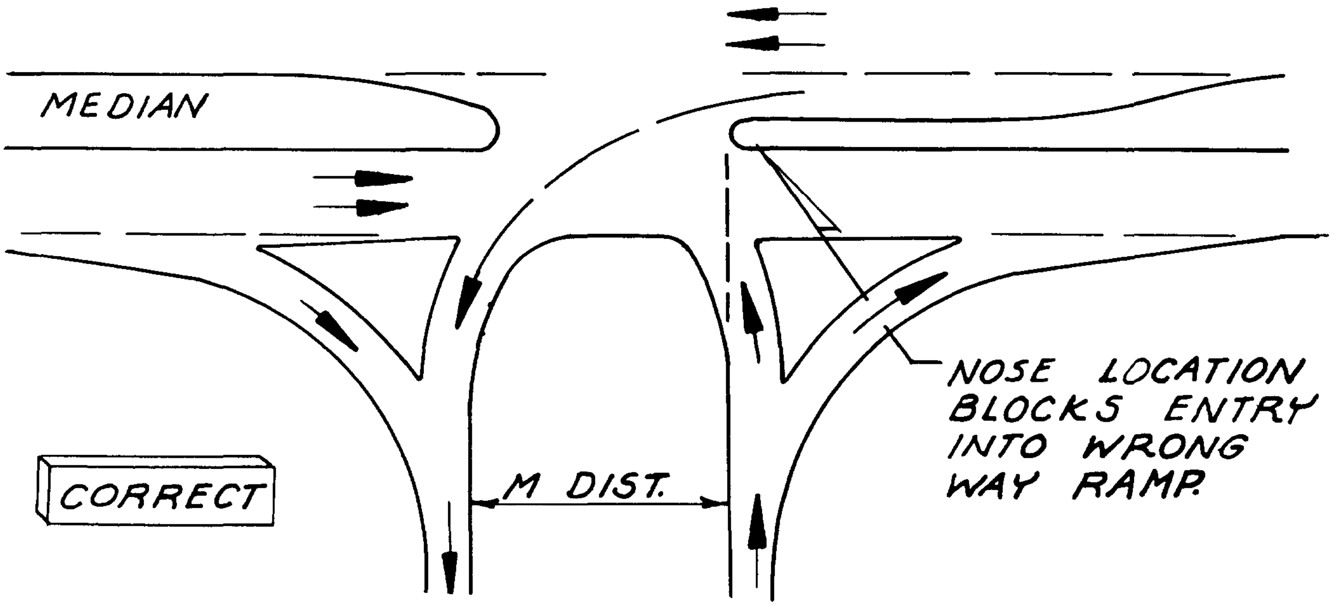




You will notice in the "correct" scheme a sharp median nose is provided to prevent wrong way entry to ramp In order to develop this design properly, it is sometimes advantageous to stagger the ramp intersections By staggering the ramps, the required opening for the left-turn movements to and from the cross road can be maintained without altering the desired median design

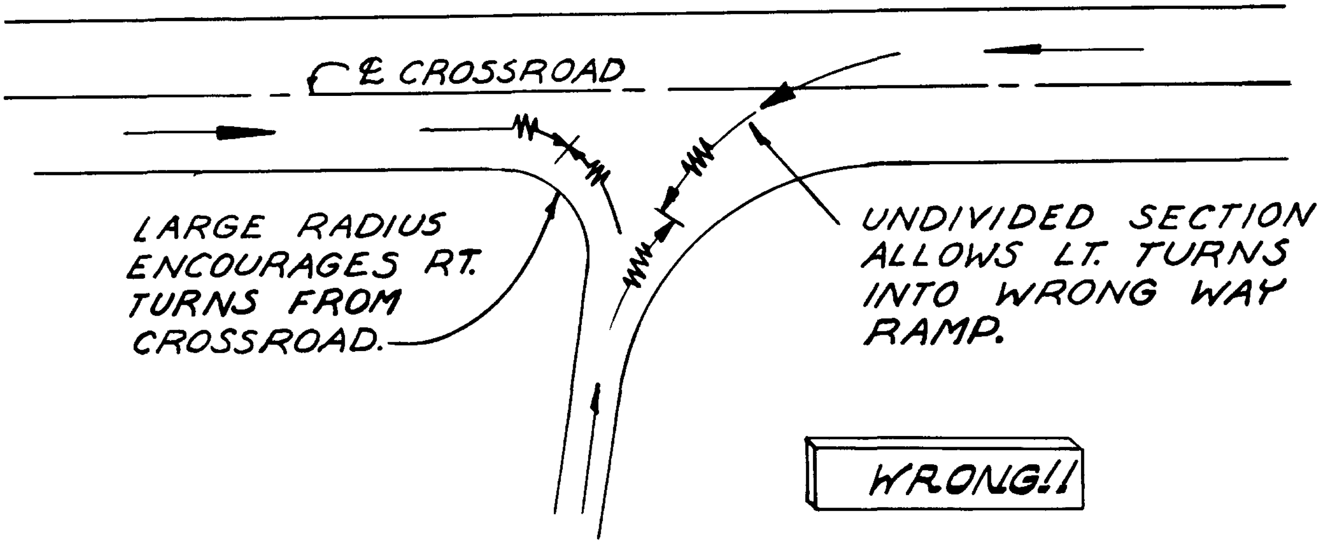
2 DESIGN TO MAKE IMPROPER RAMP ENTRY DIFFICULT





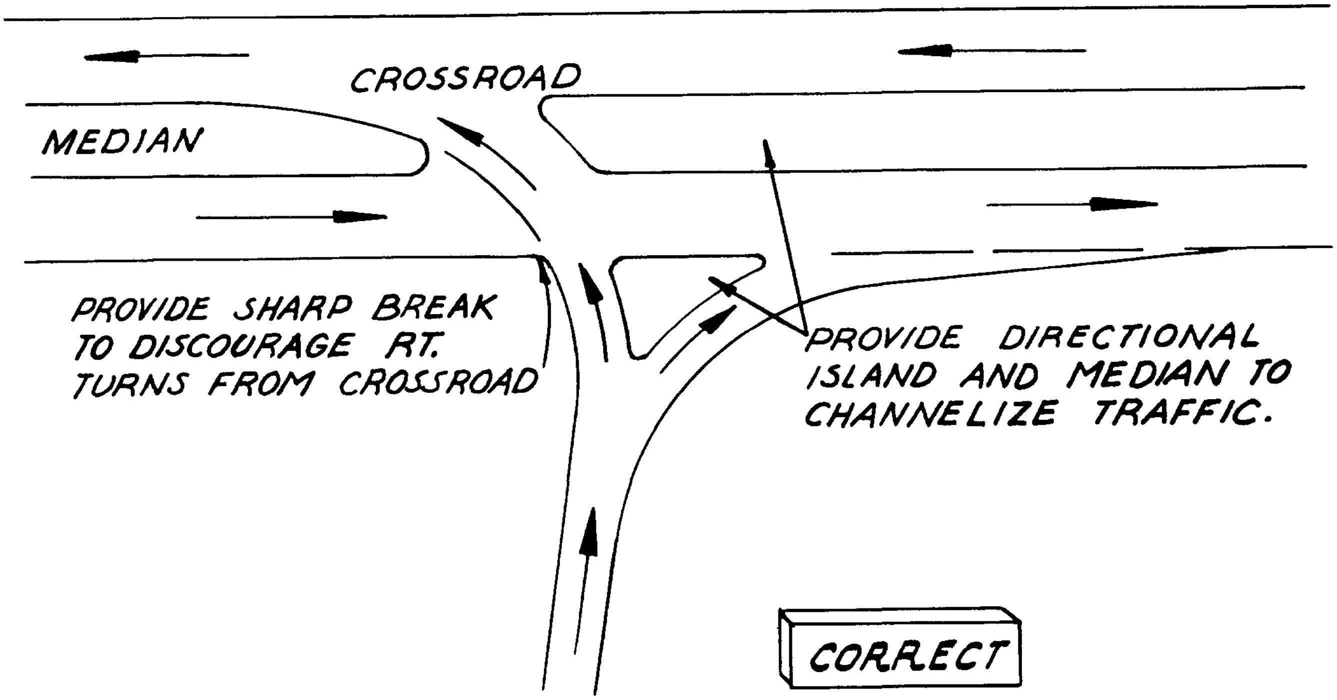
The illustrated interchange is normally constructed where an obstruction (railroad, etc) prevents the development of ramps in the other quadrants The "wrong" design will usually handle the design vehicle satisfactorily, but will allow smaller vehicles to easily turn into the improper ramp At night this design is particularly hazardous due to the limited visibility

3 PROVIDE MEDIAN AND DIRECTIONAL ISLANDS



LARGE RADIUS ENCOURAGES RT. TURNS FROM CROSSROAD.

UNDIVIDED SECTION ALLOWS LT. TURNS INTO WRONG WAY RAMP.



PROVIDE SHARP BREAK TO DISCOURAGE RT. TURNS FROM CROSSROAD

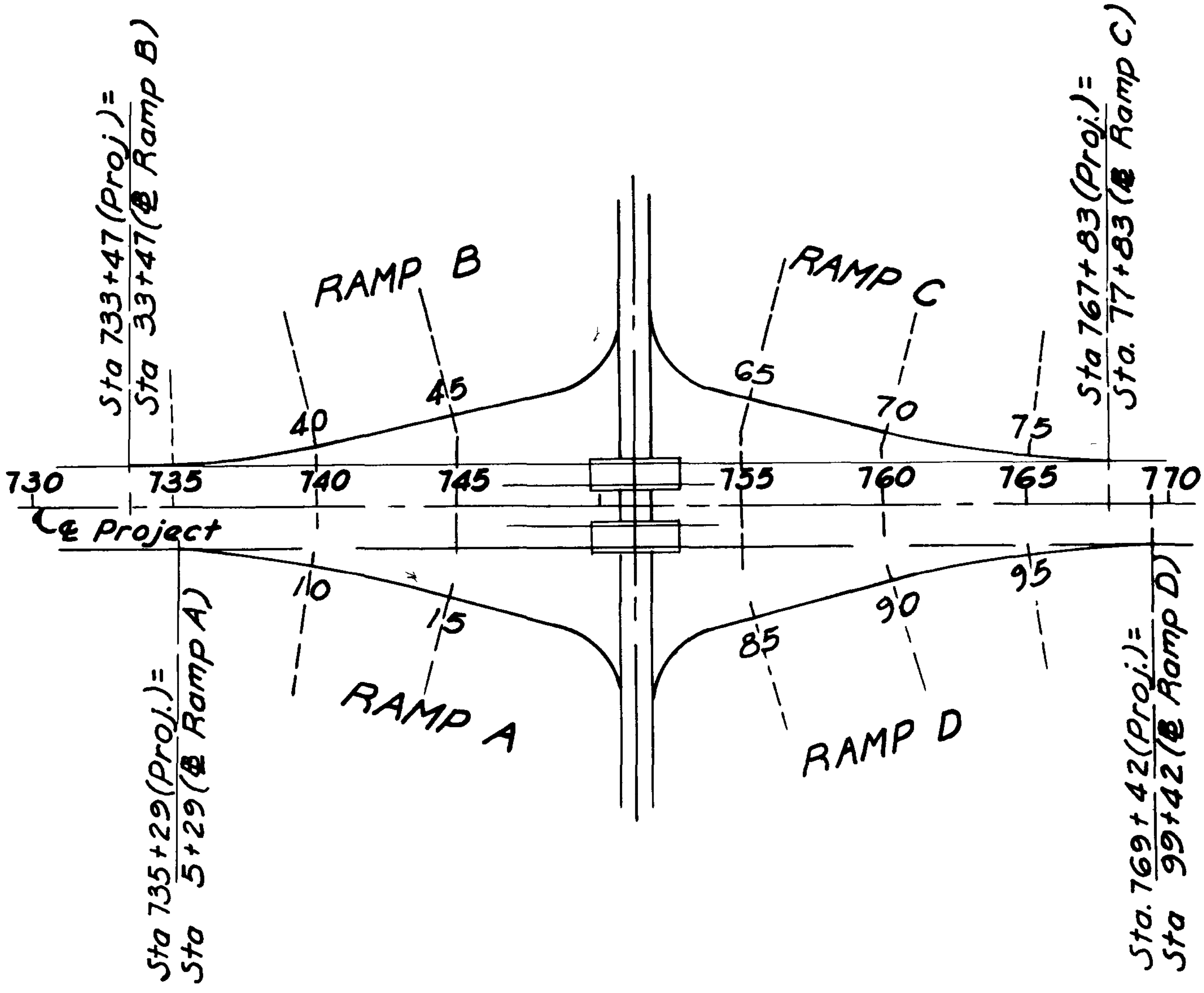
PROVIDE DIRECTIONAL ISLAND AND MEDIAN TO CHANNELIZE TRAFFIC.

Through the interchange limits, a median normally will be provided with the crossroad typical section, regardless of the number of traffic lanes Directional islands will be provided at all ramp intersections

(H) STATIONING THE RAMPS

After the ramp terminals and intersections are located, the ramp alignment can be determined The preferred method for stationing the ramps is in the same direction as the stationing on the project This procedure reduces the confusion which often results when the project and ramp stations are in opposite directions

When establishing the ramp stations it is also desirable to coordinate those stations with the stationing on the project The plotting of the cross sections and the earthwork computations will be much easier if the stations are properly coordinated, particularly for the ramps of a Diamond Interchange A suggested method for stationing the ramps is detailed below Note the ease in developing the cross section pattern when this scheme is used



(I) RAMP PROFILES

The development of the ramp profile within the terminal area is discussed in Chapter 22 and Subchapter E of this chapter This procedure will establish the desired edge of pavement profile within the limits of the auxiliary pavement

The next step in determining the ramp profile is to consider the requirements at the ramp-cross road intersection Knowing the radius of the intersecting curve, the range of allowable superelevation rates can be determined from the chart in Chapter 22 entitled "Superelevation Rates for Intersection Curves " A rate within the allowable range should be selected which will provide the desired cross slope difference If possible, the selected rate should be in the upper one half of the allowable range From this data, an edge of ramp pavement profile, relative to the cross road, can be developed within the limits of the ramp-crossroad intersection

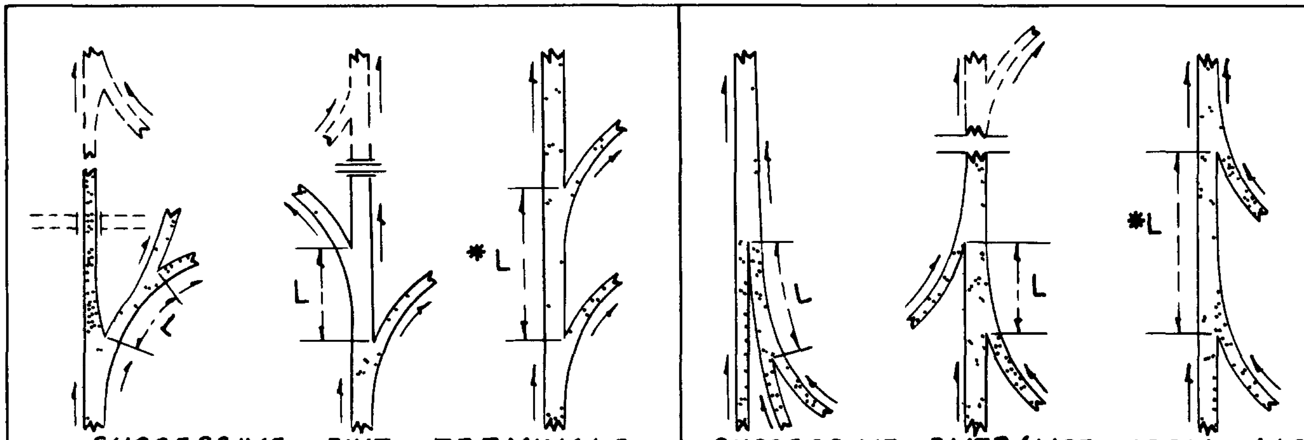
Having the profile controls at each end of the ramp, the remainder of the ramp profile can then be completed This portion of the profile should be designed in accordance with standards established for the design speed and alignment Upon completion of the ramp profile, the designer should analyze the design to determine if any dips and rolls can be eliminated

(J) SUCCESSIVE RAMP TERMINALS

At interchanges there are frequently two or more ramp terminals in close proximity along the through lanes In some interchange designs, ramps split into two separate ramps or combine into one ramp Minimum and desirable distances between successive ramp terminals are shown in the sketch and table on the next page In most cases the distances required to provide full length speed change lanes will govern The distances shown in the table are based on a decision and maneuver time of 5 to 10 seconds In most cases for rural situations the "desirable" values shown in the table should be the minimum values, and preferably greater distances should be provided in order to allow adequate distances for giving drivers directional information with signs In particular, certain minimum distances are required between successive exit terminals The minimum distances suggested for satisfactory signing are 1000 feet between exits on a freeway (center and right of Figure A in sketch) and 600 feet between a freeway exit and an exit on a collector-distributor road (left of Figure A)

PLATES

Refer to Plates 31, 32 and 35 for suggested methods in preparing plans for an interchange layout, terminal details and profiles, and ramp profiles

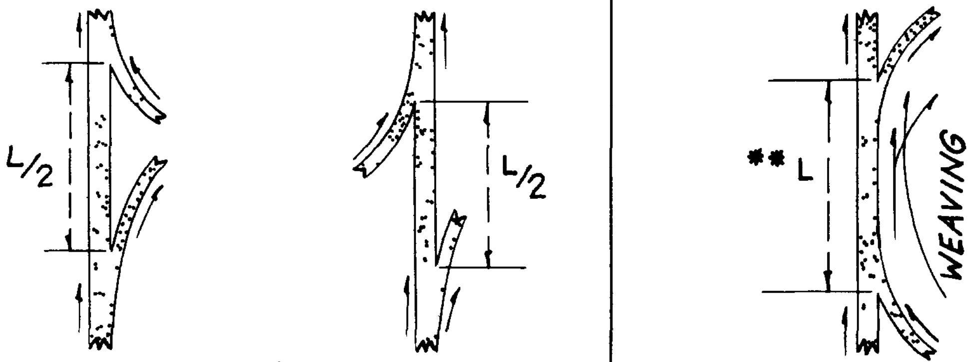


SUCCESSIVE EXIT TERMINALS

—A—

SUCCESSIVE ENTRANCE TERMINALS

—B—



EXIT TERMINAL FOLLOWED BY ENTRANCE TERMINAL

—C—

ENTRANCE TERMINAL FOLLOWED BY EXIT TERMINAL

—D—

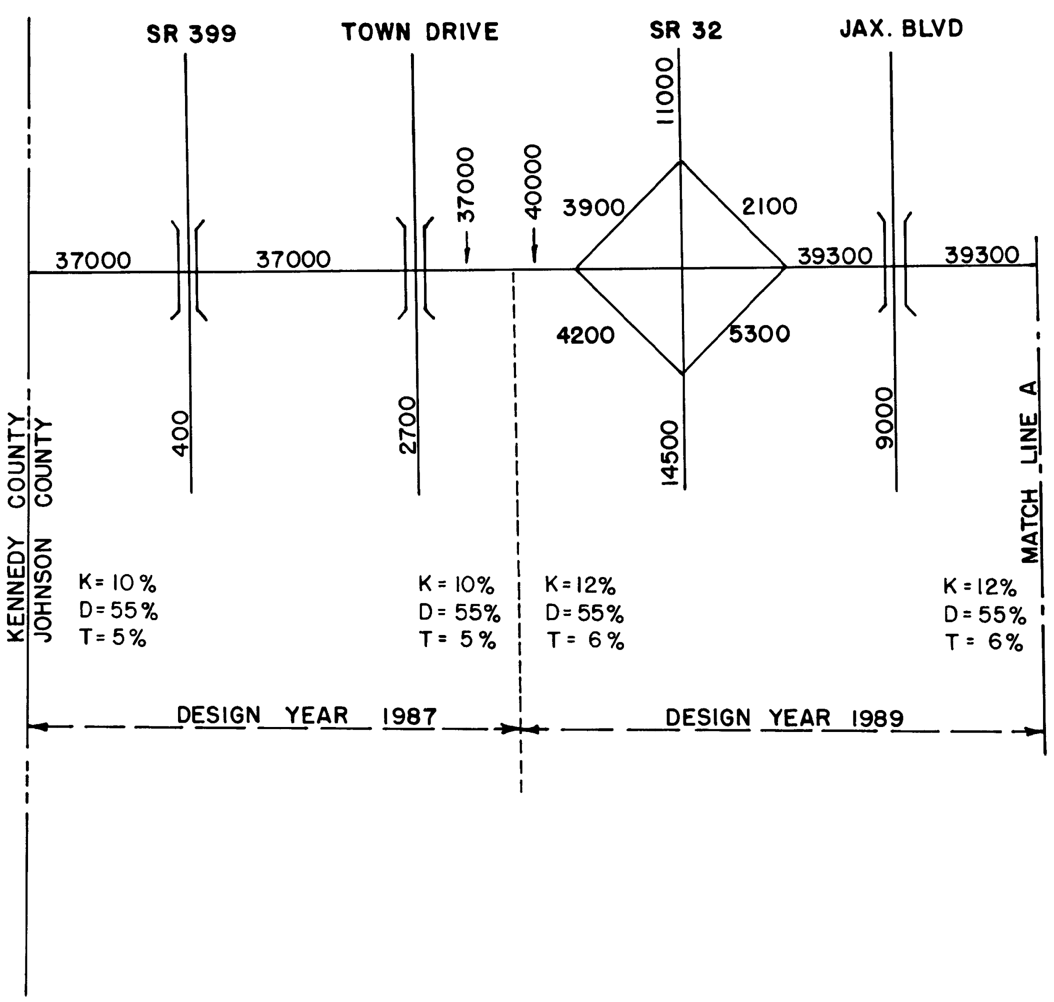
ARRANGEMENTS FOR SUCCESSIVE RAMP TERMINALS

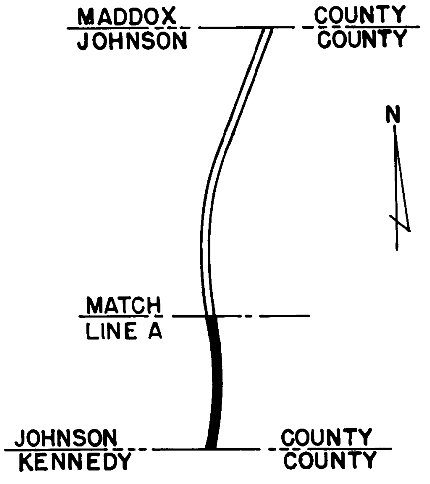
L as in table but less than length required for maneuvering or speed change

' L as in table but not less than required weaving length.

DISTANCE BETWEEN SUCCESSIVE RAMP TERMINALS

DESIGN SPEED (MPH)	30 OR LESS	40 TO 50	60 TO 70	80
AVG RUNNING SPEED (MPH)	23 TO 28	36 TO 44	52 TO 58	64
Distance L (Feet)				
Minimum	200	400	500	900
Desirable	400	700	900	1200





FLORIDA STATE ROAD DEPARTMENT
TRAFFIC AND PLANNING DIVISION

DESIGN YEAR ADT - TWO-WAY VOLUMES

ROUTE	COUNTY	DISTRICT
I - 99	JOHNSON	VII

Detailed By	Date	Checked By	Date
M J T	3-67	R L O	3-67

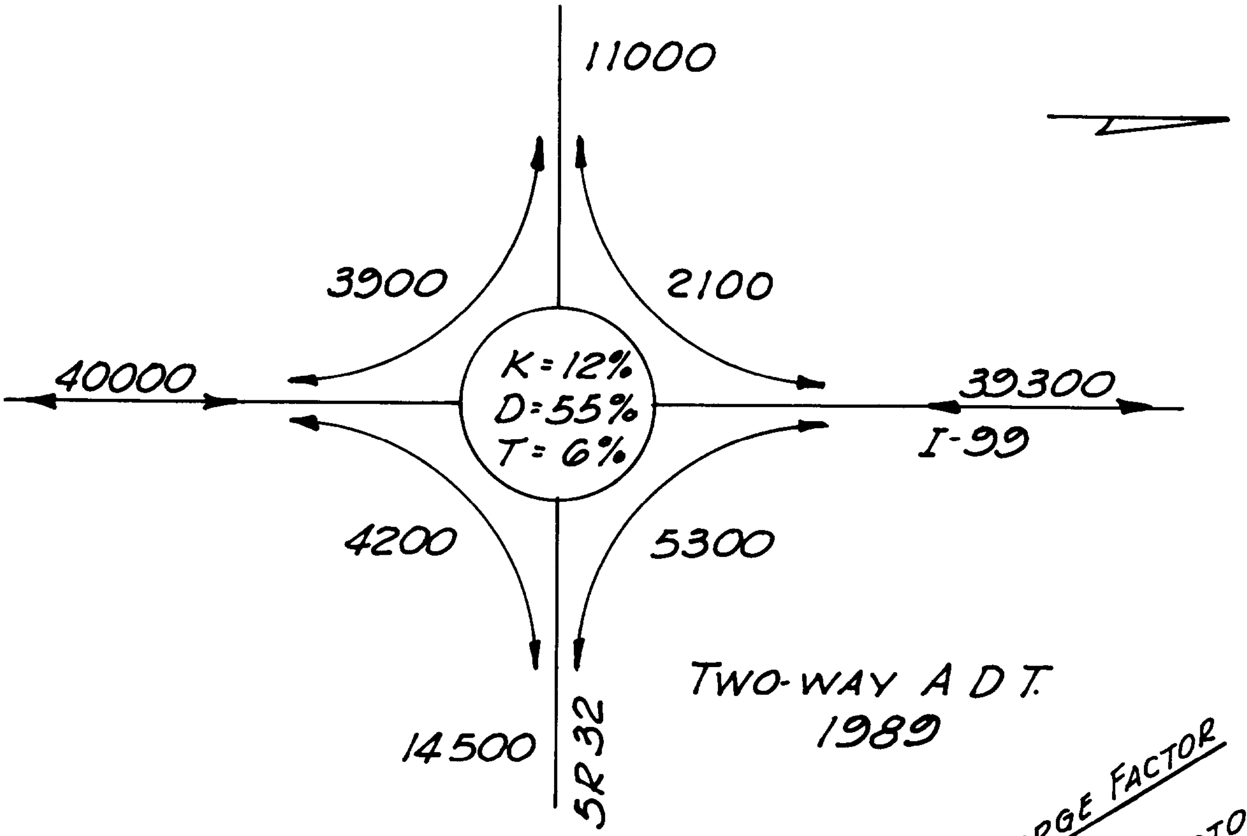
REVISIONS

Date	Description	Date	Description
		Sheet No 1 of 1	File No

TRAFFIC STRIP MAP

3-28-13

ANALYSIS OF INTERCHANGE
I-99 AT SR 32

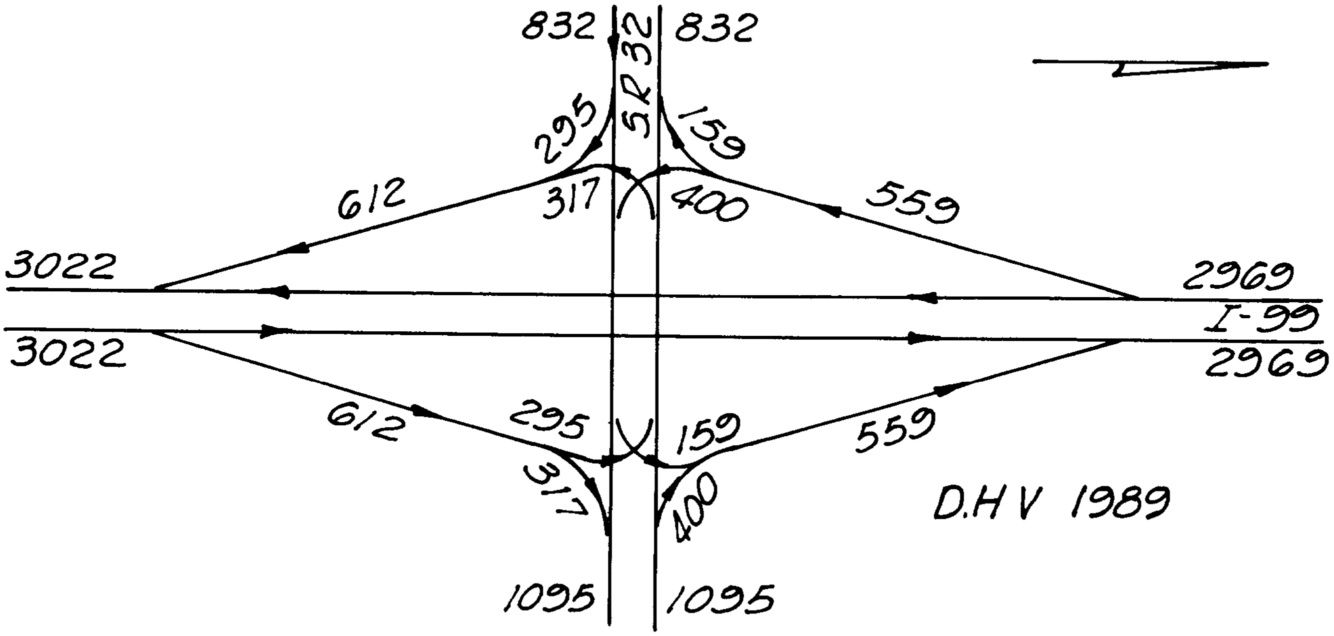


TWO-WAY A D T.
1989

$$D\ H\ V = A\ D.T. \times D \times K \times (1+T) \times \overset{\text{PEAK SURGE FACTOR}}{1\ 2} \times \overset{\text{A DT FACTOR}}{0.9}$$

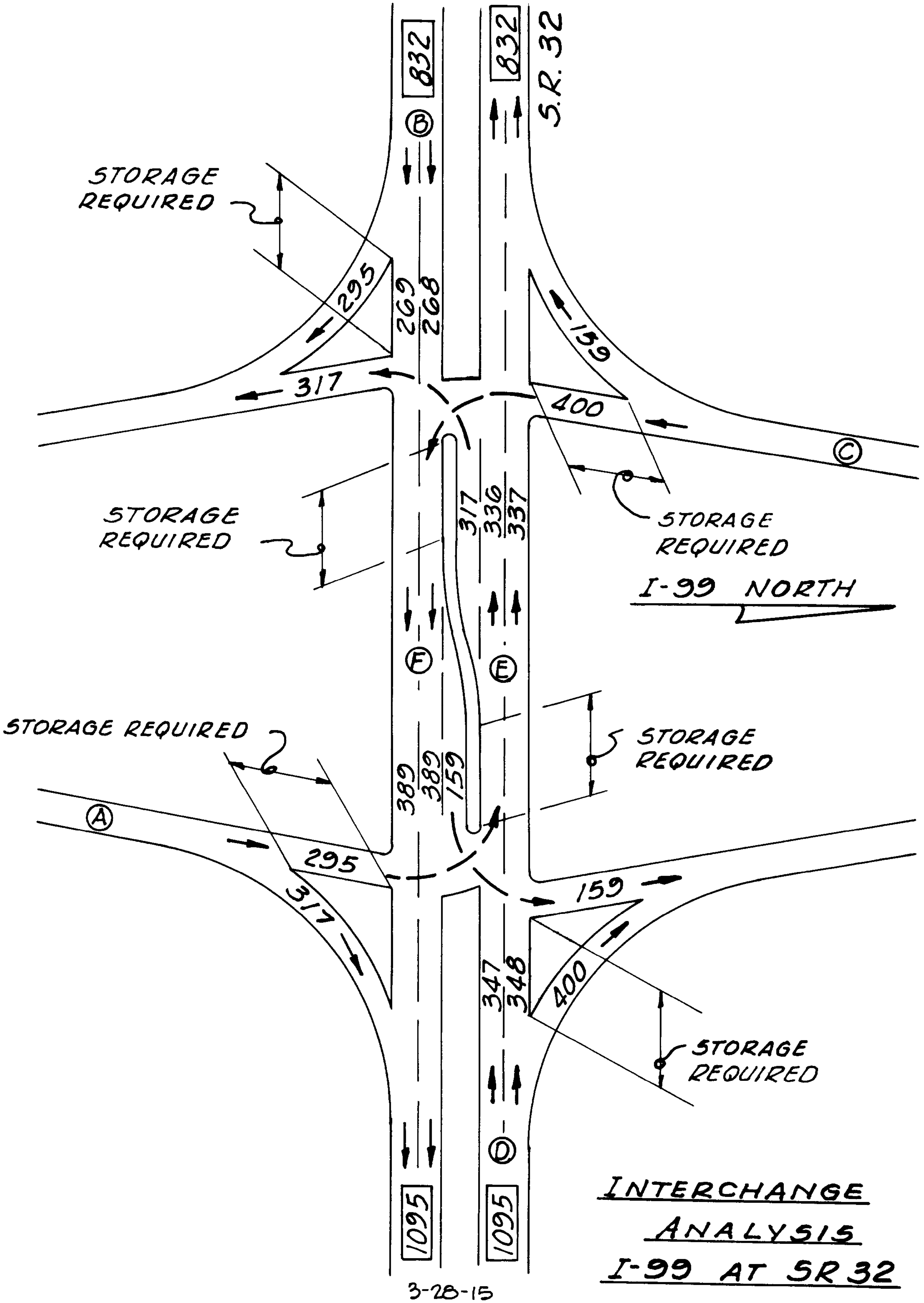
$$D.H\ V = A\ D.T \times 0\ 55 \times 0\ 12 \times 1\ 06 \times 1.2 \times 0\ 9$$

$$D.H.V = A\ D.T. \times 0\ 07556$$



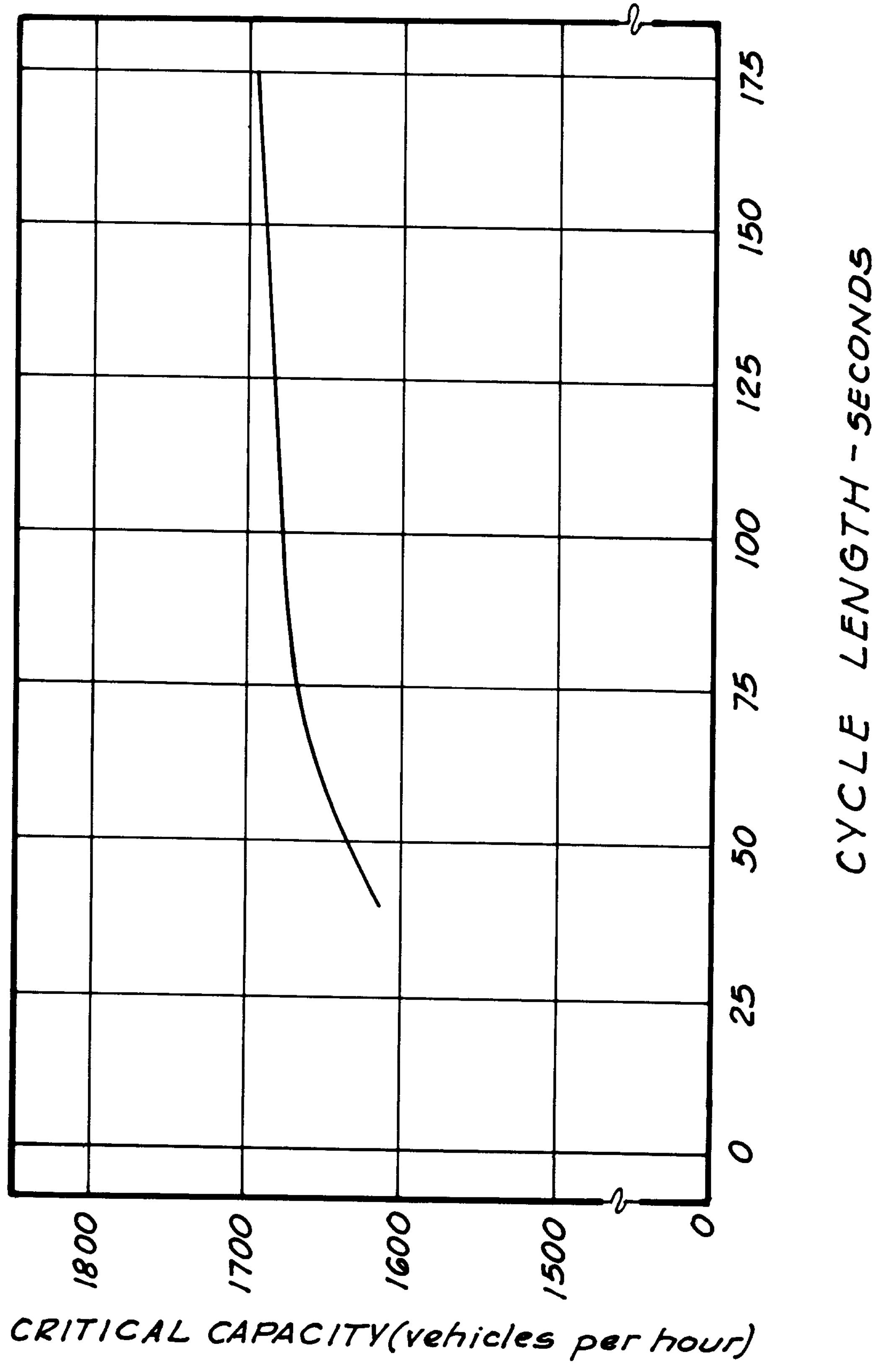
D.H V 1989

3-28-14



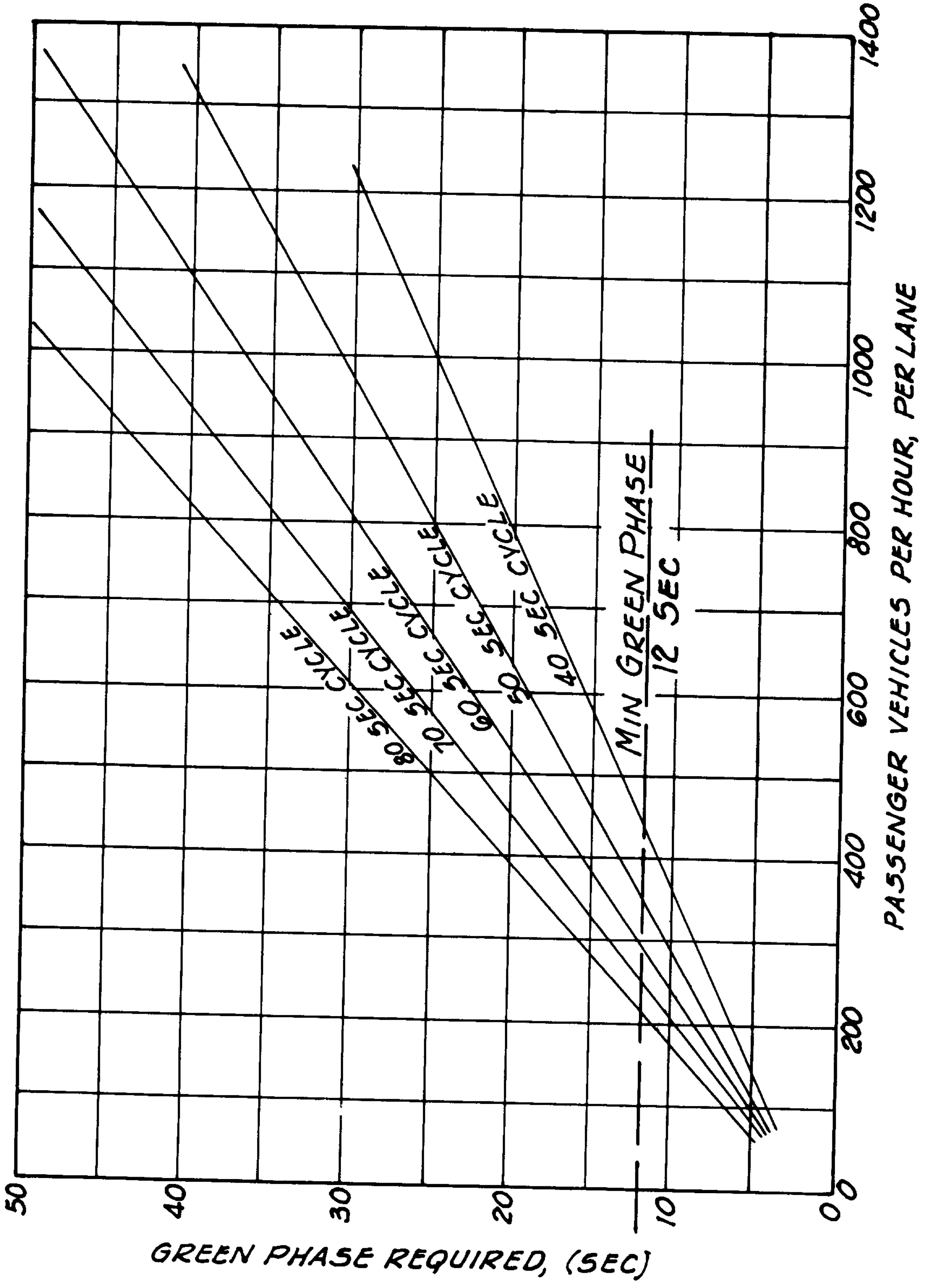
INTERCHANGE ANALYSIS
I-99 AT SR 32

3-28-15



INTERSTATE ANALYSIS
I-99 AT SR 32

3-28-16



DESIGN CAPACITY OF THROUGH MOVEMENTS
AND SINGLE LANE TURNING MOVEMENTS

INTERCHANGE ANALYSIS
I-99 AT SR 32

3-28-17

ANALYSIS OF INTERCHANGE
I-99 AT SR 32

50 Sec. Cycle

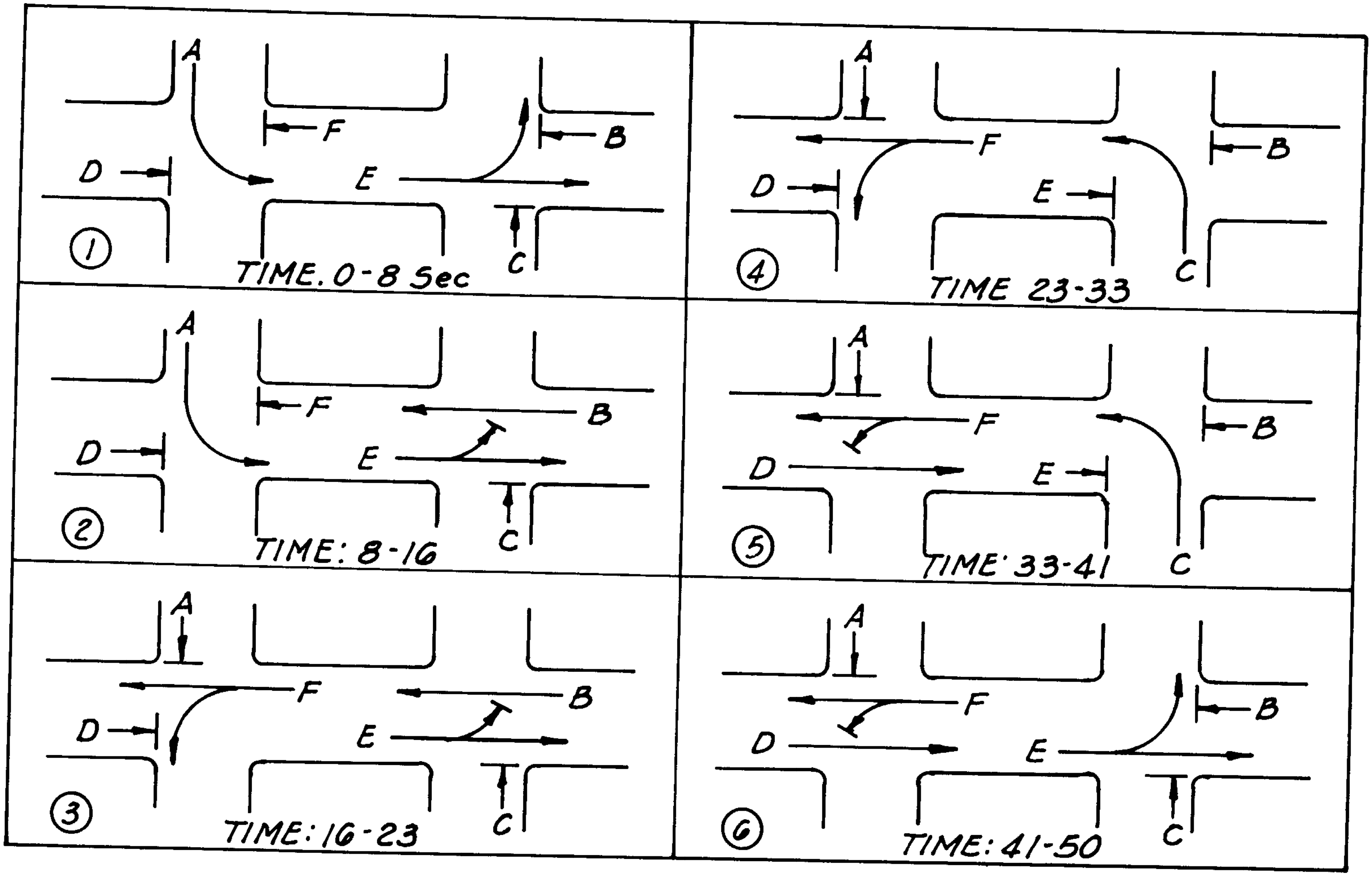
APPROACH	LANE DHV	GREEN REQ (+3 Sec Yellow Phase)	GREEN FURN. (Sec)
A	Rt Turn 317 Lt Turn 295	Free Flow 12(Min)+3 = 15 Sec.	16
B	Rt. Turn 295 2-Thru 269	Free Flow 12(Min)+3 = 15 Sec.	15
C	Rt Turn 159 Lt Turn 400	Free Flow 14 + 3 = 17 Sec	18
D	Rt Turn 400 2-Thru 348	Free Flow 12 + 3 = 15 Sec	17
E	Lt. Turn 317 2-Thru 337	12(Min)+3 = 15 Sec 12(Min)+3 = 15 Sec	17 32
F	Lt. Turn 159 2-Thru 389	12(Min)+3 = 15 Sec 13 + 3 = 16 Sec	17 34

$$\text{Storage Required} = \frac{\text{V.P.H}}{\text{cycles per. hr.}} \times \underbrace{25}_{\text{STORAGE PER VEHICLE}} \times \underbrace{1.5}_{\text{TRUCK FACTOR}} \times \text{\% Red per cycle}$$

$$\text{Storage Required} = \underbrace{0.0104}_{\text{CONSTANT FOR ANY CYCLE LENGTH}} (\text{Red Time})(\text{VPH})$$

APPROACH A(Lt Turn) = 0.0104(34)(295) = 104′ Use 125′
B(2-Thru) = 0.0104(35)(269) = 98′ Use 100′
C(Lt. Turn) = 0.0104(32)(400) = 133′ Use 150′
D(2-Thru) = 0.0104(33)(348) = 119′ Use 125′
E(Lt. Turn) = 0.0104(33)(317) = 109′ Use 125′
F(Lt. Turn) = 0 0104(33)(389) = 134′ Use 150′

3-28-18



(50 Sec Cycle)

PHASING OF TRAFFIC MOVEMENTS

INTERCHANGE ANALYSIS
I-99 AT SR 32

3-28-19

ROADWAY DESIGN MANUAL

CHAPTER 29

TRANSITION FROM TWO LANES TO FOUR LANES

The majority of our rural roads in Florida were initially constructed as two lane undivided roadways. As the traffic demands increase, these two lane facilities are being expanded to four lane sections, having two traffic lanes in each direction divided by a median. In rural areas a median width of 20' or greater is preferred. In Urban and Suburban areas, the recommended minimum median width is 15 5'

At the termination of the new 4-lane construction it is usually necessary to provide a transition back to the existing two lane roadway. Previously we have attempted to use short tapers for these transitions. The short tapers have proved to be undesirable because (1) adequate signing is very difficult and (2) the merging vehicles are forced to drastically reduce their speed. The transition should be of sufficient length to provide a safe merging condition at a desirable running speed.

A sketch included in this chapter shows two possible schemes for transitioning from two lanes to four lanes The top scheme shows a transition from a 4-lane section having the median and additional lanes constructed right of the existing roadway. The bottom scheme shows a transition from a 4-lane section having the median and additional lanes constructed left of the existing roadway. The merging length (L) for the transitions is determined by the formula

$$L = 12 V$$

L = length, V = Design Speed

Example $V = 50$ MPH

$L = 12 \times 50 = 600'$

(Note 600' is recommended as the minimum transition length for rural roads.)

Before beginning the design, an analysis will be made to determine if the existing pavement is suitable for use as one roadway of the 4-lane section. If the existing pavement is of suitable quality, the following recommendations are offered for the design of the top scheme shown in the sketch

a Through the transition, reduce the left roadway (existing pavement) from two one-way lanes into a single lane by tapering the median edge of pavement.

b. Accomplish the tapering design by channelizing with asphaltic type curb.

c. Specify that the curb is to be constructed on the surface of the existing pavement. This design will allow the curb to be easily removed in the future when it is desired to extend the four-lane section.

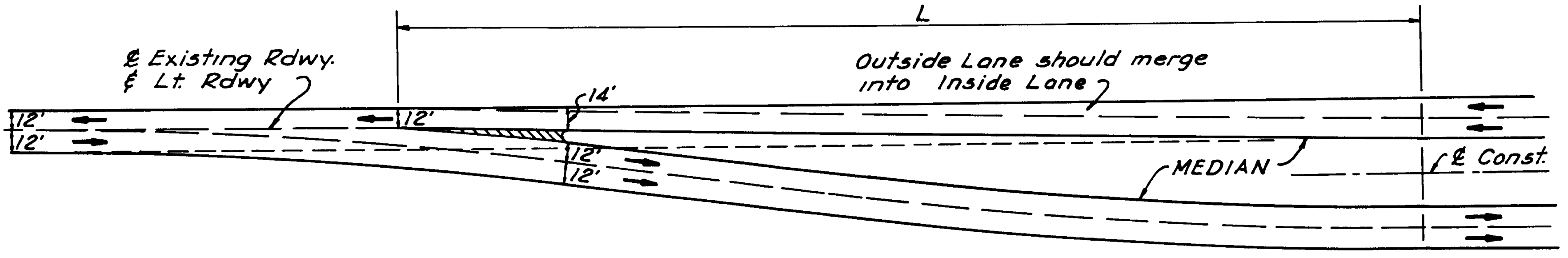
Both schemes shown in the sketch indicate that the existing pavement has a width of 24' (2-12' lanes). If the existing lanes are less than 12' wide, the transition length (L) should be increased proportionately. The minimum allowable length for the adjusted transition may be determined from the following formula

$$\text{Adjusted Length} = \frac{12' \times \text{Computed Length}}{\text{Lane Width}}$$

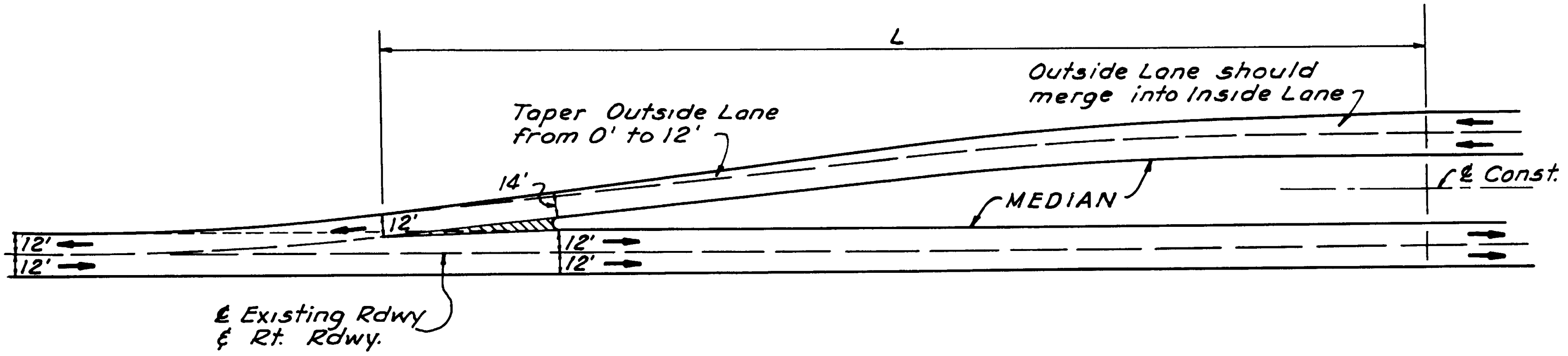
$$\text{Computed Length} = L = 12V$$

It should be emphasized that only two of many possible schemes for the transition from two lanes to four lanes are presented in the sketch. When designing other transition schemes for rural construction the computed length (L) should be maintained.

In urban areas, it is sometimes impossible to provide the desired length for the transition from two lanes to four lanes. For these cases, the designer should make every effort to design a safe and adequate connection.



LEFT ROADWAY CENTERED ON EXISTING ROADWAY



RIGHT ROADWAY CENTERED ON EXISTING ROADWAY

SCHEMES FOR TRANSITION FROM 2-LANE TO 4-LANE ROADWAY

ROADWAY DESIGN MANUAL

CHAPTER 30

DRIVEWAYS AND ROADSIDE CONTROL

(A) DRIVEWAYS

See Florida State Road Department Manual of Driveway Regulations.

(B) FRONTAGE ROADS

Frontage roads are constructed in conjunction with expressways and freeways at selected locations where right-of-way is available, and where it is necessary to intercept driveways in the interest of controlling access to the main facility.

In general, the outer separation should be of sufficient width to allow adequate turning radii for all traffic movements it is expected to accommodate. In considering vehicle storage on the cross road and possible necessity of signalization, a local road or street removed from the main facility by possibly 300 feet and developed on both sides should be utilized as the frontage road, no development should front the main facility.

The standard of construction for the frontage road is generally of a lower type than that indicated for the main facility

(C) CONTROL OF ACCESS

Under favorable conditions, and where practical, it is desirable to construct main, high volume highways featuring either complete or partial control of access. The capacity of the highway will be greater and a reduction of vehicle operating costs, accident rates and travel time will result.

Where over-all economies will result, frontage or access roads should be constructed in conjunction with limited access highways

CHAPTER 31

SAFETY

The designer, in considering safety, immediately will determine means of accident prevention. It is imperative that he understands that there is no single cause of traffic accidents. The influences acting at any instant are innumerable and probably are more or less important in certain combinations. Consequently, the individual role of any one engineering factor, such as lane width, may never be susceptible to a simple description for the reason that its role changes according to the relationship of other factors.

Statistics show that the highway itself is an important determinant of where traffic accidents happen. Designers should consider the facts that more accidents occur at those places where the situation places great demand on the momentary perceptual-decision-motor capacities of the driver The driver's basic psychophysical capacities are heavily exercised when he must deal with a situation around him that is changing rapidly. This condition occurs where the traffic friction is greater, that is, where one encounters more cars and where the flow of traffic is further hampered by intersections and driveways. Accidents are most frequent in those circumstances. Accident frequency is proportional to the load or rate of demand placed on the driver's basic ability to perceive and cope with the situation. The expected accident occurrence is summarized in this quotation "As evidenced by the accident rates, as severity of environmental conditions increases, the difficulty of the driving task increases disproportionately "

The designer, when determining (1) the typical section, (2) horizontal alignment, and (3) vertical alignment of the road should consider the effect of his design on the capabilities of the driver-his abilities, his habits, his expectations and natural and learned reactions in different driving situations It is for this reason that any theory of where accidents occur must be phrased in terms of the driver.

A common classification scheme uses three reasonably distinct phases of driver action perception, judgment and action.

Taking them separately, an accident can result where a driver fails to perceive, or incorrectly perceives, a situation. For example, accidents are more likely to occur where there are a number of things the driver must see and pay attention to at the same time. Such a case is a location with many driveways, intersections and vehicles on the highway. Or the driver's view may be obstructed, making it impossible to see a potential hazard. Then there are situations which do not appear in true perspective, so that what the driver sees is not a true representation, for instance, a road which appears to be going straight but is in reality curving out of sight.

Another factor is expectancy. Drivers are conditioned by the road they are traveling and by past experience they expect certain things to occur. Thus a sharp curve in an otherwise good alignment is the scene of more accidents than a curve of the same radius in poor alignment.

Having perceived a situation, a driver must make a decision. This may be almost automatic or it may require some time, depending on the complexity of the situation, the frequency with which it occurs in normal driving and other factors. In any event, accidents occur where more than one decision must be made at the same place, or where unusually difficult decisions must be made. Examples of the first are roads with heavy traffic volumes, frequent intersections and driveways, etc. Examples of the latter are complicated intersections with heavy traffic, or combinations of factors such as curves and traffic signals. In a special category are those situations where a driver must make a series of decisions in a short span of time.

Having perceived the situation and made his decision, the driver must act. Accidents happen where there is insufficient time or space for an action, such as narrow roadways with narrow shoulders, obstructions beside the roadway, etc. They also happen where the pavement is slippery, thus changing, drastically and abruptly, the operating characteristics of the vehicle.

Examples of methods to improve the safety of Florida highways are discussed below.

A SIGHT DISTANCES

The horizontal alignment should be reviewed relative to the vertical alignment. Locating horizontal curves just beyond the crest of vertical curves must be avoided. Hidden "dips" in the vertical alignment should be eliminated. At hazardous locations where it may be impossible to relocate the highway, consideration should be given to lengthening the vertical curves to provide increased sight distances. Very often, the designer considers that the minimum sight distance requirements established for the design speed are the desirable design criteria. It should be emphasized that these are ONLY MINIMUM REQUIREMENTS It is the designers responsibility to determine if additional sight distances may improve the safety of the facility.

B STORAGE LANES

In urban areas where many intersections occur, serious consideration should be given to the development of adequate left turn storage lanes. Preferably a raised median of sufficient width to develop these extra lanes should be provided.

C CROSSOVERS

On divided roadways, both urban and rural, crossovers are provided through the median to allow access to business sites and to make "U" turn maneuvers. The median should be of sufficient width to allow vehicles to satisfactorily stop without endangering either themselves or the through traffic. The full length of the crossing vehicle should be stored safely within the median limits.

D INTERSECTIONS AND INTERCHANGES

Very complicated and elaborate designs for intersections and interchanges should be avoided if possible. If unavoidable, the layout of these facilities should be spread or "opened" to allow for the satisfactory spacing of directional and informational signs.

E TYPICAL SECTION

In the initial stages of design, a typical section is established for the project. The designer, when developing the proposed section, should consider the probable demands required for the highway during the design year. The number and width of lanes, the necessity for parking, the median width, the shoulder width, etc. are basic considerations. A suitable typical section can eliminate numerous safety problems.

F GUARDRAIL

The satisfactory use of guardrail can reduce many serious accidents Standard Index No. 2300-X established the MINIMUM requirement for the use of guardrail. The designer should examine each hazardous location to determine if additional guardrail is needed to reduce accidents. At high fills and over large structures where guardrail is required, it may be necessary to extend the guardrail beyond the minimum requirements, particularly on the approach end. The guardrail should be installed to a point where it will be improbable for out of control vehicles to slip behind the rail and down the steep slope into the lower terrain.

G SIGN POSTS AND LIGHT POSTS

Sign posts and light posts, located close to the pavement edge, are considered a safety hazard to high speed traffic. Whenever possible, posts should be located a sufficient distance from the pavement in order to materially reduce the possibility of vehicular collisions. Posts located within 30' of the pavement edge must be either designed for safety or protected by guardrail.

For smaller diameter posts, the use of a breakaway design is recommended. When struck by a vehicle, these posts will shear off, thereby reducing the effects of the accident.

Larger posts located within the minimum safety zone should be protected with guardrail. Refer to Standard Index No. 2300-X for installation details.

Only a few examples of safety designs are given above. As he performs the design of the project, the designer always should provide the safest possible design which is economically feasible.

ROADWAY DESIGN MANUAL

CHAPTER 32

MISCELLANEOUS

(A) DRAINAGE

(1) Inlets should be spaced so as to preclude excessive flooding of the traveled way.

(2) The full roadway cross section, including shoulders, should be carried over culverts.

(3) The bottom width of lateral ditches shall be two feet wider than the span of the respective drainage structure. Side slopes shall be 1 1/2 1, or flatter, if dictated by the type of soil.

(B) EROSION CONTROL

Erosion and maintenance costs can be minimized by the use of flat slopes for roadways and ditches, protective treatment such as grassing, seeding, mulching and sodding, drainage interceptors for surface and groundwater, ground cover and plantings.

(C) LIGHTING

(1) Only critical sections of rural highways, such as intersections, interchanges, long bridges or areas of roadside interference, are considered for illumination.

(2) Luminaries should be mounted 25 to 30 feet above the pavement surface.

(3) Poles should be placed beyond the shoulder line, preferably a minimum of ten feet from the edge of the through traffic lane, or six feet when a barrier curb is placed at the pavement edge.

(4) Lighting poles are not placed in a median with width less than 20 feet.

(D) UTILITIES

See Florida State Road Department Utility Policy and Procedure Manual.

(E) SIGNING AND MARKING

Proposed signing and marking should be correlated with the geometric design. See Florida State Road Department Manual on Uniform Traffic Control Devices.

(F) RAILROAD GRADE CROSSINGS

Railroad grade crossing angles should be as near 90° as practical. The road gradient should fit the track grade smoothly with adequate sight distance adjacent to the crossing, both vertically and horizontally. However, since Florida Statutes require some vehicles to stop at all railroad crossings, provide sight distance only in relation to protective devices together with sufficient sight distance along the track to permit a stopped vehicle to cross the track or tracks, starting when the view is clear, before a train reaches the crossing. Standard Drawings, Indexes Nos. 1466-X and 5081-X, show details of various grade crossings constructed in Florida.

ROADWAY DESIGN MANUAL

CHAPTER 33

ABBREVIATIONS AND DEFINITIONS

- - - A- - -

abandoned	abd
abbreviations	abbr
abutment	abut.
acre	ac
acre-foot	ac-ft
addition	add
adjusting	adj
afternoon	PM
aggregate	agg
alternate	alt
altitude	alt
aluminum	al
angle	spell out
approved	appd
approximate	approx
area	A
article	art
asbestos	asb
asphalt	asph
assembly	asm
assistant	asst
associate	assoc
association	assn
automatic	auto
auxiliary	aux
avenue	Ave
average	avg
avoirdupois	avdp

- - -B- - -

backsight	bs
back to back	b to b
barrel	bbl
basement	bsmt
beam	spell out
bearing	brg
bearing value	B. V.
bell and spigot	b & s
bench mark	B. M.
beveled	bev
bituminous coated corrugated metal pipe culvert	BCCMP
bituminous coated & paved corrugated metal pipe culvert	BCPCMP
bituminous coated pipe arch culvert	BCPA
bituminous coated and paved pipe arch culvert	BCPPA

black	blk	boundary	bndry
blue	spell out	brick	spell out
board	bd	brook	spell out
board feet	fbm	brown	brn
bottom	bot	building	bldg
boulders	B	bulkhead	blkhd
boulevard	Blvd	bushel	bu

- - - C - - -

capacity	cap	coefficient	coef
capital	cap	column	col
cast iron	C. I.	computations	comp
cast iron pipe	C. I. P.	concrete	conc
ceiling	clg	concrete pipe	C. P.
cement	cem	conduit	spell out
cemetery	cem	construct	const
centerline	C. L.	continuous	cont
center	ctr	continued	contd
centers	ctrs	contract	cont
center to center	c to c	contractor	contr
chain	ch	contraction	contr
change	chg	control	cont
channel	spell out	continuation	cont
checked	ckd	coordinate	coord
church	ch	corner	cor
circular	cir	corrugated iron	Corr. I.
clay	CL	corrugated metal	C. M.
clear	clr	corrugated metal pipe	C. M. P.
coated	ctd	corrugated metal pipe arch culvert	CMPA

county	Co.	cubic	cu
creek	Cr	cubic foot	C.F.
cross road	x rd	cubic yard	C.Y.
cross section	x sect	culvert	culv

- - - D - - -

degree	deg	diameter	D or diam
degree of curvature	D	dimension	dim.
delta	spell out	directional	dir
department	dept	drawing	dwg
designed	dsgn	drawings	dwgs

- - - E - - -

each	ea	equal	eq
east	E	equation	eq
elbow	ell	equivalent	equiv
elevation (above sea level)	El	estimate	est
elevation (view)	elev	excavation	exc
emergency	emerg	expansion	exp
enclosure	encl	extension	ext
end to end	e to e	external	ext
engineer	Engr	external distance	E
engineering	engg	extra	spell out

- - - F - - -

face to face	f to f	Federal Aid Secondary	FAS
federal	Fed.	feet	ft
Federal Aid	FA	feet board measure	fbm
Federal Aid Interstate	FAI	feet per minute	fpm
Federal Aid Primary	FAP	feet per second	fps

ferry	fy	floor	fl
figure	Fig.	flow line	F. L.
fire hydrant	F. H.	foot	ft
flange, flanged	flg	ford	fd
flexible	flex	forenoon	AM
		foresight	fs

- - - G - - -

gage	ga	galvanized iron	G. I.
gallon	gal	general	genl
gallons per minute	gpm	green	grn
gallons per second	gps	ground	grd

- - - H - - -

hexagonal	hex	horsepower	hp
high water	H. W.	hour	hr
horizontal	horiz	house	hse or h

- - - I - - -

inch	in	inside diameter	id
including	incl	intermediate	inter
incorporated	Inc	iron pipe	I. P.
information	inf		

- - - J - - -

joint	jt	junction box	J. B.
junction	jnct		

- - - L - - -

lake	spell out	length of curve	L
latitude	lat	length of tangent	T
left	lt	light	lt
length	lgth	lighting	ltg

linear	lin	longitude	long.
linear foot	lin ft	longitudinal	long.

- - - M - - -

manhole	M. H.	miles per hour	mph
material	mtl	million	spell out
maximum	max	minimum	min
mean sea level	M S L	minute	min
meridian	mer	miscellaneous	misc
mile	spell out		

- - - N - - -

national	natl	northwest	NW
negative	neg	number	No.
north	N	numbers	Nos.
northeast	NE		

- - - O - - -

on centers	oc	ounce	oz
opposite	opp	outside diameter	od
orange	orn	outside to outside	o to o

- - - P - - -

page	p	point of intersection	PI
pages	pp	point of reverse curve	PRC
paragraph	par.	point of tangency	PT
parallel	par.	point on tangent	POT
plane	pl	portland cement concrete	PCC
plate	pl	pound, pounds	lb
point	pt	power	pwr
point of compound curvature	PCC	power pole	P.P.
point of curvature	PC	primary	pri

principal meridian	prin mer	project	Proj.

- - - Q - - -

quadrangle	quad	quart	qt

- - - R - - -

radius	R or rad	reinforcement	reinf
railroad	R R	reinforcing	reinf
railway	Ry	required	reqd
range	R	revision	rev
received	recd	right	rt
red	spell out	right-of-way	R/W
reduction	reduc	river	R
reference	ref	road	rd
reflector	refl	roadway	rdy
regular	reg	round	rd
reinforced	reinf	route	Rte.

- - - S - - -

sanitary sewer	San. S.	spillway	splwy
second	sec	square	sq
secondary	secd	square foot	sq ft
section	sect	square inch	sq in
separate	sep	square mile	sq mile
service	serv	square yard	sq yd
sheet	sh	standard	std
signal	sig	station	sta
south	S	State	spell out
southeast	S E	storm sewer	S. S.
southwest	S W	stream	str

street	St	superstructure	superstr
structural	str	support	sup.
structure	str	survey	surv
substructure	substr	symmetrical	sym
Superelevation (Ft./Ft.)	e		

- - - T - - -

tangent	tan.	terminal	term.
tee	spell out	terra cotta	T. C.
telegraph	telg	thousand	M
telephone	telp	tongue & groove	t & g
telephone pole	T.P.	township	Twp
temperature	temp	typical	typ

- - - U - - -

underground	ug	U.S. Geological Survey	USGS
upstream	upstr	U.S. Coast & Geodetic Survey	USC & GS

- - - V - - -

variable	var	vertical curve	V.C.
vertical	vert	volume	vol

- - - W - - -

weight	wt	white	wht
west	W		

- - - Y - - -

yard	yd	yellow	yel
year	yr		

These definitions apply to the various terms used in this manual·

Highway, Street or Road-A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way (Recommended usage· in urban areas - highway or street, in rural areas - highway or road).

Arterial Highway-A general term denoting a highway primarily for through traffic, usually on a continuous route.

Control of Access-The condition where the right of owners or occupants of abutting land or other persons to access, light, air, or view in connection with a highway is fully or partially controlled by public authority.

> Full control of access means that the authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only and by prohibiting crossings at grade or direct private driveway connections.
>
> Partial control of access means that the authority to control access is exercised to give preference to through traffic to a degree that, in addition to access connections with selected public roads, there may be some crossings at grade and some private driveway connections.

Expressway-A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at intersections.

Freeway-An expressway with full control of access.

Parkway-An arterial highway for noncommercial traffic, with full or partial control of access, and usually located within a park or a ribbon of park-like development.

Major Street or Major Highway-An arterial highway with intersections at grade and direct access to abutting property, and on which geometric design and traffic control measures are used to expedite the safe movement of through traffic.

Through Street or Through Highway-Every highway or portion thereof at the entrance to which vehicular traffic from intersecting highways is required by law to stop before entering or crossing the same and when stop signs are erected. (Uniform Vehicle Code, Act V)

Local Street or Local Road-A street or road primarily for access to residence, business or other abutting property.

Divided Highway-A highway with separated roadways for traffic in opposite directions.

Belt Highway-An arterial highway for carrying traffic partially or entirely around an urban area or portion thereof (Also called circumferential highway).

Radial Highway-An arterial highway leading to or from an urban center.

Frontage Street or Frontage Road-A local street or road auxiliary to and located on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

Toll Road, Toll Bridge, or Toll Tunnel-A highway, bridge, or tunnel open to traffic only upon payment of a direct toll or fee.

Cul-de-sac Street-A local street open at one end only and with special provision for turning around.

Dead-end Street-A local street open at one end only without special provision for turning around.

Roadway-(General) The portion of a highway, including shoulders, for vehicular use. A divided highway has two or more roadways.

Roadway-(In construction specifications) The portion of a highway within limits of construction.

Roadbed-The graded portion of a highway, usually considered as the area between the intersections of top and side slopes, upon which the base course, surface course, shoulders, and median are constructed.

Subgrade-The portion of a roadbed prepared as a foundation for the base or surface course.

Median-The portion of a divided highway separating the traveled ways for traffic in opposite directions.

Traveled Way-The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

Shoulder-The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Roadside-A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway also may be considered roadside.

Traffic Lane-The portion of the traveled way for the movement of a single line of vehicles.

Auxiliary Lane-The portion of the roadway adjoining the traveled way for parking, speed-change, or for other purposes supplementary to through traffic movement.

Parking Lane-An auxiliary lane primarily for the parking of vehicles.

Speed-change Lane-An auxiliary lane, including tapered areas, primarily for the acceleration or deceleration of vehicles entering or leaving the through traffic lanes.

Median Lane-A speed-change lane within the median to accommodate left-turning vehicles.

Outer Separation-The portion of an arterial highway between the traveled ways of a roadway for through traffic and a frontage street or road.

Passenger Car-A motor vehicle designed for the transportation of not more than eight persons. The term includes taxicabs, limousines, and station wagons.

Bus-A self-propelled motor vehicle designed for the transportation of more than eight persons.

Trolley Coach-A motor vehicle, designed for the transportation of persons, which is propelled by electric power from overhead trolley wires but not operated upon rails.

Streetcar-A vehicle designed for the transportation of persons and operated upon rails principally in municipalities.

Truck-A general term denoting a motor vehicle designed for transportation of property. The term includes single unit trucks and truck combinations.

Truck Combination-A truck tractor and a semi-trailer, either with or without a full trailer, or a truck with one or more full trailers.

Light Delivery Truck-A single unit truck, such as a panel or pick-up truck, with size and operating characteristics similar to those of a passenger car and commonly used for short-haul light delivery service.

Parked Vehicle-A vehicle stopped for temporary storage.

Standing Vehicle-A vehicle stopped for a brief interval as when loading or unloading.

Curb Loading Zone-Roadway space adjacent to a curb and reserved for exclusive use of vehicles during loading or unloading of passengers or property.

Traffic Control Device-Any sign, signal, marking or installation placed or erected under public authority, for the purpose of regulating, warning, or guiding traffic.

Traffic Sign-A traffic control device mounted on a support above the level of the roadway that conveys a specific message by means of unchanging words or symbols.

Traffic Marking-A traffic control device consisting of lines, patterns, or colors on the pavement, curbs, or other objects within or adjacent to the roadway, or words or symbols on the pavement.

Traffic Signal-A power-operated traffic control device by which traffic is regulated, warned, or alternately directed to take specific actions.

Traffic Control Signal-A traffic signal by which traffic is alternately directed to stop and to proceed.

Delay-The time lost while traffic is impeded by some element over which the driver has no control.

Operational Delay-Delay caused by interference between components of traffic.

Fixed Delay-Delay caused by traffic controls.

Speed-The rate of movement of a vehicle, generally expressed in miles per hour.

Average Spot Speed-The arithmetic mean of the speeds of all traffic, or component thereof, at a specified point

Over-all Travel Time-The time of travel, including stops and delays except those off the traveled way.

Running Time-The time the vehicle is in motion.

Over-all Travel Speed-The speed over a specified section of highway, being the distance divided by over-all travel time. The average for all traffic, or component thereof, is the summation of distances divided by the summation of over-all travel times.

Running Speed-The speed over a specified section of highway, being the distance divided by running time. The average for all traffic, or component thereof, is the summation of distances divided by the summation of running times.

Design Speed-A speed determined for design and correlation of the physical features of a highway that influence vehicle operation. It is the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern.

Merging-The converging of separate streams of traffic into a single stream.

Diverging-The dividing of a single stream of traffic into separate streams.

Weaving-The crossing of traffic streams moving in the same general direction accomplished by merging and diverging.

Volume-The number of vehicles passing a given point during a specified period of time.

Density-The number of vehicles per mile on the traveled way at a given instant.

Headway-The time interval between passages of consecutive vehicles moving in the same direction by a given point

Spacing-The distance between consecutive vehicles measured front to front.

Design Volume-A volume determined for use in design, representing traffic expected to use the highway Unless otherwise stated, it is an hourly volume.

Average Daily Traffic-The average 24-hour volume, being the total volume during a stated period divided by the number of days in that period. Unless otherwise stated, the period is a year. - The term is commonly abbreviated as ADT.

Thirtieth Highest Hourly Volume-The hourly volume that is exceeded by 29 hourly volumes during a designated year (Corresponding definitions apply to any other ordinal highest hourly volume, as tenth, twentieth, etc.).

Basic Capacity-The maximum number of passenger cars that can pass a given point on a lane or roadway during one hour under the most nearly ideal roadway and traffic conditions that can be attained.

Possible Capacity*-The maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions regardless of their effect in delaying drivers and restricting their freedom to maneuver.

Practical Capacity*-The maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions, without unreasonable delay or restriction to the drivers' freedom to maneuver.

*NOTE: The difference between the levels of "possible capacity" and "practical capacity" is accounted for by the effects of traffic density. At "practical capacity," the lower volume level, the traffic density is not great enough to cause any unreasonable delay or undue restriction on the drivers' freedom to maneuver. As traffic volumes increase beyond practical capacity, a high traffic density results. The high traffic densities cause substantial delay and restriction on the drivers' freedom to maneuver. However, due to lower and more uniform speed, these conditions also result in higher traffic volumes up to a point corresponding to "possible capacity" values. As traffic density increases above that at possible capacity, a sharp reduction in traffic volume results.

Design Capacity-The practical capacity or lesser value determined for use in designing the highway to accommodate the design volume.

Intersection-The general area where two or more highways join or cross, within which are included the roadway and roadside facilities for traffic movements in that area.

Intersection Leg-Any one of the highways radiating from and forming part of an intersection. The common intersection of two highways crossing each other has four legs.

Intersection Entrance-That part of an intersection leg for traffic entering the intersection.

Intersection Exit-That part of an intersection leg for traffic leaving the intersection.

Three-Leg Intersection-An intersection with three legs, where two highways join.

Y Intersection-A three-leg intersection in the general form of a "Y".

T Intersection-A three-leg intersection in the general form of a "T".

Four-Leg Intersection-An intersection with four legs, as where two highways cross.

Multi-leg Intersection-An intersection with five or more legs.

Railroad Grade Crossing-The general area where a highway and a railroad cross at the same level, within which are included the railroad, roadway, and roadside facilities for traffic traversing that area.

Island-A defined area between traffic lanes for control of vehicle movements or for pedestrain refuge. Within an intersection a median or an outer separation is considered an island. An island may or may not be curbed.

Approach Nose-An end of an island, or neutral area between roadways, which faces approaching traffic that passes either on one or both sides.

Merging End-An end of an island, or neutral area between roadways, beyond which traffic merges.

Cross Connection-A connecting roadway between two nearby and generally parallel roadways.

Median Opening-A gap in a median provided for crossing and turning traffic.

At-grade Intersection-An intersection where all roadways join or cross at the same level.

Channelized Intersection-An at-grade intersection in which traffic is directed into definite paths by islands.

Unchannelized Intersection-An at-grade intersection without islands for directing traffic into definite paths.

Flared Intersection-An unchannelized intersection, or a divided highway intersection without islands other than medians, where the traveled way of any intersection leg is widened or an auxiliary lane added.

Rotary-A channelized intersection in which traffic moves counterclockwise around a center island desirably of sufficient size to induce weaving movements in lieu of direct crossings.

Weaving Section-A length of one-way roadway, designed to accommodate weaving, at one end of which two one-way roadways merge and at the other end of which they separate.

Intersection Angle-The angle between two intersection legs.

Railroad Crossing Angle-The angle of 90° or less where a railroad and a highway intersect.

Skew Angle-The complement of the acute angle between two centerlines which cross.

Design Vehicle-A selected motor vehicle whose weight, dimensions, and operating characteristics are used to establish highway design controls to accommodate vehicles of a designated type.

Angle of Turn-The angle through which a vehicle travels in making a turn.

Turning Path-The path of a designated point on a vehicle making a specified turn.

Minimum Turning Path-The path of a designated point on a vehicle making its sharpest turn.

Minimum Turning Radius-The radius of the minimum turning path of the outside of the outer front tire. (Vehicle manufacturers' data books give minimum turning radius to the centerline of the outer front tire).

Turning Track Width-The radial distance between the turning paths of the outside of the outer front tire and the outside of the inner rear tire.

Turning Roadway-A connecting roadway for traffic turning between two intersection legs.

Turning Movement-The traffic making a designated turn at an intersection.

Grade Separation-A crossing of two highways, or a highway and a railroad, at different levels.

Underpass-A grade separation where the subject highway passes under an intersecting highway or railroad (Also called undercrossing).

Overpass-A grade separation where the subject highway passes over an intersecting highway or railroad (Also called overcrossing).

Interchange-A grade separated intersection with one or more turning roadways for travel between intersection legs.

Interchange Ramp-A turning roadway at an interchange for travel between intersection legs.

Turning Roadway Terminal-The general area where a turning roadway connects with a through traffic roadway. "Exit" used as a modifier refers to leaving the through traffic lanes and "entrance" refers to entering the through traffic lanes.

Outer Connection-A one-way turning roadway primarily for a right turning movement It may include provision for a left turn at a terminal to accommodate another turning movement.

Loop-A one-way turning roadway that curves about 270° to the right to accommodate a left-turning movement It may include provision for a left turn at a terminal to accommodate another turning movement.

Direct Connection-A one-way turning roadway which does not deviate greatly from the intended direction of travel.

Two-way Ramp-A ramp for travel in two directions. At a cloverleaf it serves as both an outer connection and a loop.

Cloverleaf-A four-leg interchange with loops for left turns and outer connections for right turns or two-way ramps for these turns. A full cloverleaf has ramps for two turning movements in each quadrant.

Diamond Interchange-A four-leg interchange with a single one-way ramp in each quadrant. All left turns are made directly on the minor highway.

Directional Interchange-An interchange, generally having more than one highway grade separation, with direct connections for the major left-turning movements.

Rotary Interchange-A multi-leg interchange where one highway is grade separated from a rotary on which all turning movements and through movements of all other highways are accommodated.

Right-of-way-A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to a highway.

Easement-A right acquired by public authority to use or control property for a designated highway purpose.

Slope Easement-An easement for cuts or fills.

Drainage Easement-An easement for directing the flow of water.

Sight Line Easement-An easement for maintaining or improving the sight distance.

Planting Easement-An easement for reshaping roadside areas and establishing, maintaining, and controlling plant growth thereon.

Scenic Easement-An easement for conservation and development of roadside views and natural features.

Right of Access-The right of ingress to a highway from abutting land and egress from a highway to abutting land (See Control of Access).

Riparian Rights-The rights of an owner of water-fronting lands in the bed, banks, accretions, water, access, moorage, and related items.

Dedication-The setting apart by the owner and acceptance by the public of property for highway use, in accordance with statutory or common law provisions.

ROADWAY DESIGN MANUAL

INDEX — SECTION 4

PLATES

STATE JOB NO. 99065-3508-11-21

FED ROAD DIV NO	STATE	PROJECT NO	FISCAL YEAR	SHEET NO
3	FLA.		'67	1

LEROY GUIDE NO 290

STATE OF FLORIDA
STATE ROAD DEPARTMENT

PLANS OF PROPOSED
STATE HIGHWAY

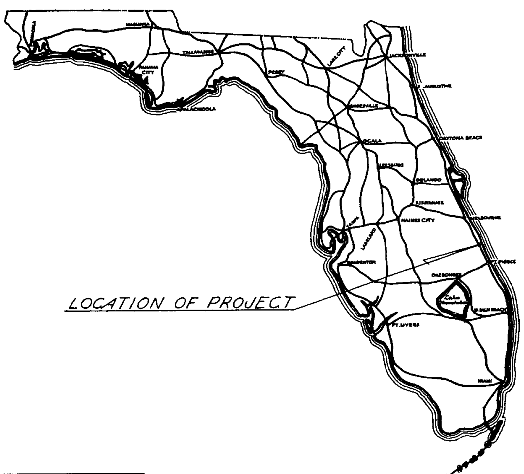
F.A. PROJECT NO. F-999-10(11)
GREEN RIVER COUNTY
STATE ROAD NO 101

LEROY GUIDE NO 500

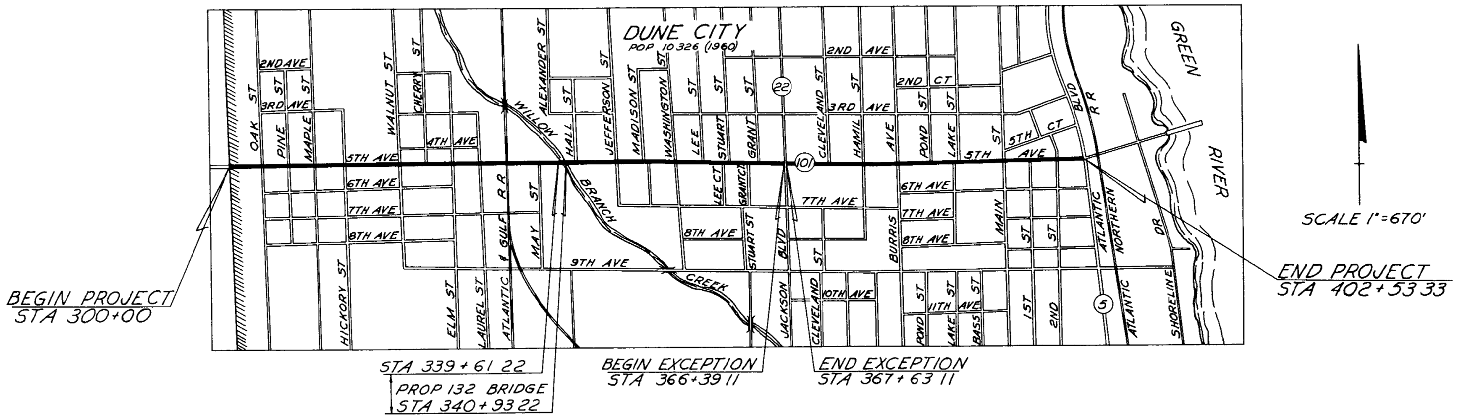
LEROY GUIDE NO 350

INDEX OF SHEETS

FOR INDEX OF BRIDGE SHEETS SEE BRIDGE PLANS
FOR INDEX OF SIGNING SHEETS SEE SIGNING PLANS



LOCATION OF PROJECT



SCALE 1"=670'

BEGIN PROJECT
STA 300+00

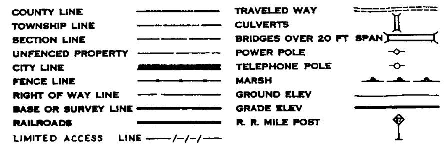
STA 339+61 22
PROP 132 BRIDGE
STA 340+93 22

BEGIN EXCEPTION
STA 366+39 11

END EXCEPTION
STA 367+63 11

END PROJECT
STA 402+53 33

CONVENTIONAL SIGNS



GOVERNING SPECIFICATIONS STATE OF FLORIDA STATE ROAD DEPARTMENT
STANDARD SPECIFICATIONS DATED 1966
APPROVED BY BUREAU OF PUBLIC ROADS – DATE

LENGTH OF PROJECT	LIN. FT.	MILES
ROADWAY	9,997 33	1 893
BRIDGES	132 00	0 025
NET LENGTH OF PROJ	10,129 33	1 918
EXCEPTIONS	124 00	0 023
GROSS LENGTH OF PROJ	10,253 33	1 941

ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN REDUCED IN SIZE BY REPRODUCTION THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA.

SUBMITTED BY

STATE HIGHWAY ENGINEER

APPROVED DATE

[redacted]

DIVISION ENGINEER
BUREAU OF PUBLIC ROADS

PLATE I

FED ROAD D NO	STATE	PROJECT NO	FISCAL YR	SHEET NO
3	FLA.		67	1

STATE OF FLORIDA
STATE ROAD DEPARTMENT

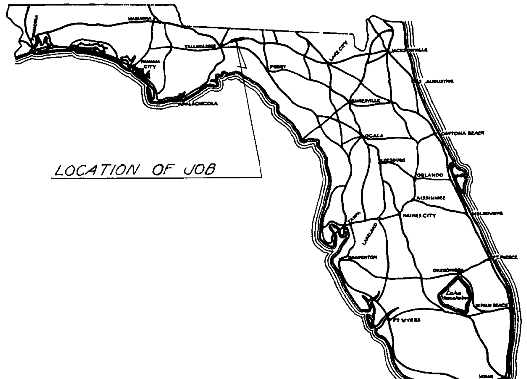
PLANS OF PROPOSED

STATE HIGHWAY

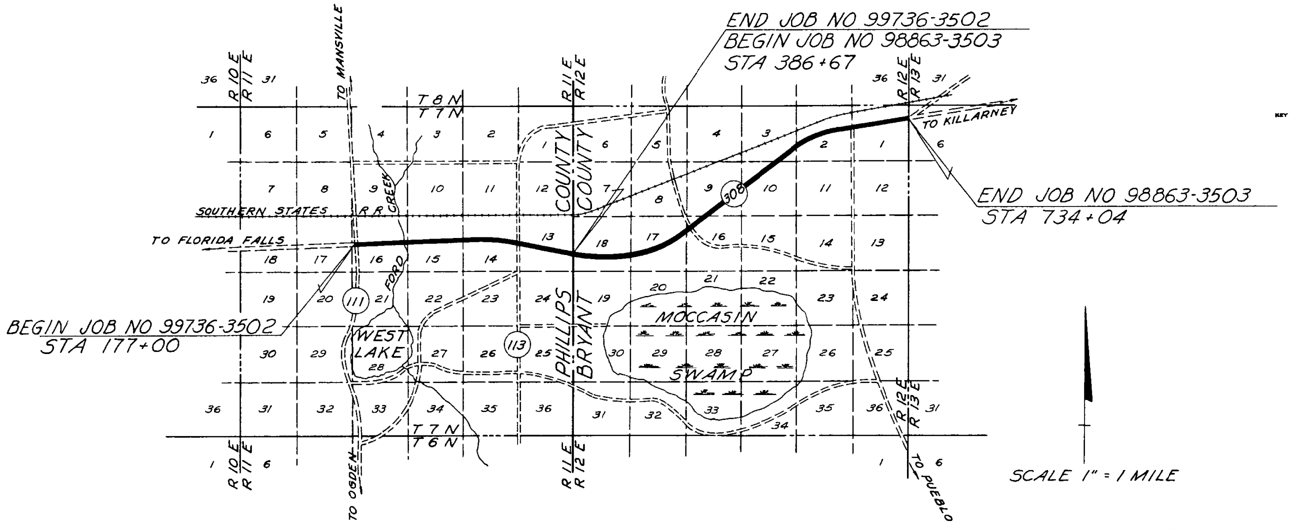
STATE JOBS NOS. 99736-3502-01-21
AND 98863-3503-01-21
PHILLIPS & BRYANT COUNTIES

STATE ROAD NO 308

INDEX OF SHEETS



LOCATION OF JOB



SCALE 1" = 1 MILE

CONVENTIONAL SIGNS

COUNTY LINE	—·—·—	TRAVELED WAY	═ ═ ═
TOWNSHIP LINE	— - — - —	CULVERTS	‖
SECTION LINE	— — —	BRIDGES OVER 20 FT SPAN	⊐═⊏
UNFENCED PROPERTY	— - - —	POWER POLE	-◇-
CITY LINE	▬▬▬	TELEPHONE POLE	-○-
FENCE LINE	—×—×—	MARSH	▴ ▴ ▴
RIGHT OF WAY LINE	— ——	GROUND ELEV	——
BASE OR SURVEY LINE	———	GRADE ELEV	━━
RAILROADS	━━━	R R. MILE POST	◈

GOVERNING SPECIFICATIONS STATE OF FLORIDA, STATE ROAD DEPARTMENT

STANDARD SPECIFICATIONS DATED 1966

APPROVED BY BUREAU OF PUBLIC ROADS - DATE

LENGTH	OF			JOBS		
	JOB NO 99736-3502		JOB NO 98863-3503		TOTAL	
	LIN FT	MILES	LIN FT	MILES	LIN FT	MILES
ROADWAY	20,967 00	3971	34,737 00	6 578	55,704 00	10 549
BRIDGES	0 00	0000	0 00	0 000	0 00	0 000
NET LENGTH OF JOBS	20,967 00	3971	34,737 00	6 578	55,704 00	10 549
EXCEPTIONS	0 00	0000	0 00	0000	0 00	0000
GROSS LENGTH OF JOBS	20,967 00	3971	34,737 00	6578	55,704 00	10 549

SUBMITTED BY

STATE HIGHWAY ENGINEER

ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN REDUCED IN SIZE BY REPRODUCTION THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA

APPROVED DATE

[redacted]

DISTRICT ENGINEER
BUREAU OF PUBLIC ROADS

PLATE 2

FED ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.			

STATE JOB NO. 98765-3501-01-21
BLUE COUNTY
STATE ROAD NO 923

STATE JOB ONLY

F.A. PROJ. NO. F-666-2(30) AND
STATE JOB NO. 99321-3501-02-41
CHIPLEY & BARTOW COUNTIES
STATE ROAD NO. 456

F A PROJECT AND STATE JOB

F.A. PROJ. NO. FU-000-3(12)
NORRIS COUNTY
STATE ROAD NO 873

F A PROJECT URBAN AND RURAL

STATE JOBS NOS. 96211-3501-01-42
AND 96430-3501-01-41
FOWLER COUNTY
STATE ROAD NOS. 745 & 901

2 STATE JOBS ON DIFFERENT ROADS

F. A. PROJ. NOS. F-123-4(17) & F-123-3(10)
SHEPARD COUNTY
STATE ROAD NO. 713

2 F A PROJECTS ON SAME ROAD

F.A. PROJ. NO. I-00-1(23)565
PEARL COUNTY
STATE ROAD NO 712

INTERSTATE PROJECT

F.A. PROJ. NO. U-001-4(18)
WEST COUNTY
STATE ROAD NO 995

F A URBAN

KEY MAP TITLE EXAMPLES

PLATE 3

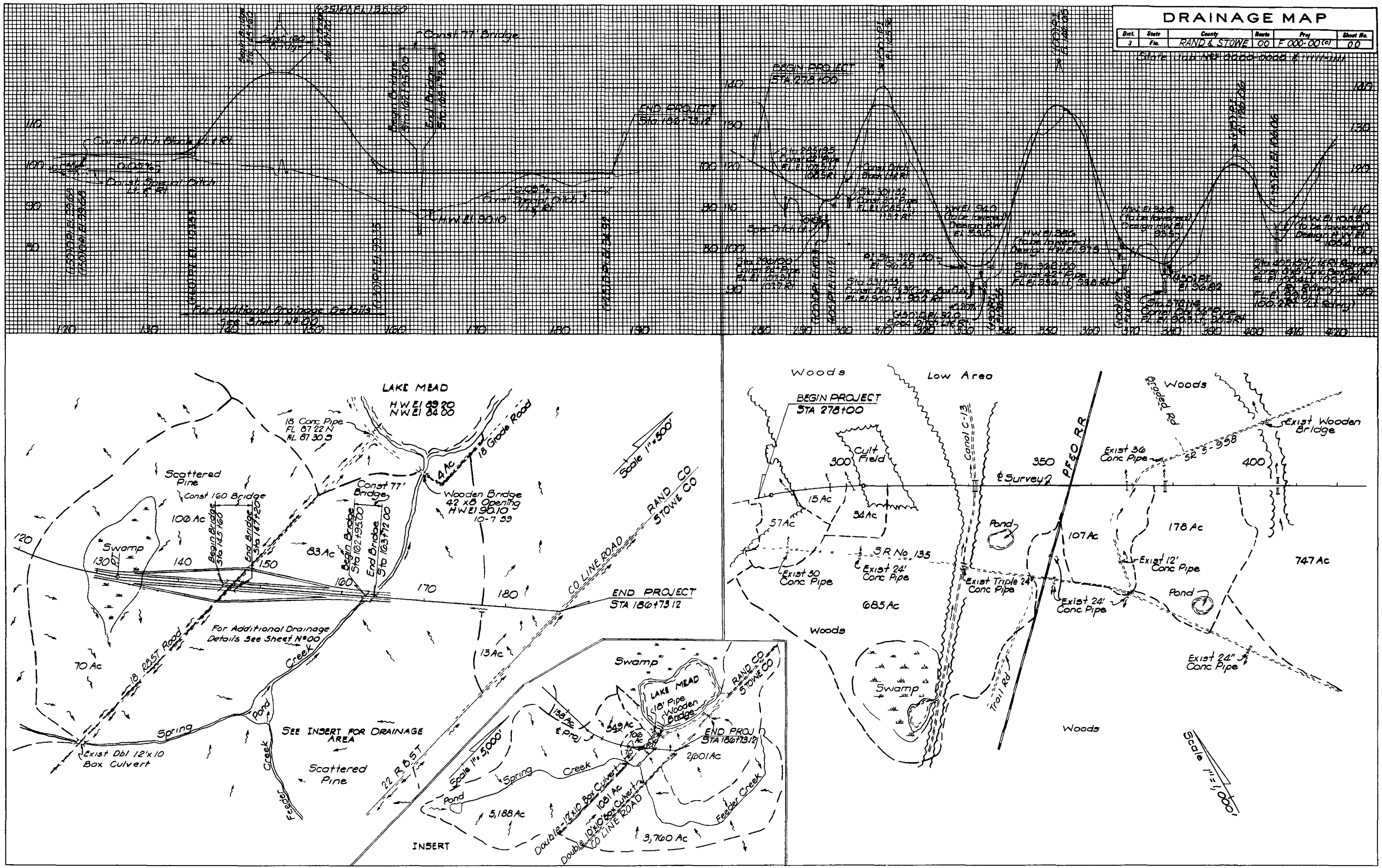

DRAINAGE MAP
Dist. 3
State Fla.
County RAND & STOWE
Route 00
Proj F 000-00(0)
Sheet No. 00
BEGIN PROJECT STA 278+00
END PROJECT Sta 180+73.12
Const 160 Bridge
Const 77' Bridge
Begin Bridge
End Bridge
Const Ditch Block
Const Special Ditch
HW El 90.10
For Additional Drainage Details See Sheet No 00
LAKE MEAD
HW El 89.20
NW El 84.00
16 Conc Pipe
18 Grade Road
Wooden Bridge 42 x 8 Opening HW El 90.10 10-7-59
Scale 1" = 500'
Scattered Pine
Swamp
100 Ac
83 Ac
70 Ac
13 Ac
4 Ac
120
130
140
150
160
170
180
CO LINE ROAD
RAND CO
STOWE CO
18 RAST Road
For Additional Drainage Details See Sheet No 00
Spring
Creek
Pond
Feeder Creek
Exist Dbl 12'x10 Box Culvert
SEE INSERT FOR DRAINAGE AREA
22 RAST
Scale 1" = 5,000'
5,188 Ac
3,760 Ac
2,601 Ac
1,081 Ac
549 Ac
Double 12'x10 Box Culvert
Double 10'x10 Box Culvert
18" Pipe
Wooden Bridge
END PROJ STA 180+73.12
INSERT
Woods
Low Area
Cult Field
300
350
400
15 Ac
34 Ac
57 Ac
107 Ac
178 Ac
685 Ac
747 Ac
Canal C-13
PFEO RR
℄ Survey
Graded Rd
SR No 135
SR 5-958
Exist Wooden Bridge
Exist 36 Conc Pipe
Exist 30 Conc Pipe
Exist 24' Conc Pipe
Exist Triple 24' Conc Pipe
Exist 12' Conc Pipe
Exist 24" Conc Pipe
Pond
Trail Rd
Swamp
Woods
Scale 1" = 1,000'

PLATE 4

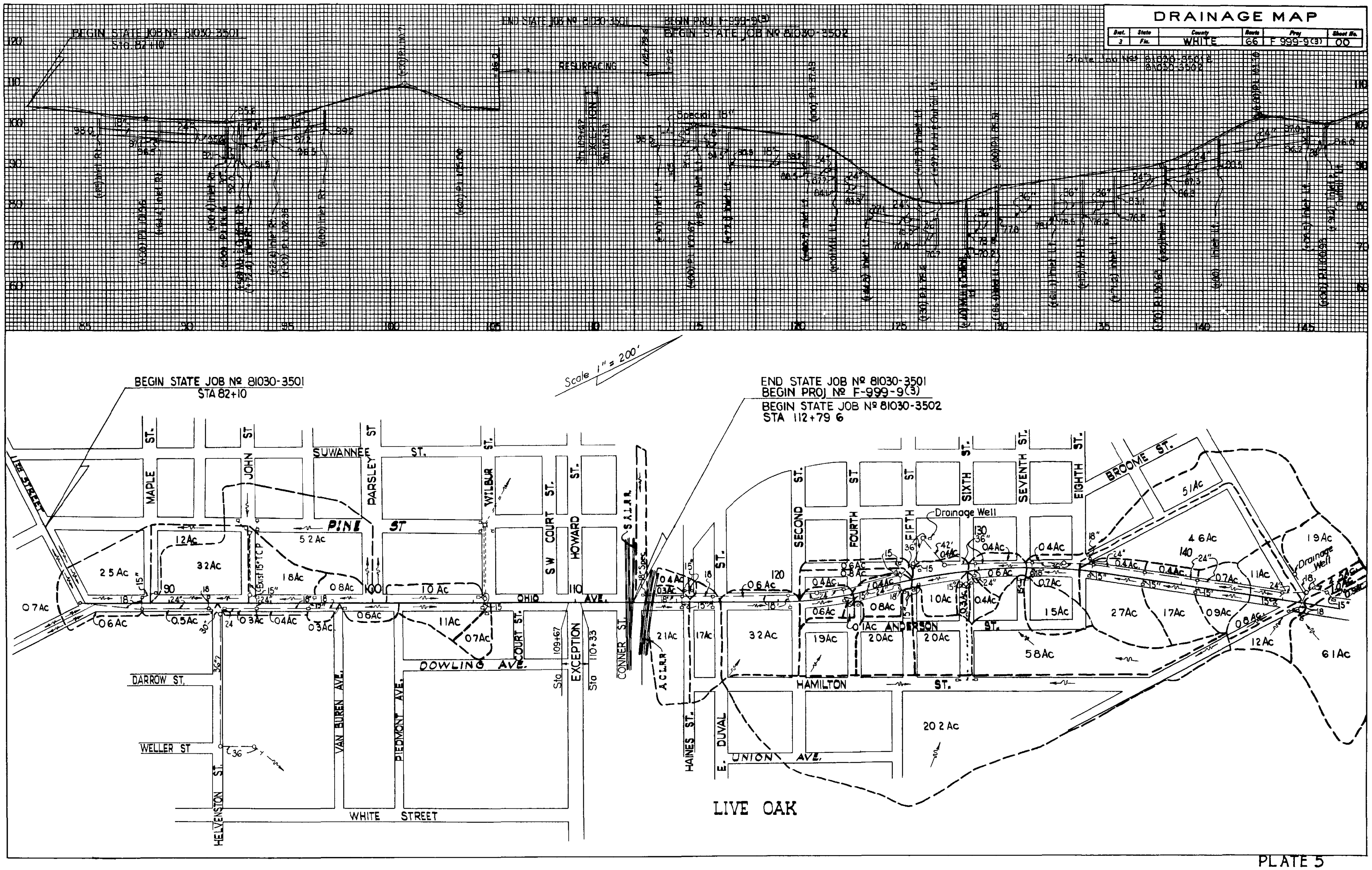
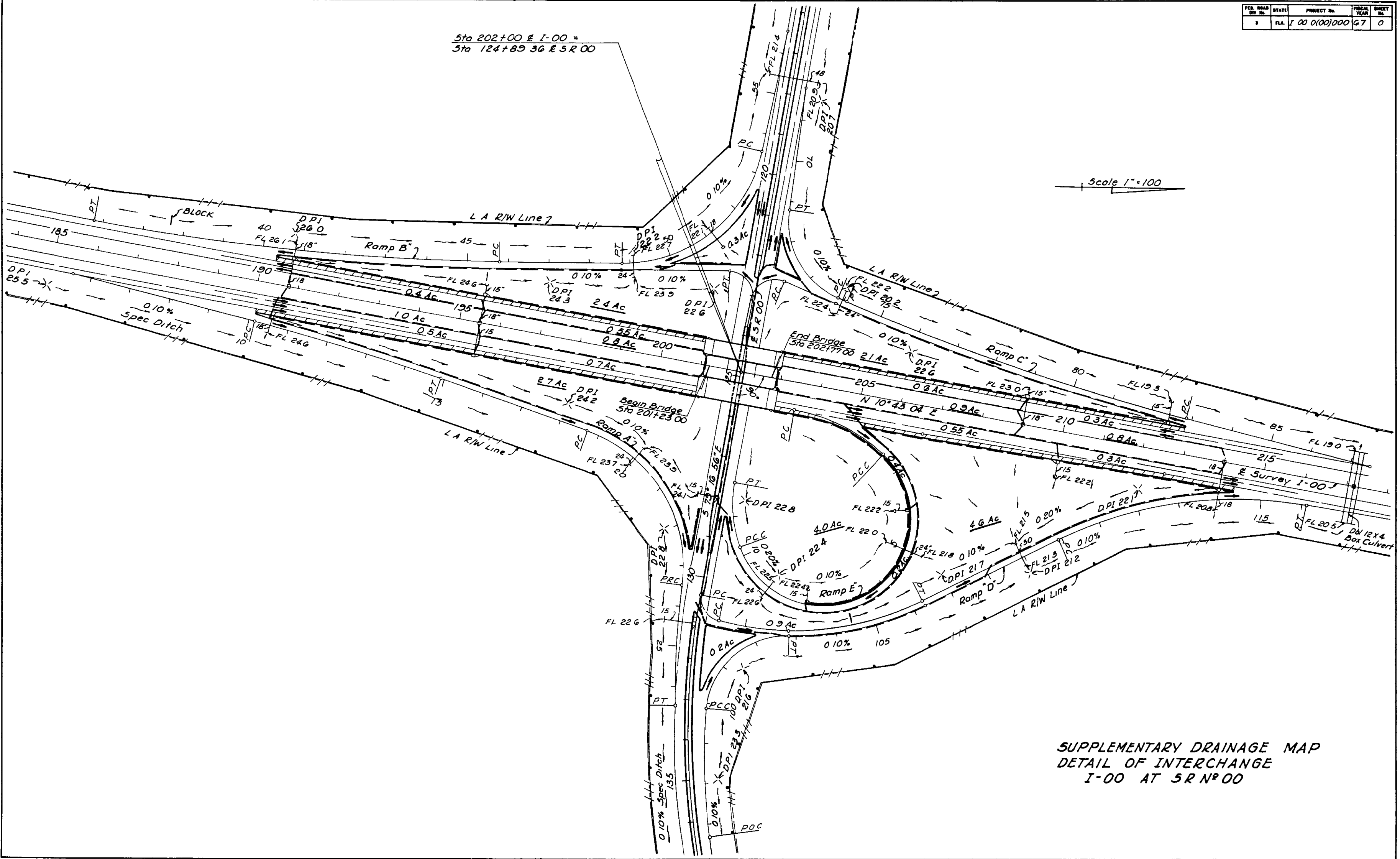

DRAINAGE MAP
Dist. 3
State Fla.
County WHITE
Route 66
Proj F 999-9(3)
Sheet No. 00
State Job Nos. 81030-3501 & 81030-3502
BEGIN STATE JOB Nº 81030-3501
STA 82+10
END STATE JOB Nº 81030-3501
BEGIN PROJ Nº F-999-9(3)
BEGIN STATE JOB Nº 81030-3502
STA 112+79 6
RESURFACING
EXCEPTION
Sta 109+67
Sta 110+33
Scale 1" = 200'
LIVE OAK
MAPLE ST.
JOHN ST.
SUWANNEE ST.
PARSLEY ST
PINE ST
WILBUR ST.
S W COURT ST.
HOWARD ST.
COURT ST.
OHIO AVE.
DOWLING AVE.
DARROW ST.
WELLER ST
HELVENSTON ST.
VAN BUREN AVE.
PIEDMONT AVE.
WHITE STREET
CONNER ST.
S.A.L.R.R.
A.C.L.R.R.
HAINES ST.
E. DUVAL ST.
UNION AVE.
SECOND ST.
FOURTH ST
FIFTH ST
SIXTH ST.
SEVENTH ST.
EIGHTH ST.
BROOME ST.
ANDERSON ST.
HAMILTON ST.
Drainage Well
0 7Ac
0 6Ac
2 5Ac
1 2Ac
3 2Ac
0 5Ac
0 3Ac
0 4Ac
5 2Ac
1 8Ac
0 8Ac
1 0Ac
1 1Ac
0 7Ac
2 1Ac
1 7Ac
1 9Ac
2 0Ac
5 8Ac
20 2Ac
1 5Ac
2 7Ac
1 7Ac
0 9Ac
4 6Ac
5 1Ac
1 1Ac
1 9Ac
1 2Ac
6 1Ac
85
90
95
100
105
110
115
120
125
130
135
140
145

PLATE 5

FED. ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.	I 00 0(00)000	67	0



SUPPLEMENTARY DRAINAGE MAP
DETAIL OF INTERCHANGE
I-00 AT SR Nº 00

PLATE 6

FED ROAD DIV N	STATE	PROJECT No.	FISCAL YEAR	SHEET No
3	FLA	I-00-0(00)000	67	0

State Job Nº 00000-0000

SUMMARY OF SODDING

STATION TO STATION		MEDIAN	SIDE SLOPES LEFT	SIDE SLOPES RIGHT	TOTAL SQ YD
326+75 - 336+40		1072			1072
337+90 - 348+25		1,150			1,150
326+28 - 336+40	Lt Rdwy		3,765		3,765
327+00 - 336+40	Rt Rdwy			3,652	3,652
337+90 - 348+17	Lt Rdwy		4,189		4,189
337+90 - 348+12	Rt Rdwy			4,074	4,074
OWENS ROAD					
7+00 - 13+92			2,591		2,591
7+00 - 13+82				2,640	2,640
16+18 - 23+00			2,672		2,672
16+08 - 23+00				2,733	2,733
TOTAL					28,538

Stationing is approximate Final limits to be established by the Engineer during construction

ESTIMATE OF TURNOUTS

Pavement (Owens Road)	75 Sq Yds
Pavement (Pecan Park Road)	100 Sq Yds

Turnouts to be constructed at locations designated by the Engineer during construction in accordance with Index Nº 5016-X

TABULATION OF DITCH PAVEMENT

STATION TO STATION	LT	MED	RT	TOTAL
316+00 to 318+00	155			135
331+00 to 331+50		39		39
335+40 to 336+50			86	86
340+00	12			12
Median Inlets				30
Miscellaneous				53
TOTAL (Sq Yds)				375

Stationing is approximate Final limits to be established by the Engineer during construction

TABLE OF SIDEDRAIN PIPE

STATION TO STATION	SIDE	LENGTH	18"	24"
305+00 TO 315+00	LT	60	60	
320+00 TO 330+00	RT	90'		90'
TOTALS			60	90

Stationing is approximate Final limits to be established by the Engineer during construction

SUMMARY OF GUARDRAIL

STATION TO STATION	SIDE	LENGTH
305+37 50 - 307+75 00 Rt Rdwy	Rt	237 50
306+25 00 - 308+62 50 Lt Rdwy	Lt	237 50
334+83 - 336+33 Rt Rdwy	Lt	150 00
337+97 - 339+47 Lt Rdwy	Rt	150 00
349+68 75 - 351+93 75 Rt Rdwy	Rt	225 00
350+56 25 - 352+81 25 Lt Rdwy	Lt	225 00
442+43 75 444+68 75 Rt Rdwy	Rt	225 00
443+31 25 - 445+56 25 Lt Rdwy	Lt	225 00
TOTAL		1,675 00

Stationing is approximate Final limits to be established by the Engineer during construction

GENERAL STABILIZING NOTES

1 No stabilizing will be required for paved turnouts to private property

2 Stable material may be required for unpaved turnouts to private property, as directed by the Engineer, in accordance with Section 102 6 of the Standard Specifications

3 Stabilize graded connections to County Roads and Streets to L B R 00, 12 deep unless otherwise shown on Plans

4 Stabilize all turnouts and intersections to County Roads and Streets to L B R 00, 12 deep and 12" outside pavement edges (6' back of curb)

BASIS OF ESTIMATE

Item Nº 300-1-1	0 15 Gal/SY
Item Nº 300 1-2	0 20 Gal/SY
Item Nº 300 1 3	0 04 Gal/SY/Application (ACSC)
	0 05 Gal/SY/Application (SAHM)
Item Nº 300 31	15 Lbs/SY

SUMMARY OF UNDERDRAIN-6 INCH

STATION TO STATION	LT	RT	TOTAL
350+00 TO 358+50	850		850
380+00 TO 390+50		1,050'	1,050'
TOTAL			1900

Stationing is approximate Final limits to be established by the Engineer during construction

SUMMARY OF QUANTITIES

	ITEM Nº	ITEM	UNIT	QUANTITY
	110 1	Clearing and Grubbing	Lump Sum	1
	110 2	Clearing and Grubbing [Borrow Pits]	Acre	192 76
	110 4	Plugging Water Wells (Non Artesian)	Per Well	2
	135 1	Grading	Lump Sum	1
	135 6	Borrow Excavation	Cu Yd	581495
	135 7	Subsoil Excavation	Cu Yd	41,340
	160 1	Stabilizing (L B R)(12")	Sq Yd	251,074
	160 2	Stabilizing (L B R)(6)	Sq Yd	3,926
	160 3	Commercial Stabilizing Material	Cu Yd	45,235
	200-1-2	Limerock Base (8½" Thick) [Double Course]	Sq Yd	10,761
	200 1 3	Limerock Base (10½" Thick) [Double Course]	Sq Yd	136,961
	300 1-2	Bituminous Material (Prime-Armor Coat)	Gallon	29,544
	300 1 3	Bituminous Material (Tack Coat)	Gallon	11,331
	300 1-5	Bituminous Material (Plant Mix) (AC 60-70)	Gallon	264,690
	300-31	Sand or Screenings for Armor Coat	Ton	1,108
	331 1 3	Type I Asphaltic Concrete (1½" Thick)	Sq Yd	4,952
	331 2 15	Type I Asphaltic Concrete Surface Course (1" Thick) with Binder Course (2" Thick)	Sq Yd	137,559
	331 4	Type I Asphaltic Concrete	Ton	10
	360-1	Concrete Approach Slabs	Each	6
	400 1-1	Class A Concrete (Culverts)	Cu Yd	631 80
	405-1	Class NS Concrete [Endwalls]	Cu Yd	91 36
	415 1 1	Reinforcing Steel (Roadway)	Pound	92,933
	425 1 2	Inlets (Ditch Bottom)	Each	34
	430 1 22	Concrete Pipe Culvert (15")[Cross Drain]	Lin Ft	135
	430 1 23	Concrete Pipe Culvert (18")[Cross Drain]	Lin Ft	1,385
	430 1 24	Concrete Pipe Culvert (24")[Cross Drain]	Lin Ft	566
	430 1-26	Concrete Pipe Culvert (36")[Cross Drain]	Lin Ft	72
Alt	430 4 22	Bituminous Coated and Paved Corrugated Steel Pipe Culvert (15") (Curb Drain)	Lin Ft	113
Alt	430 10 22	Bituminous Coated and Paved Corrugated Aluminum Pipe Culvert (15") (Curb Drain)	Lin Ft	113
	430-18-3	Side Drain Pipe Culvert (18")	Lin Ft	60
	430 18 4	Side Drain Pipe Culvert (24")	Lin Ft	90
	440 1 2	Underdrains (6")	Lin Ft	1,900
	520 2 2	Concrete Curb (Type "B")	Lin Ft	1,231
	520 2 3	Concrete Curb (Type "C")	Lin Ft	595
	520-30	Concrete Shoulder Gutter	Lin Ft	7,078
	520 5 42	Concrete Traffic Separator (Type IV) (6 Wide)	Lin Ft	344
	522 1	Concrete Sidewalk, 4" Thick	Sq Yd	92
	524-1 1	Concrete Ditch Pavement (3" Thick)	Sq Yd	375
	536-1-1	Guardrail (Roadway)	Lin Ft	1,675
	540 1	Right of Way Markers	Each	28
	550 1	Fencing, Type "A"	Lin Ft	47,042
	550 3 1	Pull, End, and Corner Posts, and Assemblies (Type "A" Fence)	Post	143
	570-1	Grassing	Sq Yd	1,000
	570 2	Grassing and Mulching	Sq Yd	345,644
	570 3	Mulch Material	Ton	286
	570-4	Fertilizer	Ton	35 17
	570 30	Water for Grassing and Sodding	M Gals	391
	575 1	Sodding	Sq Yd	28,538
Shoulder Alt F	200 1-1	Limerock Base (6½" Thick)	Sq Yd	70,534
	300 1-1	Bituminous Material (Prime Coat)	Gallon	10,580
	300-1 3	Bituminous Material (Tack Coat)	Gallon	2,821
	300 1-4	Bituminous Material (Plant Mix) (AC 85-100)	Gallon	53,938
	331-1-1	Type I Asphaltic Concrete (1 Thick)	Sq Yd	70,534
Shoulder Alt G	300-1-3	Bituminous Material (Tack Coat)	Gallon	7053
	300 1-4	Bituminous Material (Plant Mix) (AC 85 100)	Gallon	298,732
	335-1 71	Sand-Asphalt Hot Mix (6 Thick) (800 lb Stability)	Sq Yd	70,534

Item Nº 331-4 Included for contingencies for adjustment of connections to existing streets, drives, etc, as directed by the Engineer

Item Nº 524 1 1 Includes 53 Sq Yds, not shown on plans, to be constructed at locations designated by the Engineer in accordance with Index Nº 1101 X

Item Nº 570-1 Includes 500 Sq Yds to be used, if and where necessary, as directed by the Engineer

For Signing Items and Quantities See Signing Plans

For Bridge Items and Quantities See Bridge Plans

PLATE 7

SUMMARY OF DRAINAGE STRUCTURES

FED. ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.			

INDEX No	STA TO STA	SIDE	TYPE	SIZE	LENGTH	CONCRETE PIPE										INLETS									MANHOLES							JUNC BOX "J"	CONC CLASS "A" CU YD	CONC CLASS "NS" CU YD	REINF STEEL LB	REMARKS
						15"	18"	24"	30"	36"	42"	SPECIAL 42"	48"	54"	60'	"C"		"E"	"F"	"J 5"	"J-6"	"P-5"		"P 6"	J-7'		J 8"	"P-7"	"P-8"	SPECIAL						
																0 4'	4 6	6 8	4-6	8-10	8-10'	4-6	6 8	4-6	6-8	8 10'	12'-14	6-8	6 8'	0 4	4-6	6'-8'				
5047-X	77+79 to 77+84	Lt. - Rt.	Inlet, Pipe	15	80	80																/														
5047-X	77+73 to 77+84	Rt.	Inlet, Pipe	15	7	7																	/													
5047-X	77+84 to 79+44.75	Rt.	Manhole, Pipe	24"	158'			158																					/							
5047-X	79+44.75 to 79+44.75	Rt.	Inlet, Pipe	15"	16'	16													/																	Pave around Inlet
5047-X	79+44.75 to 81+64	Rt. - Lt.	Manhole, Pipe	24"	226			226																					/							Conn. 24 Pipe to Exist. Manhole
5047-X	81+64 to 81+73	Lt.	Pipe, Manhole	18"	7		7																					/								Conn. 18 Pipe to Exist. Manhole
5047-X	81+79 to 81+78	Lt	Inlet, Pipe	15"	7'	7																		/												
5047-X	81+78 to 81+78	Lt. - Rt	Pipe, Inlet	15"	77	77																		/												
5047-X	81+78 to 83+88	Rt.	Manhole, Pipe	24"	210			210																					/							Encase 8" San. Sewer
5047-X	83+88 to 83+88	Lt. - Rt.	Inlet, Pipe	15"	68	68																/														
5047-X	83+88 to 87+18	Rt.	Manhole, Pipe	30	360'				360																				/							
	OUTFALL NO I																																			
5047-X	87+18 ℄ S.R. 99 to																																			
	14+45 ℄ Outfall	Rt.	Pipe, Junction Box	54	398									398'																		/				
5047 X	14+45 to 14+60	Rt.	Pipe, Manhole	54	10									10											/											
5047 X	14+60 to 14+99	Rt.	Pipe, Manhole	54"	33									33												/										
1454-X	14+99 to 15+52	Rt. - Lt.	Pipe, Endwall	54"	96									96																				12.71		
	31+70 to 31+70	Lt.	Weir, Pipe	42	5						5																						15.27		1,870	Const. Weir
5047-X	31+70 to 33+80	Lt. - Rt.	Manhole, Pipe	42	187						187														/											
5047 X	33+80 to 34+95	Rt.	Manhole, Pipe	Special 42"	112							112														/										
	S.R NO 99																																			
5047 X	87+18 to 87+18	Rt. - Lt.	Manhole, Pipe	54	93									93												/										
5061 X	87+18 to 91+50	Lt.	Spec Manhole, Pipe	54	432									432																	/					
5047-X	91+50 to 94+93	Lt.	Manhole, Pipe	54	343									343													/									
5047-X	94+93 to 94+93	Rt. Lt.	Inlet, Pipe	15"	68	68																		/												
5061-X	94+93 to 97+80	Lt.	Spec. Manhole, Pipe	54"	287									287																/						
5047-X	97+80 to 97+80	Lt.	Inlet, Pipe	15	11	11																/														
5061 X	97+80 to 99+02	Lt.	Spec. Manhole, Pipe	54	202									202																	/					
5047 X	99+02 to 99+02	Rt. - Lt.	Inlet, Pipe	15"	68	68																/														Const 15 Pipe into 54" Pipe
5047 X	99+02 to 102+00	Lt.	Inlet, Pipe	42	288						288										/															
5047 X	102+00 to 102+00	Rt - Lt.	Inlet, Pipe	15	81	81																/														
5047 X	102+00 to 104+70	Rt.	Inlet, Pipe	42	267						267										/															
5047-X	104+70 to 104+70	Rt. - Lt.	Inlet, Pipe	15	82	82																	/													
5047-X	104+70 to 107+45	Lt.	Inlet, Pipe	42	271'						271									/																
5047-X	107+50 to 110+80	Lt.	Manhole, Pipe	42	331						331															/										
5046 X	111+06 to 110+80	Lt.	Inlet, Pipe	15	35	35										/																				Exist 18" x 10" (To Remain)
5047 X	110+80 to 110+80	Rt. - Lt.	Inlet, Pipe	15	80	80																		/												
5047 X	110+80 to 115+40	Lt.	Manhole, Pipe	36	456					456																/										
5046-X	115+80 to 115+40	Lt.	Inlet, Pipe	15	43	43											/																			Conn 15" Pipe to Exist Inlet
5047 X	115+40 to 119+00	Lt.	Pipe, Manhole	30	358				358																			/								
5046-X	119+00 to 119+00	Lt.	Inlet, Pipe	15	16	16										/																				
5047-X	119+00 to 123+00	Lt. - ℄	Manhole, Pipe	48	404								404													/										
5047-X	122+60 to 123+00	Lt. - ℄	Inlet, Pipe	15	71'	71																		/												
5047-X	123+00 to 123+00	Rt. - ℄	Inlet, Pipe	15"	55	55																/														
5047-X	123+00 to 124+15.80	℄ - Lt.	Manhole, Pipe	48	129								129													/										
	OUTFALL NO 2																																			
5047 X, 2415-X	10+79 to 13+53	℄	Manhole, Pipe, Endwall	60"	270										270											/							13.56		758	
1454 X	17+00 to 19+19.91	℄	Weir, Endwall, Pipe	36	218					218																							4.54	5.11	624	Const. Weir
5047-X	19+19.91 to 22+95.11	℄	Manhole, Pipe	42"	369						369															/										
1915-X	19+19.91		Pipe Stubs	15 & 24"	6 & 6	6		6																												Const. Stubs and Plug
5047 X	22+95.11 to 26+70.11	℄	Manhole, Pipe	42	369						369															/										
5046 X	26+70.11 to 31+76	℄	Inlet, Pipe	42"	500						500							/																		
1915-X	26+70.11		Pipe Stubs	15" & 24"	6 & 6	6		6																												Const. Stubs and Plug
5047 X, 1454-X	31+76 to 36+42	℄	Manhole, Pipe, Endwall	42"	459						459'															/								7.03		
	SR NO 99																																			
5047-X	124+15.80 to 124+90	Lt. - ℄	Pipe, Manhole	48"	104								104													/										
5047 X	124+90 to 124+90	Lt.	Inlet, Pipe	15	15	15																	/													
5047 X	124+90 to 128+03	Lt. - ℄	Pipe, Manhole	48"	309								309													/										
1454 X	136+00	Rt. - Lt.	Pipe, Endwalls	18	78		78																											3.84		
1454 X	146+00	Rt. Lt.	Pipe, Endwalls	24	78			78																										5.30		
1454 X	160+00	Rt. - Lt.	Pipes, Endwalls	Dbl 30	80				160																									9.24		
8011, 1101 X	175+00	Rt. - Lt.	Conc. Box Culvert	6 x 4	146																												97.91		11,729	
8050 Mod.	190+00	Rt. Lt.	Conc. Box Culvert	Trip. 8 x 9	293																												824.61*		128,738 *	
	TOTALS					892'	85	684'	878'	674	3046'	112	946'	1,894'	270'	2	1	1	1	1	2	6	3	5	2	13	1	2	4	1	2	1	955.89	43.23	143,719	

*DENOTES BRIDGE CULVERT QUANTITY

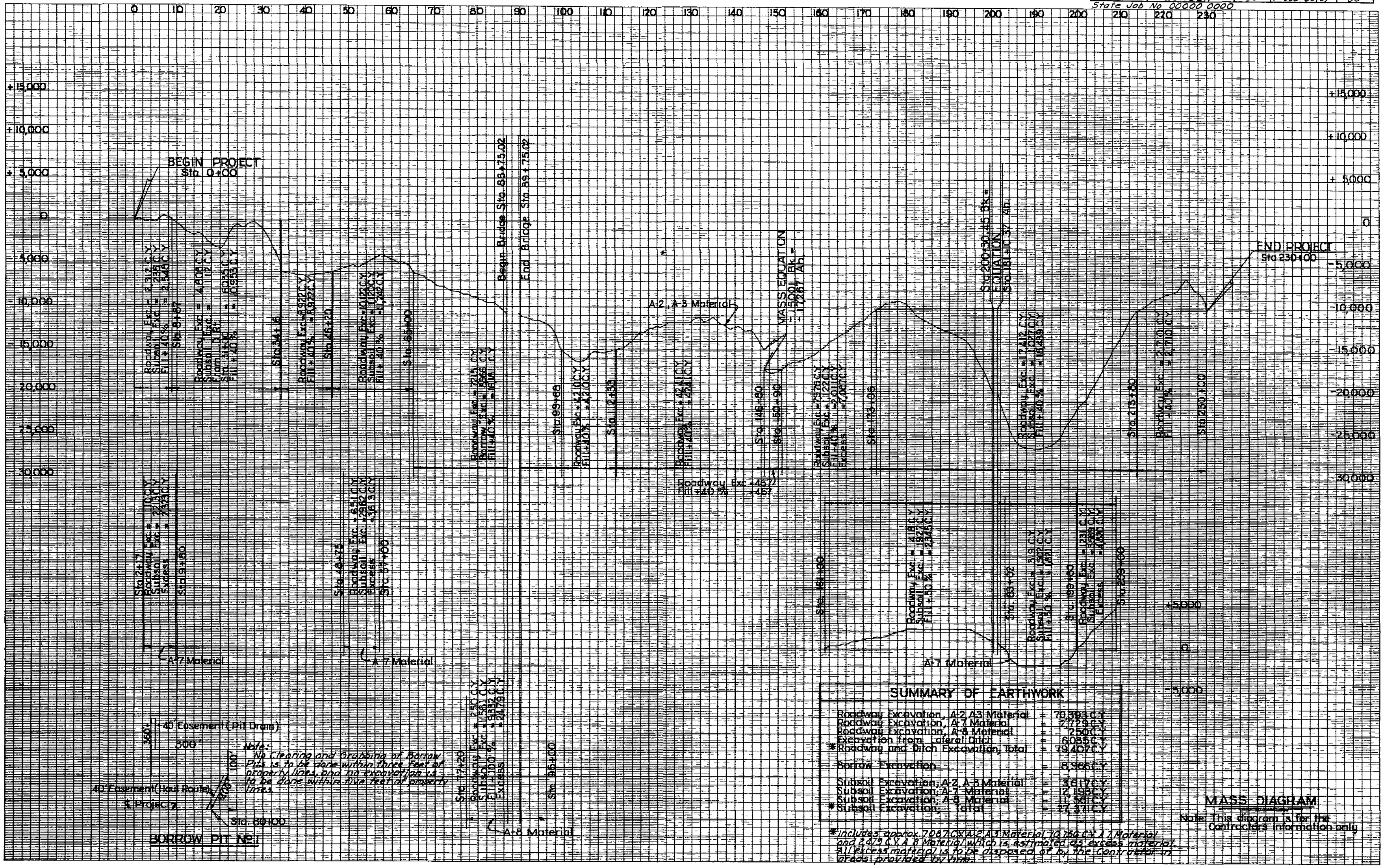
VIM W0140

CROSS SECTIONS

Scale as shown

Fed Rd D N	State	County	Route	Proj No	Sheet No
3	Fla	LOWDEN	00	F 000-00(0)	00

State Job No 00000 0000



Note:
No Clearing and Grubbing of Borrow Pits is to be done within three feet of property lines, and no excavation is to be done within five feet of property lines.

SUMMARY OF EARTHWORK

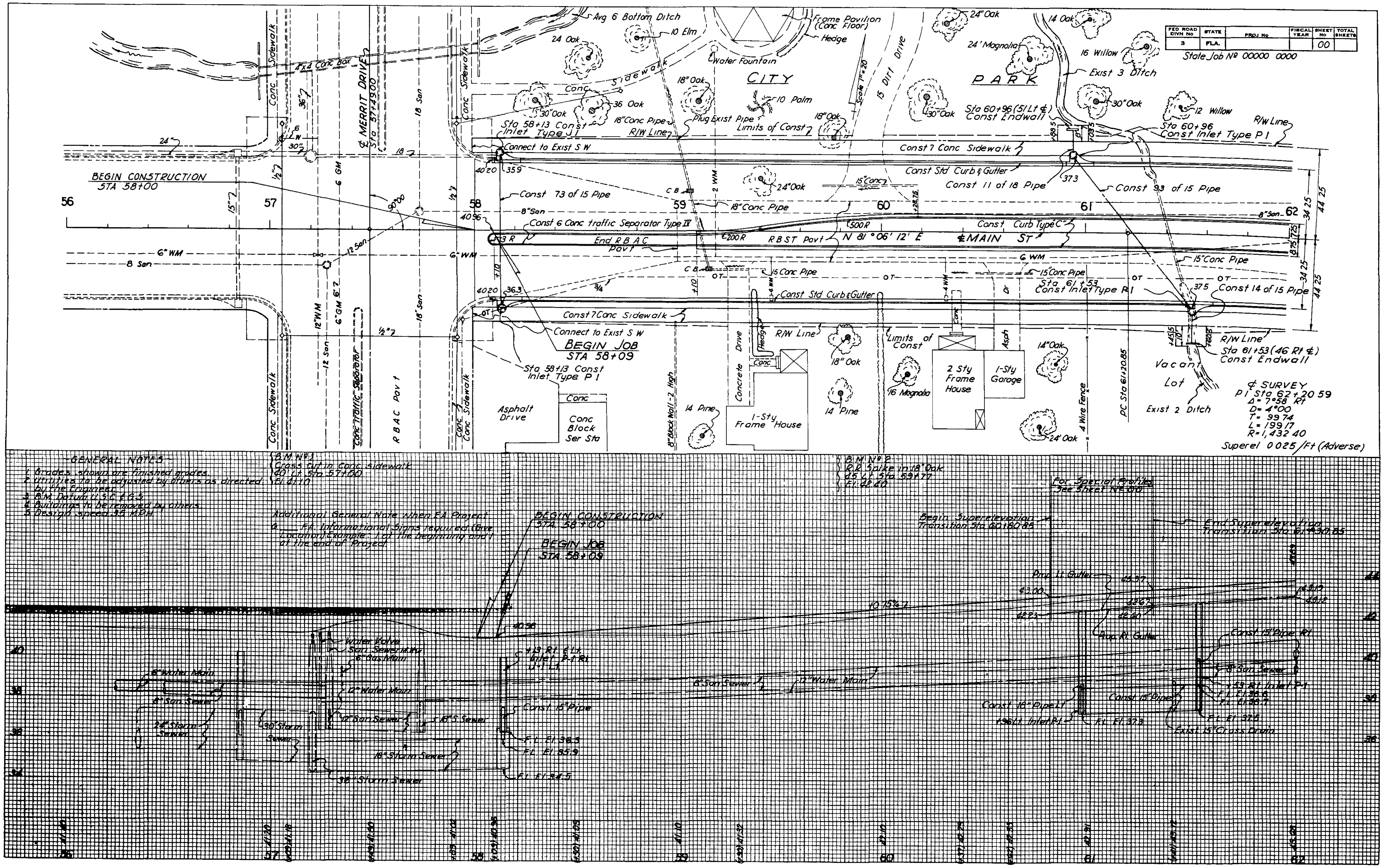
Roadway Excavation, A-2 A3 Material	=	70,393 C.Y.
Roadway Excavation, A-7 Material	=	2,729 C.Y.
Roadway Excavation, A-8 Material	=	250 C.Y.
Excavation from Lateral Ditch	=	6085 C.Y.
* Roadway and Ditch Excavation, Total	=	79,407 C.Y.
Borrow Excavation	=	8,966 C.Y.
Subsoil Excavation, A-2, A-3 Material	=	3,617 C.Y.
Subsoil Excavation, A-7 Material	=	12,193 C.Y.
Subsoil Excavation, A-8 Material	=	11,561 C.Y.
* Subsoil Excavation, Total	=	27,371 C.Y.

** Includes approx. 7087 C.Y. A-2 A3 Material, 10,750 C.Y. A-7 Material and 2479 C.Y. A-8 Material which is estimated as excess material. All excess material is to be disposed of by the Contractor in areas provided by him.*

MASS DIAGRAM

Note: This diagram is for the Contractors information only

PLATE 10



GENERAL NOTES

1. Grades shown are finished grades.
2. Utilities to be adjusted by others as directed by the Engineer.
3. B.M. Datum U.S.C.&G.S.
4. Buildings to be removed by others.
5. Design speed 35 M.P.H.

B.M. Nº 1
Cross cut in Conc Sidewalk
40' Lt Sta 57+00
El 41.10

Additional General Note when F.A. Project

6. ___ F.A. Informational Signs required (Give Location) Example: 1 at the beginning and 1 at the end of Project

PLATE 11

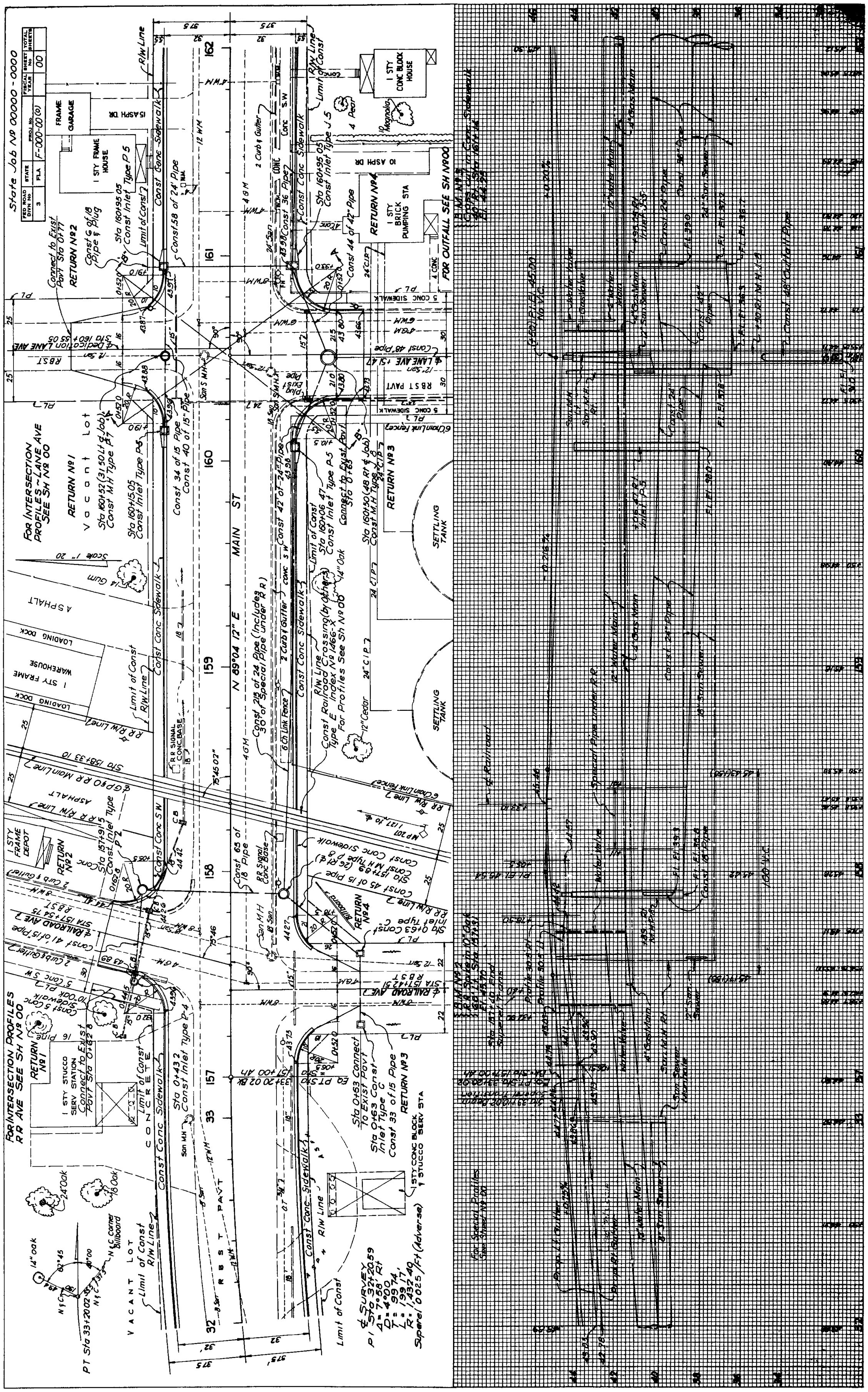
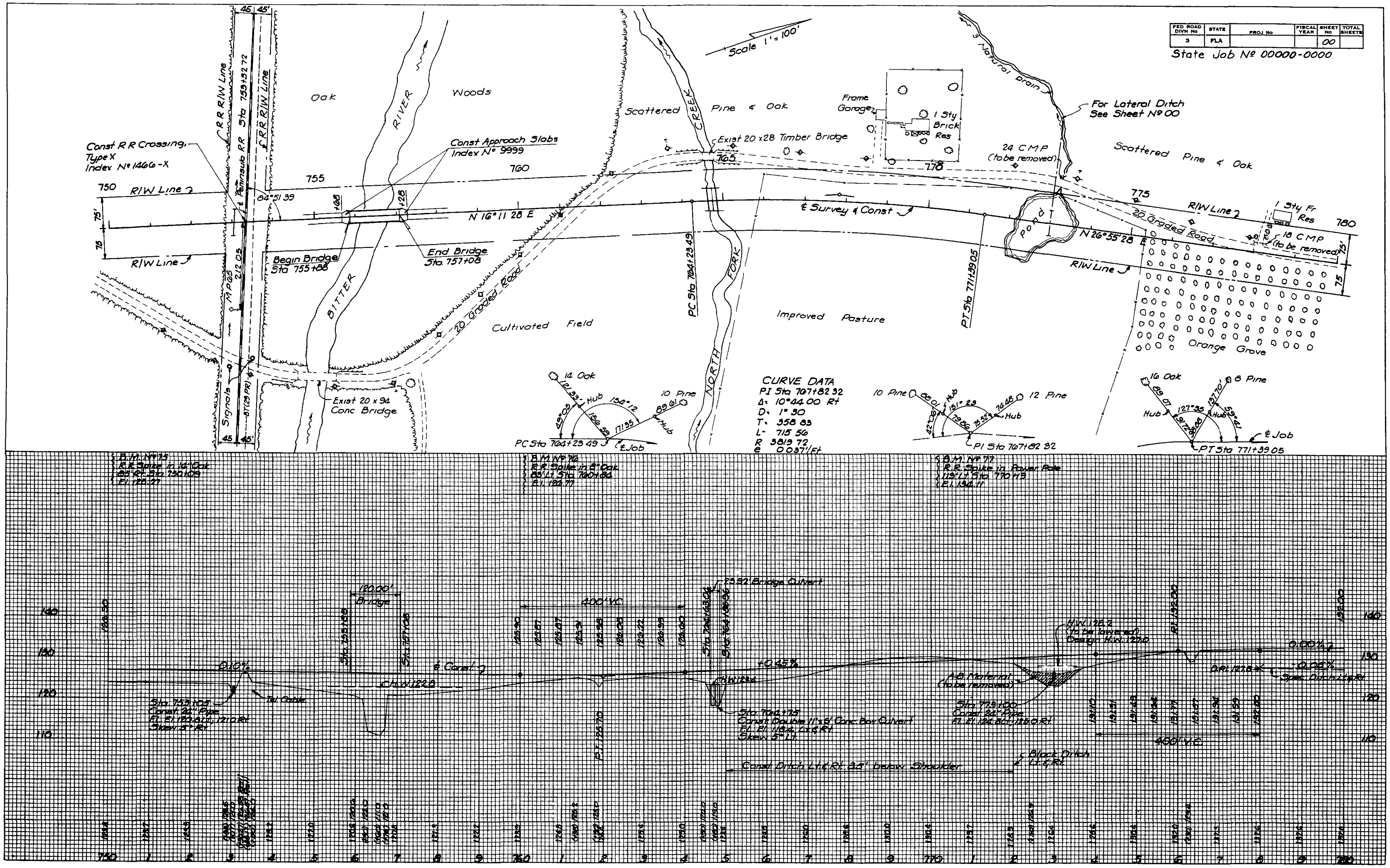

State Job No 00000-0000
FED ROAD DIV NO 3
STATE FLA
PROJ NO F-000-00(0)
SHEET NO 00
N 89°04' 12" E MAIN ST
RETURN No1
RETURN No2
RETURN No3
RETURN No4
FOR INTERSECTION PROFILES ~ LANE AVE SEE SH No 00
FOR INTERSECTION PROFILES RR AVE SEE SH No 00
FOR OUTFALL SEE SH N900
Const Conc Sidewalk
R/W Line
Limit of Const
RBST PAVT
Const Railroad Crossing (by others) Type E Index No 1466-X For Profiles See Sh No 00
℄ SURVEY
PI Sta 32+20.59
SETTLING TANK
1 STY BRICK PUMPING STA
1 STY FRAME HOUSE
FRAME GARAGE
1 STY CONC BLOCK HOUSE
1 STY FRAME WAREHOUSE
1 STY FRAME DEPOT
1 STY STUCCO SERV STATION
1 STY CONC BLOCK & STUCCO SERV STA
VACANT LOT
Scale 1" = 20'
℄ Railroad
For Special Profiles See Sheet No 00
157
158
159
160
161
162
32
33

PLATE 12



FED ROAD DIVN No | STATE | PROJ No | FISCAL YEAR | SHEET No | TOTAL SHEETS
3 | FLA | | | 00 |
State Job Nº 00000-0000
Scale 1" = 100'
Oak
Woods
RIVER
BITTER
Scattered Pine & Oak
CREEK
NORTH
FORK
Exist 20 x 28 Timber Bridge
Frame Garage
1 Sty Brick Res
3' Natural Drain
For Lateral Ditch See Sheet Nº 00
24 C M P (to be removed)
Scattered Pine & Oak
1 Sty Fr Res
18 C M P (to be removed)
Orange Grove
Improved Pasture
Cultivated Field
20' Graded Road
Const R R Crossing, Type X Index Nº 1466-X
R R R/W Line
℄ Peninsula RR Sta 753+52.72
℄ R R R/W Line
Const Approach Slabs Index Nº 9999
750
755
760
765
770
775
780
R/W Line
N 16° 11' 28" E
N 26° 55' 28" E
84° 51' 39"
Begin Bridge Sta 755+88
End Bridge Sta 757+08
℄ Survey & Const
PC Sta 764+23.49
PT Sta 771+39.05
Pond
Signals
M P 65
212.05
BT (29 PR)
Exist 20 x 94 Conc Bridge
45
45'
75'
75
14 Oak
10 Pine
Hub
℄ Job
PC Sta 764+23.49
CURVE DATA
PI Sta 767+82.32
Δ = 10° 44' 00" Rt
D = 1° 30'
T = 358.83
L = 715.56
R = 3819.72
e = 0.037'/Ft
10 Pine
12 Pine
PI Sta 767+82.32
16 Oak
8 Pine
PT Sta 771+39.05
B.M. Nº 75 R.R. Spike in 14" Oak 85' Rt. Sta. 750+09 El. 125.27
B.M. Nº 76 R.R. Spike in 8" Oak 85' Lt. Sta. 760+84 El. 122.77
B.M. Nº 77 R.R. Spike in Power Pole 115' Lt. Sta. 770+13 El. 134.11
0.10%
Sta. 753+05 Const 24" Pipe Fl. El. 120.6 Lt., 121.0 Rt. Skew 5° Rt.
Tel. Cable
120.00' Bridge
Sta. 755+88
Sta. 757+08
℄ Const.
C.H.W. 122.8
400' V.C.
P.I. 125.70
25.92' Bridge Culvert
Sta. 764+23.04
Sta. 764+25.96
+0.45%
H.W. 123.4
Sta. 764+75 Const Double 11'x5' Conc. Box Culvert F.L. El. 118.4 Lt. & Rt. Skew 5° Lt.
Const Ditch Lt. & Rt. 3.5' below Shoulder
Block Ditch Lt. & Rt.
A-8 Material (to be removed)
Sta. 773+00 Const 24" Pipe Fl. El. 124.8 Lt., 125.0 Rt.
H.W. 128.2 (to be lowered) Design H.W. 127.0
P.I. 132.00
0.00%
-0.05%
D.P.I. 127.8
Spec. Ditch Lt. & Rt.
400' V.C.
110
120
130
140
750
760
770
780

PLATE 13

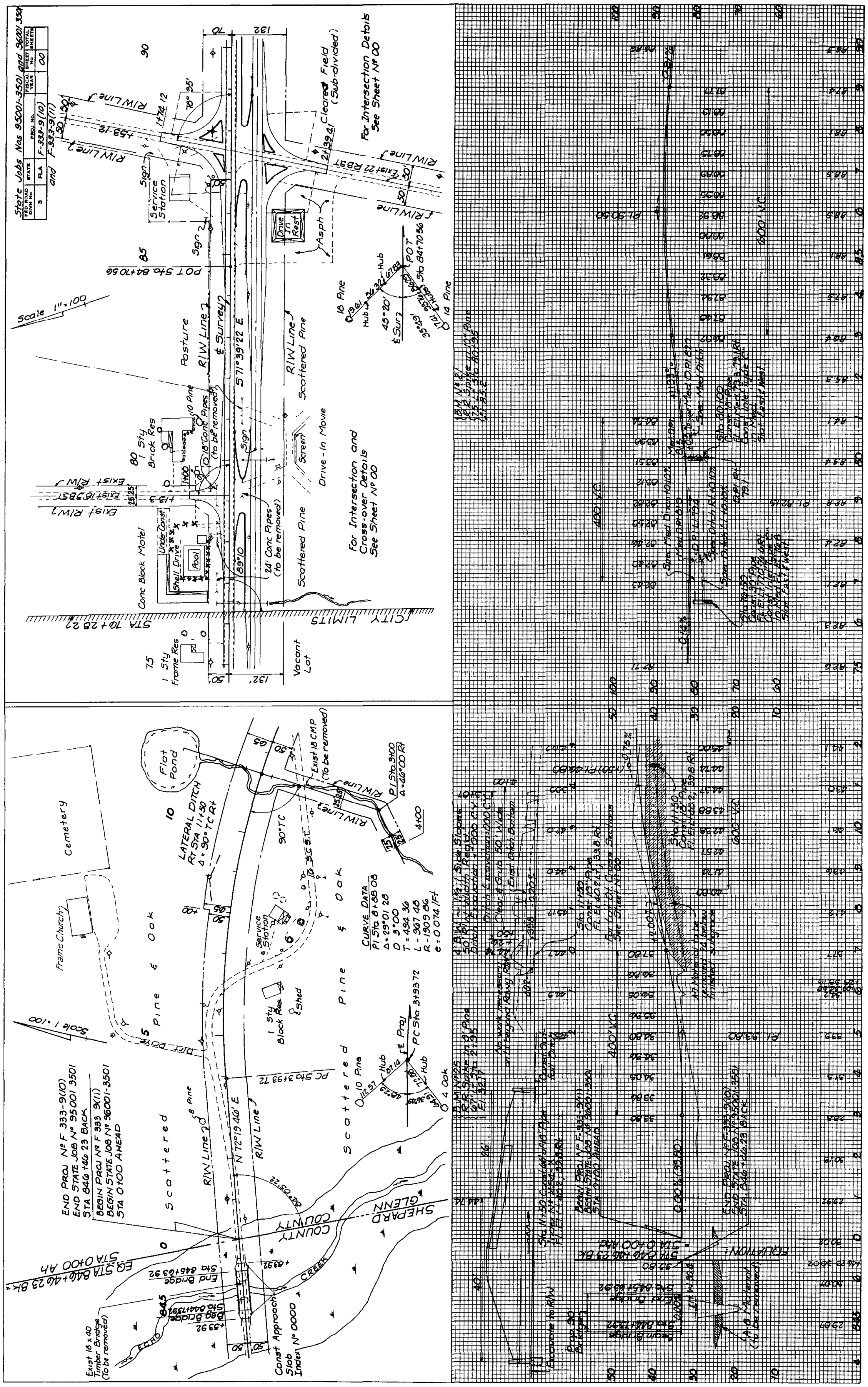

State Jobs Nos 95001-3501 and 96201-3501
Scale 1"=100
Cemetery
Frame Church
Flat Pond
LATERAL DITCH
Service Station
1 Sty Block Res.
Shed
Scattered Pine & Oak
CURVE DATA
PI Sta 8+88.08
Δ = 29°01'28
D = 3°00
T = 494.36
L = 967.48
R = 1909.86
e = 0.074 /Ft
END PROJ Nº F 333-9(10)
END STATE JOB Nº 95001-3501
STA 846+46.23 BACK
BEGIN PROJ Nº F 333-9(11)
BEGIN STATE JOB Nº 96001-3501
STA 0+00 AHEAD
EQ STA 846+46.23 Bk = STA 0+00 Ah
SHEPARD COUNTY
GLENN
ECHO CREEK
Exist 18 x 40 Timber Bridge (To be removed)
Const Approach Slab Index Nº 0000
N 72°19'40" E
R/W Line
STA 70+28.22
CITY LIMITS
1 Sty Frame Res
Vacant Lot
Conc Block Motel
Pool
Drive-In Movie
Scattered Pine
For Intersection and Cross-over Details See Sheet Nº 00
1 Sty Brick Res
Pasture
S 71°39'22" E
POT Sta 84+70.56
Service Station
Drive In Rest
Cleared Field (Sub-divided)
For Intersection Details See Sheet Nº 00
400' V.C.
600' V.C.
EQUATION

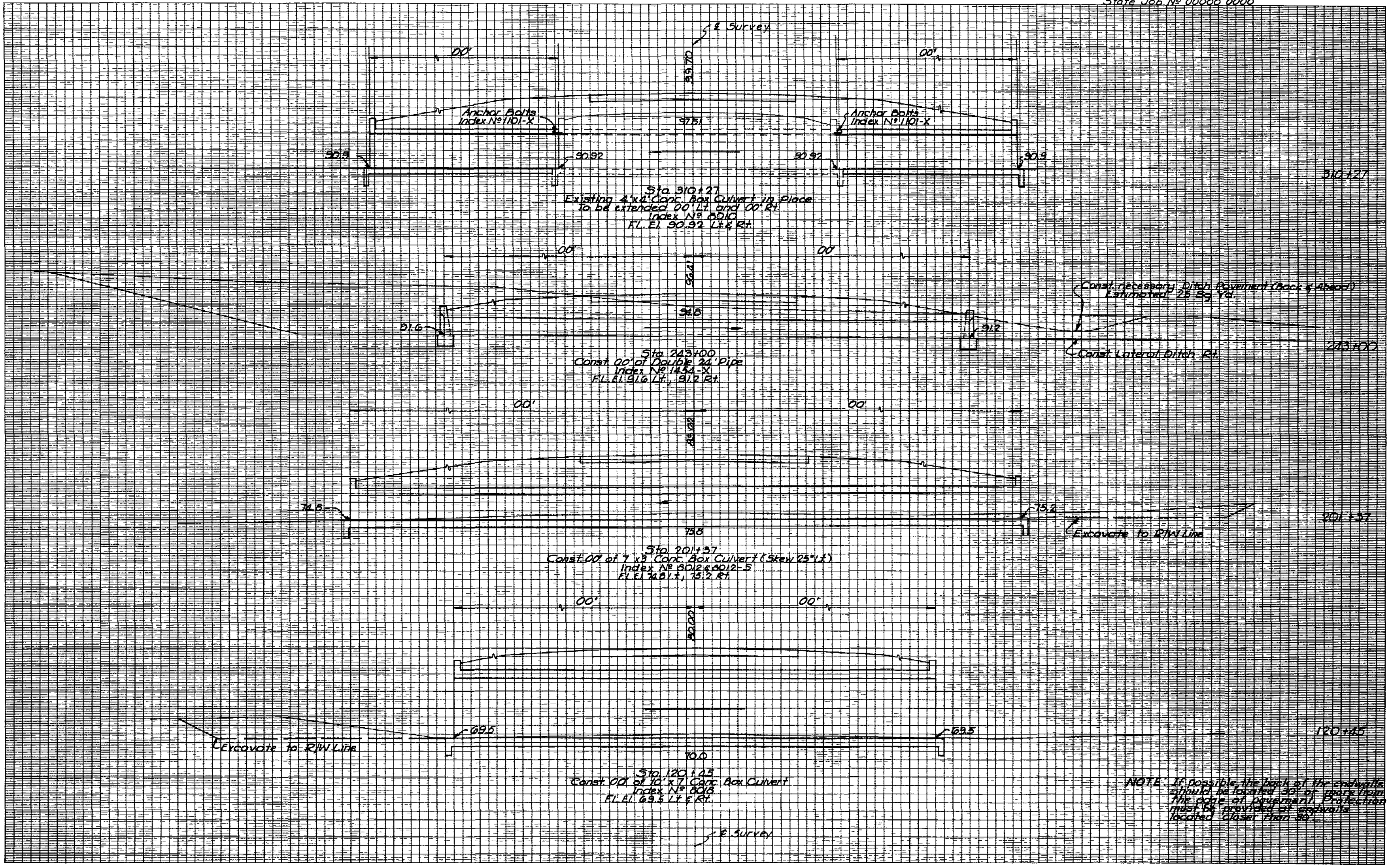
PLATE 14

CROSS SECTIONS

Scale 1 inch = 5 feet

Fed Road D No	State	County	Route	Proj No.	Sheet No
3	Fla.	WORTH	00		00

State Job № 00000 0000



Sta. 310+27
Existing 4'x4' Conc. Box Culvert in Place
To be extended 00' Lt. and 00' Rt.
Index № 8010
F.L. El. 90.92 Lt & Rt.

Const. necessary Ditch Pavement (Back & Ahead)
Estimated 25 Sq. Yd.

Const. Lateral Ditch Rt.

Sta. 243+00
Const. 00' of Double 24" Pipe
Index № 1454-X
F.L. El. 91.6 Lt., 91.2 Rt.

Excavate to R/W Line

Sta. 201+37
Const. 00' of 7' x3' Conc. Box Culvert (Skew 25° Lt.)
Index № 8012 & 8012-5
F.L. El. 74.8 Lt., 75.2 Rt.

Excavate to R/W Line

Sta. 120+45
Const. 00' of 10'x7' Conc. Box Culvert
Index № 8018
F.L. El. 69.5 Lt & Rt.

NOTE: If possible the back of the endwalls should be located 30' or more from the edge of pavement. Protection must be provided at endwalls located closer than 30'.

Application No.________
Route No.________
Original Plotted by ________
Checked by ________
Template by________
Area by________
Finals Plotted by________
Checked by________
Area by________
Checked by________

A. R. COGSWELL
JACKSONVILLE, FLA.

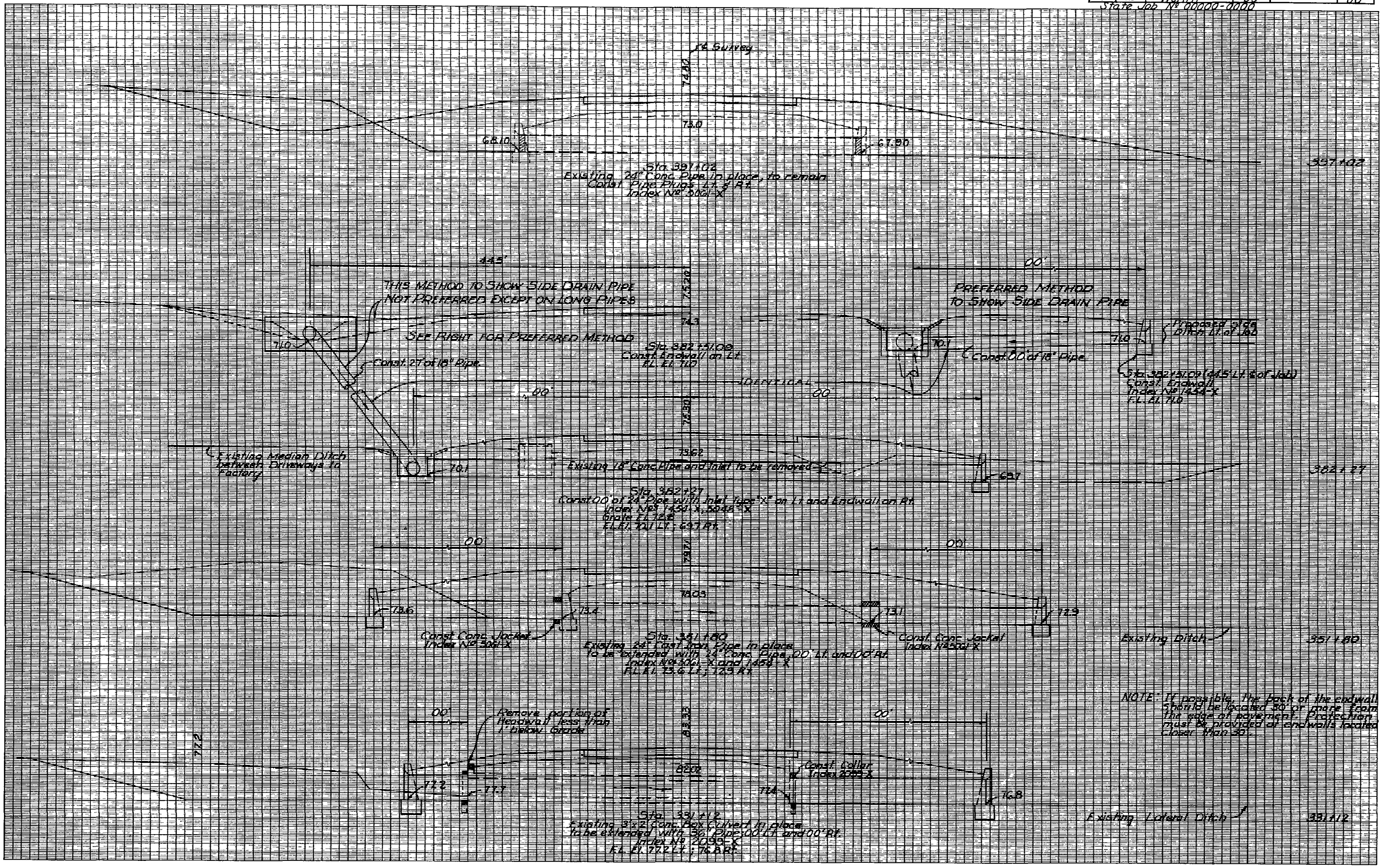
PLATE 15

CROSS SECTIONS

Scale 1 inch = 5 feet

Fed Road D n No.	State	County	Route	Proj No.	Sheet No.
3	Fla	WORTH	00		00

State Job Nº 00000-0000



Sta. 397+02
Existing 24" Conc Pipe in place, to remain
Const Pipe Plugs Lt & Rt
Index Nº 5061-X

THIS METHOD TO SHOW SIDE DRAIN PIPE
NOT PREFERRED EXCEPT ON LONG PIPES

SEE RIGHT FOR PREFERRED METHOD

Const. 27' of 18" Pipe.

Sta. 382+51.09
Const Endwall on Lt.
F.L. El. 71.0

PREFERRED METHOD
TO SHOW SIDE DRAIN PIPE

Const. 00' of 18" Pipe

Proposed Side
Ditch Lt. of Job

Sta. 382+51.09 (44.5 Lt. ℄ of Job)
Const. Endwall
Index Nº 1454-X
F.L. El. 71.0

Existing Median Ditch
between Driveways to
Factory

Existing 18" Conc Pipe and Inlet to be removed

Sta. 382+27
Const 00' of 24" Pipe with Inlet Type "X" on Lt and Endwall on Rt.
Index Nºs 1454-X, 5048-X
Grate El. 72.8
F.L. El. 70.1 Lt. ; 69.7 Rt.

Const. Conc. Jacket
Index Nº 5061-X

Sta. 351+80
Existing 24" Cast Iron Pipe in place
to be extended with 24" Conc. Pipe, 00' Lt. and 00' Rt.
Index Nºs 5061-X and 1458-X
F.L. El. 73.6 Lt. ; 72.9 Rt.

Const. Conc. Jacket
Index Nº 5061-X

Existing Ditch

Remove portion of
Headwall less than
1' below Grade

Const. Collar
Index 2099-X

Sta. 331+12
Existing 3'x2' Conc. Box Culvert in place
to be extended with 36" Pipe, 00' Lt. and 00' Rt.
Index Nº 2099-X
F.L. El. 77.2 Lt. ; 76.8 Rt.

Existing Lateral Ditch

NOTE: If possible, the back of the endwall should be located 30' or more from the edge of pavement. Protection must be provided at endwalls located closer than 30'.

Application No.__________
Route No.__________
Original Plotted by__________
Checked by__________
Template by__________
Area by__________
Finals Plotted by__________
Checked by__________
Area by__________
Checked by__________

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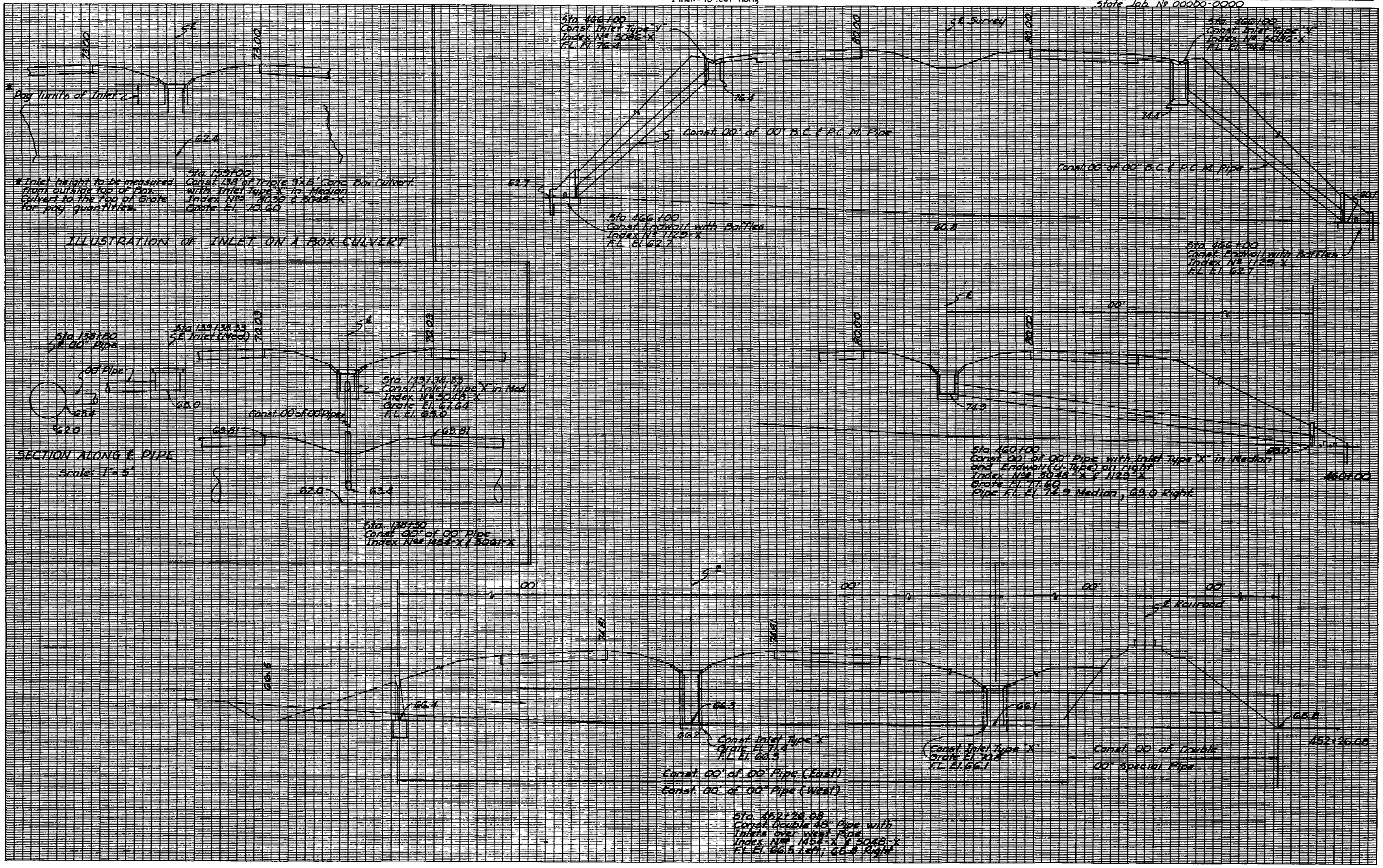
PLATE 16

CROSS SECTIONS

Scale 1 inch = 5 feet Vert
1 inch = 10 feet Horiz

Fed. Road Divn. No.	State	County	Route	Proj No.	Sheet No.
3	Fla.	Ventry	00		

State Job Nº 00000-0000



Application No. __________
Route No. __________
Original Plotted by __________
Checked by __________
Template by __________
Area by __________
Finals Plotted by __________
Checked by __________
Area by __________
Checked by __________

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JACKSONVILLE, FLA.

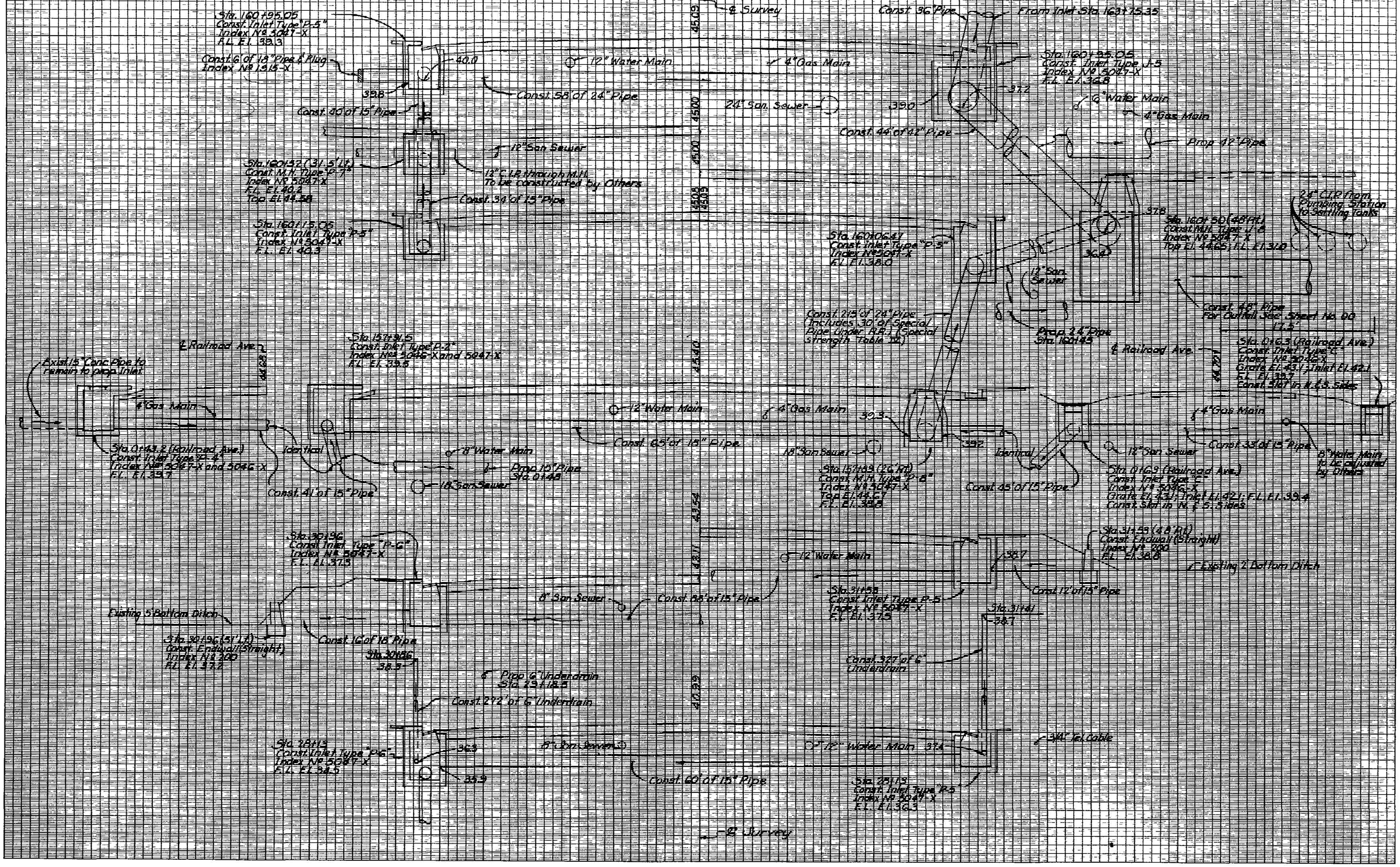
PLATE 17

Fed Road D n No.	State	County	Route	Proj No	Sheet No
3	Fla	ADAMS	00		

State Job No.00000-0000

CROSS SECTIONS

Scale 1 inch = 5 feet



Application No. ____________

Route No. ____________

Original Plotted by ____________

Checked by ____________

Template by ____________

Area by ____________

Plastic Plotted by ____________

Checked by ____________

Area by ____________

Checked by ____________

A. R. COGSWELL
JACKSONVILLE, FLA.

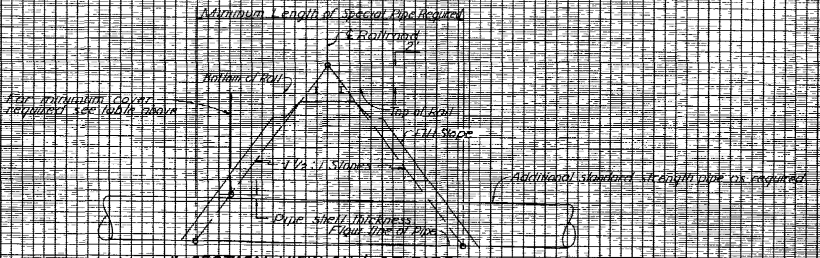
PLATE 18

~~GROSS SECTIONS~~

~~Scale 1 inch = 5 feet~~

Fed Road D s No.	State	County	Route	Proj No.	Sheet No.
3	Fla.				

RAILROAD COMPANY	CLEARANCE BELOW BOTTOM OF RAIL (Feet)	STRENGTH (A.S.T.M.)
Apalachicola Northern	4.0	Table IV
Atlantic Coast Line	4.0	Table IV
Atlantic and St Andrews Bay	3.0	Table IV
Florida East Coast	3.5	Table IV
Jacksonville Terminal Company	4.0	Table IV
Louisville and Nashville	4.0 (below bottom of crossties)	Table IV
Marianna and Blountstown	3.5	Table IV
St Louis - San Francisco	4.5	Table IV, Wall B
Seaboard Air Line (main line)	5.5	Table IV
Seaboard Air Line (secondary tracks)	4.5	Table IV
Southern Railway System	6.0	Table V
Georgia Southern and Florida	6.0	Table V
Live Oak, Perry and Gulf	6.0	Table V
St Johns River Terminal	6.0	Table V
South Georgia	6.0	Table V
Valdosta Southern	3.5	Table IV

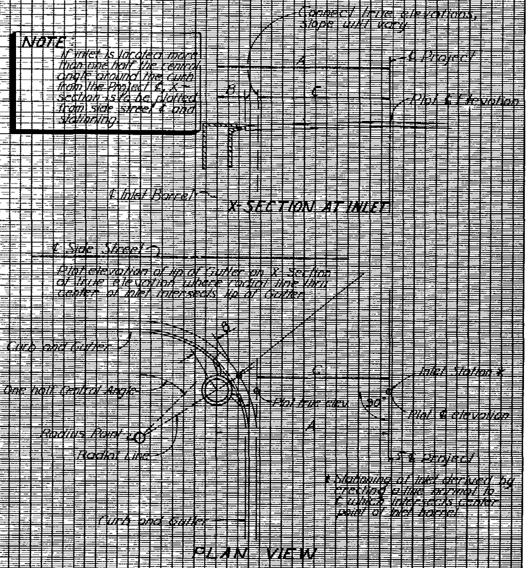


X-SECTION VIEW ON ℄ OF PIPE

METHOD FOR DETERMINING THE LENGTH OF SPECIAL PIPE REQUIRED UNDER RAILROADS

Scale 1" = 5' Vert.
1" = 10' Horiz.

NOTE: If inlet is located more than one half the central angle around the curb from the Project ℄, X-section is to be plotted from side street ℄ and stationing.



DETAILS FOR PLOTTING CROSS SECTION OF INLET LOCATED ON CURB RETURN

Scale: 1" = 10'

PLATE 19

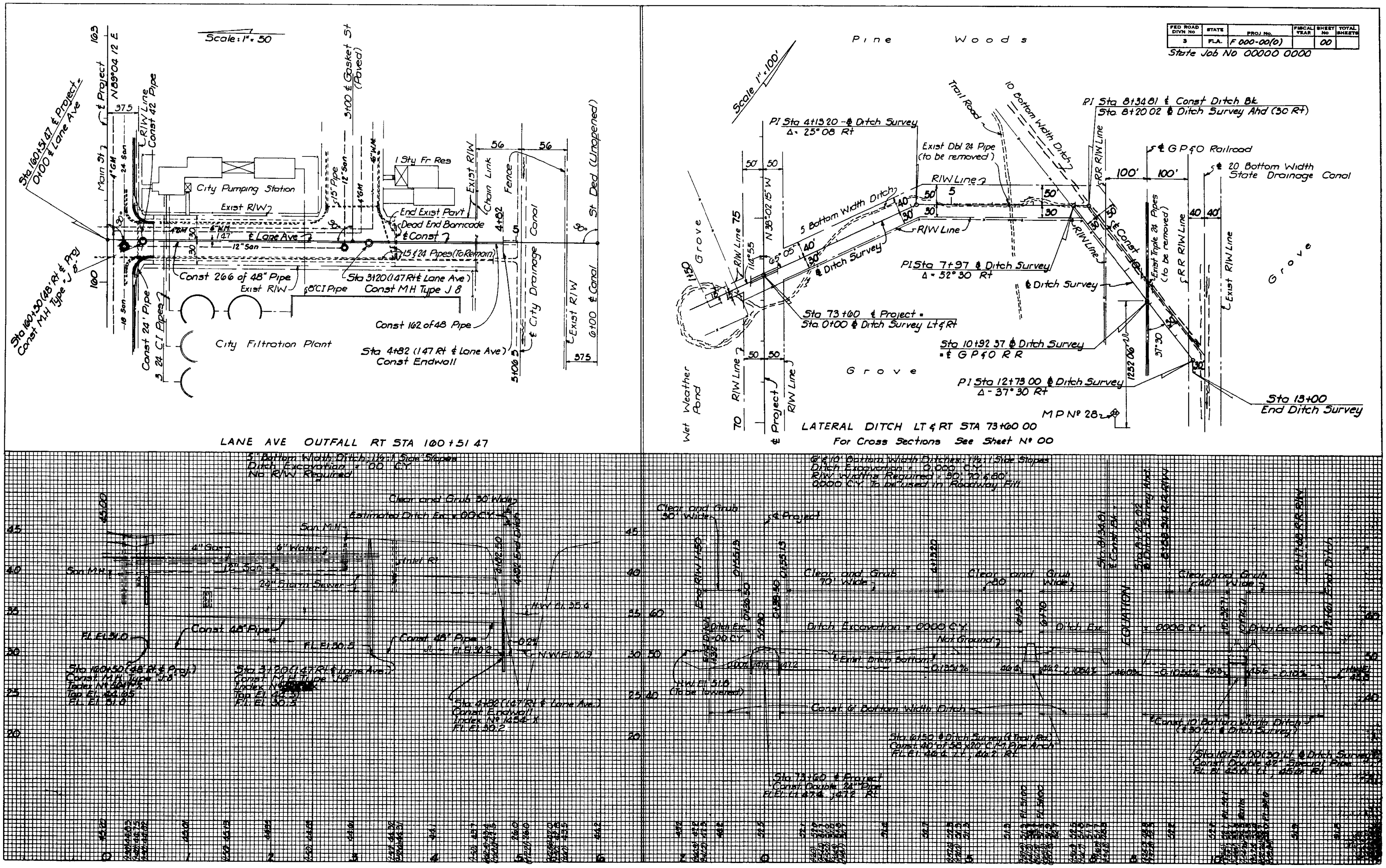

FED ROAD DIVN No | STATE | PROJ No. | FISCAL YEAR | SHEET No | TOTAL SHEETS
3 | FLA. | F 000-00(0) | | 00 |
State Job No 00000 0000
Scale: 1" = 50
Sta 100+51.47 ¢ Project = 0+00 ¢ Lane Ave
Sta 100+30 (48' Rt ¢ Proj) Const M.H. Type "J 8"
¢ Project
N 89°04' 12" E
Main St
R/W Line
Const 42 Pipe
City Pumping Station
Exist R/W
15 Pipe
12" San
5+00 ¢ Gasket St (Paved)
1 Sty Fr Res
End Exist Pav't
Dead End Barricade
¢ Const
15 & 24 Pipes (To Remain)
Exist R/W
Chain Link Fence
4+82
¢ City Drainage Canal
St Ded (Unopened)
6+00 ¢ Canal
Exist R/W
¢ Lane Ave
12" San
Const 266 of 48" Pipe
Exist R/W
8" CI Pipe
Sta 3+20 (147 Rt ¢ Lane Ave) Const M.H. Type J 8
Const 24' Pipe
3 24 CI Pipes
City Filtration Plant
Const 162 of 48 Pipe
Sta 4+82 (147 Rt ¢ Lane Ave) Const Endwall
LANE AVE OUTFALL RT STA 100+51 47
Pine Woods
Scale 1" = 100'
Trail Road
10 Bottom Width Ditch
PI Sta 4+13.20 ¢ Ditch Survey Δ = 25° 08' Rt
Exist Dbl 24 Pipe (to be removed)
PI Sta 8+34.81 ¢ Const Ditch Bk
Sta 8+20.02 ¢ Ditch Survey Ahd (30 Rt)
¢ G P & O Railroad
¢ 20 Bottom Width State Drainage Canal
N 38°02' 15" W
5 Bottom Width Ditch
R/W Line
R/W Line 75
PI Sta 7+97 ¢ Ditch Survey Δ = 52° 30' Rt
¢ Ditch Survey
¢ Const
Exist Triple 24 Pipes (to be removed)
R R R/W Line
Exist R/W Line
Grove
Sta 73+00 ¢ Project = Sta 0+00 ¢ Ditch Survey Lt & Rt
Sta 10+92.57 ¢ Ditch Survey = ¢ G P & O R R
PI Sta 12+73.00 ¢ Ditch Survey Δ = 37° 30' Rt
37° 30'
1252.06
M P No 28
Sta 13+00 End Ditch Survey
Wet Weather Pond
¢ Project
LATERAL DITCH LT & RT STA 73+00 00
For Cross Sections See Sheet No 00
5' Bottom Width Ditch 1½:1 Side Slopes
Ditch Excavation = 00 CY
No R/W Required
Clear and Grub 30' Wide
Estimated Ditch Ex. = 00 CY
San M.H.
4" Gas
6" Water
Inlet Rt
24" Storm Sewer
Const 48" Pipe
Fl. El. 30.5
Fl. El. 31.0
Const 48" Pipe
Fl. El. 30.2
H.W. El. 35.4
N.W. El. 30.9
Sta 100+30 (48' Rt ¢ Proj) Const M.H. Type "J 8" Index No 424 Top El. 44.65 Fl. El. 31.0
Sta 3+20 (147 Rt ¢ Lane Ave) Const M.H. Type "J 8" Index No Top El. 42.5 Fl. El. 30.3
Sta 4+82 (147 Rt ¢ Lane Ave) Const Endwall Index No 1434 X Fl. El. 30.2
6' & 10' Bottom Width Ditches 1½:1 Side Slopes
Ditch Excavation = 0,000 CY
R/W Widths Required = 90', 70' & 60'
0000 CY To be used in Roadway Fill
Clear and Grub 30' Wide
¢ Project
End R/W 1+50
Clear and Grub 70' Wide
Clear and Grub 80' Wide
Clear and Grub 40' Wide
Ditch Excavation = 0000 CY
Nat Ground
Exist Ditch Bottom
H.W. El. 31.6 (to be lowered)
Const 6' Bottom Width Ditch
EQUATION
Const 10 Bottom Width Ditch (¢ 30 Lt ¢ Ditch Survey)
12+73.00 End Ditch
Sta 6+50 ¢ Ditch Survey (¢ Trail Rd) Const 40" x 1.55 x 20" C.M. Pipe Arch Fl. El. 26.6 Lt, 26.2 Rt
Sta 73+60 ¢ Project Const Double 24" Pipe Fl. El. Lt 27.4, 27.2 Rt
Sta 10+53.00 (30 Lt ¢ Ditch Survey) Const Double 42" Special Pipe Fl. El. 25.0 Lt, 25.0 Rt
45
40
35
30
25
20
0
1
2
3
4
5
6
PLATE 20

PLATE 20

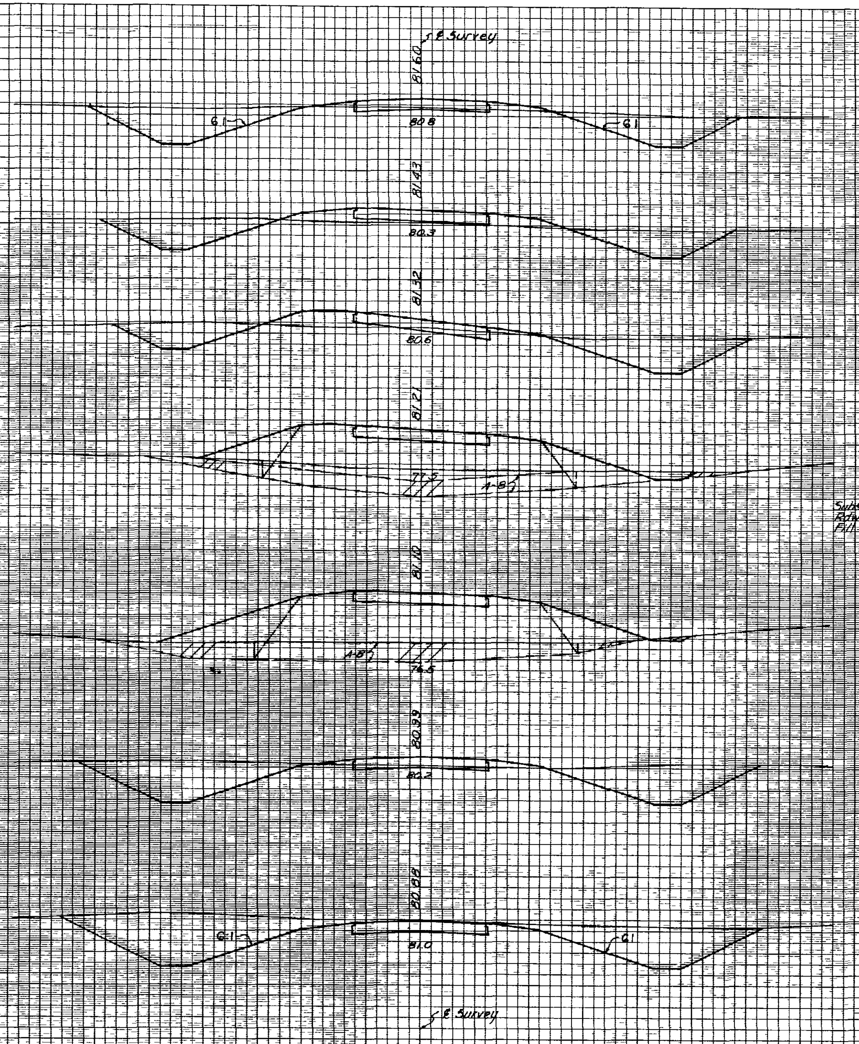
Fed Rd D #	State	County	Route	Proj No.	Sheet No.
3	Fla	FULTON	00	00000 0000	00

CROSS SECTIONS

Scale 1 inch = 5 feet Vert
1inch - 10 feet Horiz

A-B MATERIAL						
Subs Exc		Rdwy Exc		Fill		
A	V	A	V	A	V	
0		0		0		+50 End A-B Fill & A-B Exc.
	96		3		34	
104		5		37		
	359		6		215	
90		0		79 0		+00 Beg A-B Fill
	34		0		0	
0		0				+80 Beg A-B Exc

Subs Exc = 489 C.Y.
Rdwy Exc = 9 C.Y.
Fill + 100% = 498 C.Y.



	A-2, A-3 MATERIAL					
	Subs Exc		Rdwy Exc		Fill	
	A	V	A	V	A	V
18+00	0		124		8	
EQUATION 17+26.02 Ab 16+67.37 Bk		0		365		95
16+00	0		92		28	
		0		374		107
15+00	0		110		30	
		0		102		118
+50	0		0		97	
		39		0		342
14+00	42		0		272	
+93		3 78 73		0 2 2		65 898 833
13+00	0		1		213 292	
		0		287		532
12+00	0		154		6	
		0		767		11
11+00	0		260		0	
		0		363		0
10+00	0		260		0	

Subs Exc = 237 C.Y.
Rdwy Exc = 3765 C.Y.
Fill + 45% = 4,002 C.Y.

Application No.
Route No.
Original Pls tied b
Checked by
Template by
Area b
Planis Plotted by
Checked by
Area b
Checked by
R. COGSWELL
JACKSONVILLE, FLA.

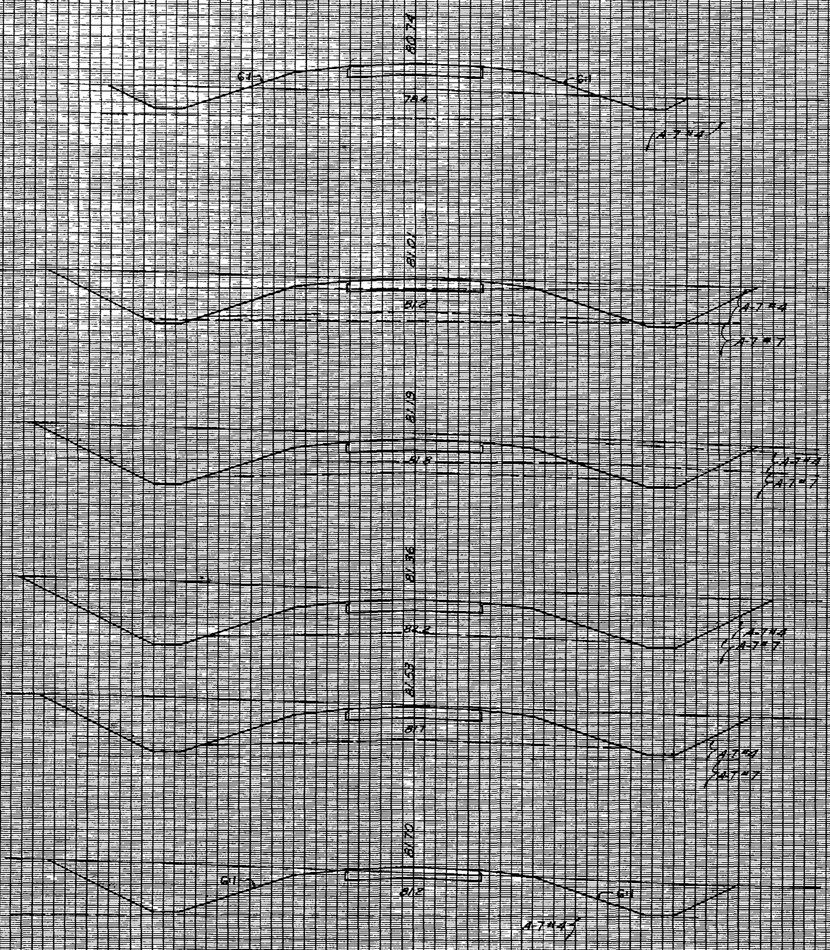
PLATE 21

CROSS SECTIONS

Scale 1 inch = 5 feet Vert
1 inch = 10 feet Horiz

Fed Road D n No.	State	County	Route	Proj No.	Sheet No.
3	Fla.	FULTON	00	00000 0000	00

A-7 MATERIAL #4				A-7 MATERIAL #7				
Subs. Exc		Rdwy Exc		Subs. Exc.		Rdwy Exc		
A	V	A	V	A	V	A	V	
0		0		0		0		+45 End A-7 Exc.
	113		112		0		5	
136		134		0		6		
	396		348		156		115	
78		162		84		56		
	337		419		163		133	
104		64		4		16		
	252		176		7		30	
52		31		0		0		
	6		6		0		0	
0		0		0		0		+90 Beg A-7 Exc



	A-2, A-3 MATERIAL					
	Subs. Exc		Rdwy Exc.		Fill	
	A	V	A	V	A	V
24+00	0		52		86	
		19		311		430
23+00	10		116		146	
		19		396		570
22+00	0		98		162	
		96		685		596
21+00	52		272		160	
		304		341		563
20+00	112		236		144	
		207		761		270
19+00	0		175		2	
		0		554		19

Application No.________
Route No.________
Original Plotted by________
Checked by________
Template by________
Area by________
Finals Plotted by________
Checked by________
Area by________
Checked by________

A. R. COGSWELL
JACKSONVILLE, FLA.

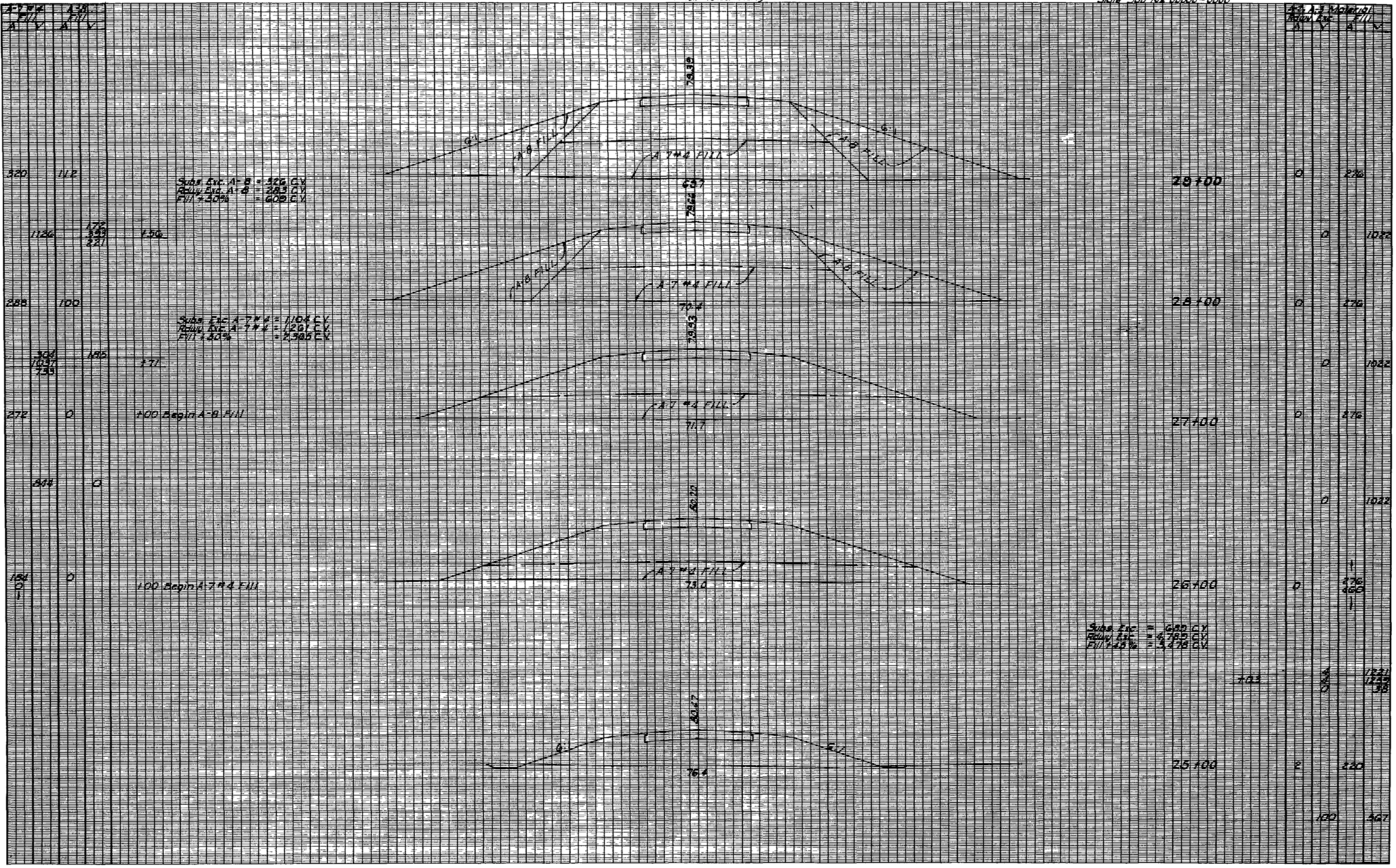
PLATE 22

CROSS SECTIONS

Scale 1 inch = 5 feet Vert
1 inch = 10 feet Horiz

Fed. Road Divn No.	State	County	Route	Proj No.	Sheet No.
3	Fla.	FULTON	00		00

State Job No 00000-0000



Application No.__________
Route No.__________
Original Platted by__________
Checked by__________
Template by__________
Area by__________
Finals Platted by__________
Checked by__________
Area by__________
Checked by__________

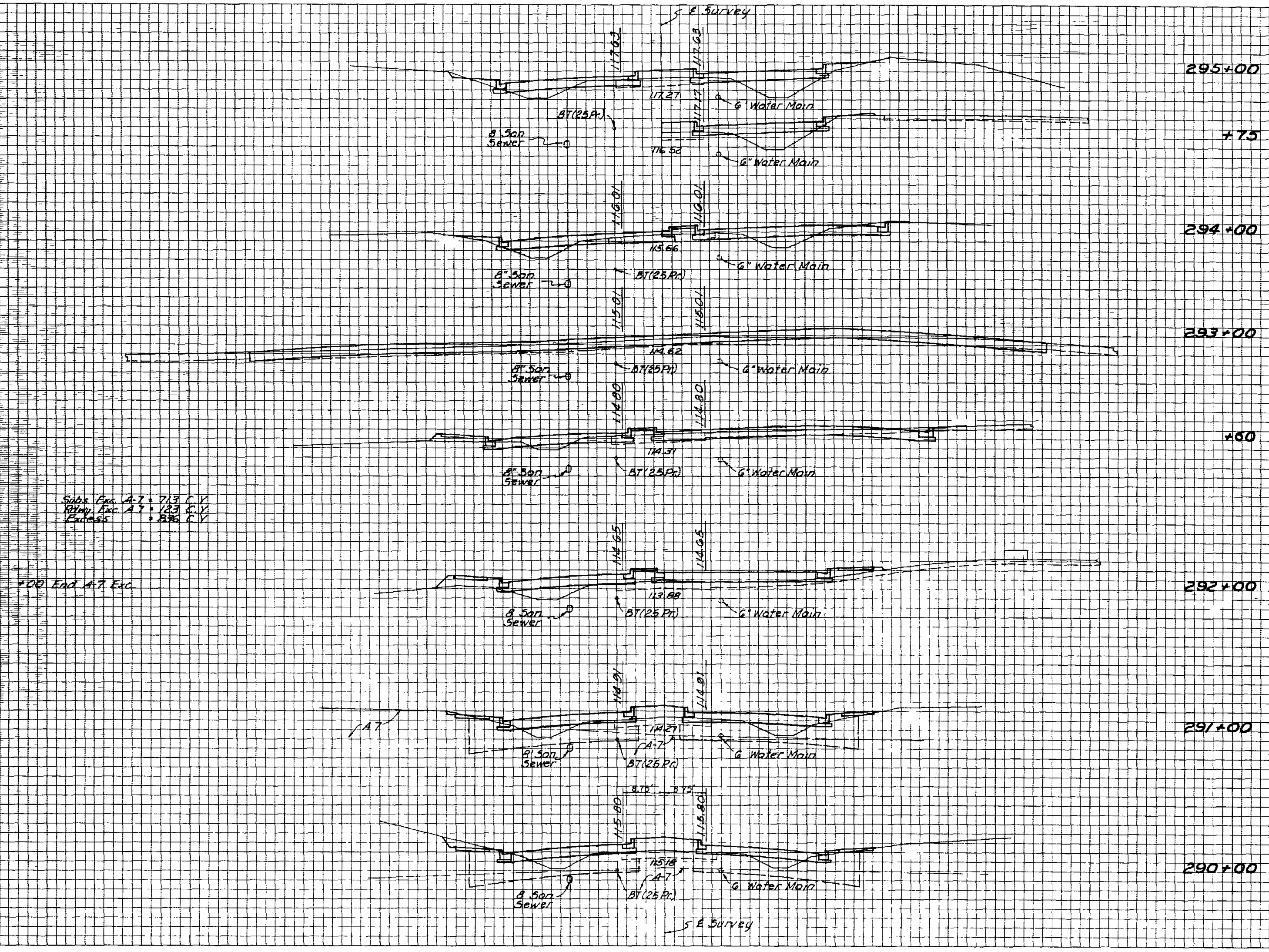
A R COGSWELL
JACKSON VILLE, FLA

PLATE 23

Fed Rd D No	State	County	Route	Proj No	Sheet No
3	Fla	BROWN	00	00000 0000	00

CROSS SECTIONS

Scale 1 inch = 5 feet Vert
1 inch 10 feet Horiz



Subs. Exc. A-7 = 713 C.Y.
Rdwy. Exc. A-7 = 123 C.Y.
Excess = 836 C.Y.

+00 End A-7 Exc.

A-7 MATERIAL			
Subs Exc		Rdwy Exc	
A	V	A	V
0		0	
	144		7
78		4	
	237		7
50		0	

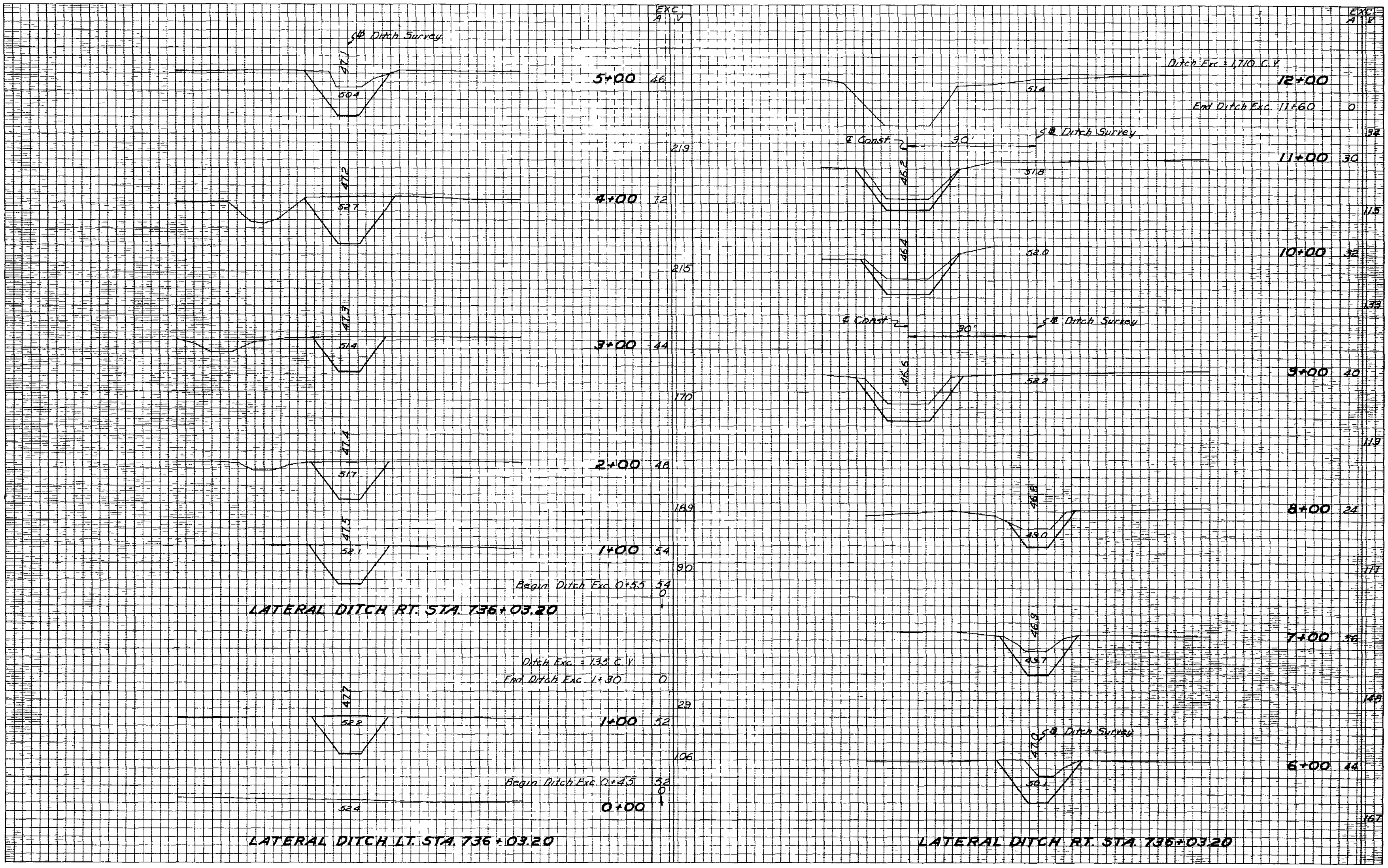
	A-2, A-3 MATERIAL					
	Subs Exc		Rdwy Exc		Fill	
	A	V	A	V	A	V
295+00			11		63	
				64		174
+75						
294+00			23		31	
				48		143
293+00			3		46	
				34		65
+60			43		42	
				49		103
292+00	0		1		51	
		107		7		426
291+00	58		3		179	
		281		35		691
290+00	94		16		194	

PLATE 24

CROSS SECTIONS

Scale 1 inch 5 feet *Vert*
1 inch - 10 feet Horiz

Fed Rd D No	State	County	Route	Proj No	Sheet No
3	Fla	PHILLIPS	00	00000 0000	00



LATERAL DITCH RT. STA. 736+03.20

LATERAL DITCH LT. STA. 736+03.20

LATERAL DITCH RT. STA. 736+03.20

Application
Row N
Original Plotted by
Checked
Template by
Area by
Final Plotted by
Checked by
Area by
Checked by

PLATE 25

CROSS SECTIONS

Scale 1 inch = 5 feet

Fed Rd D No	State	County	Route	Proj No	Sheet No
3	Fla	HAYWOOD	00	00000 0000	00

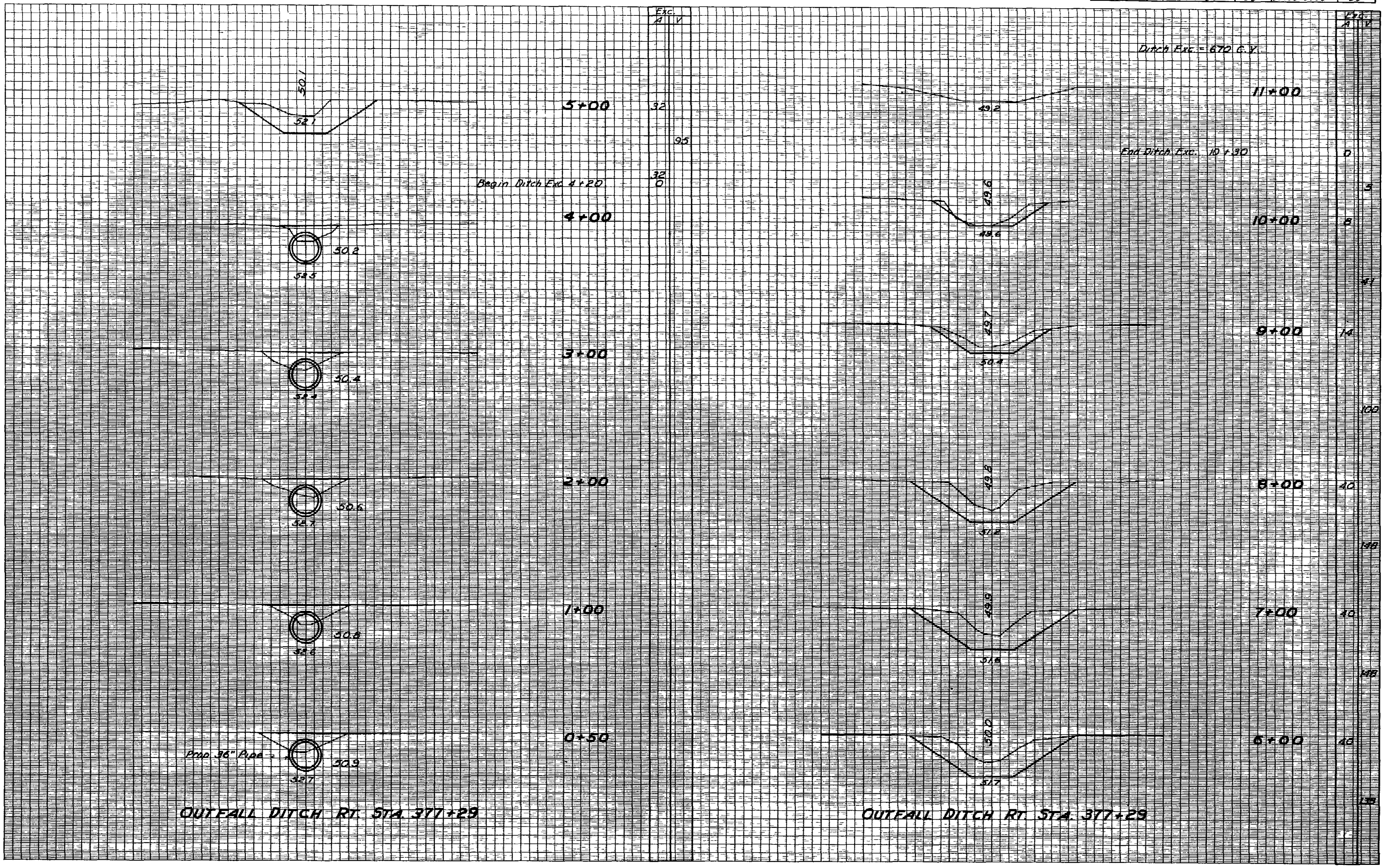


PLATE 26

Application No.________
Route No.________
Original Plotted by________
Checked by________
Template by________
Area by________
Finals Plotted by________
Checked b________
Area b________
Checked by________

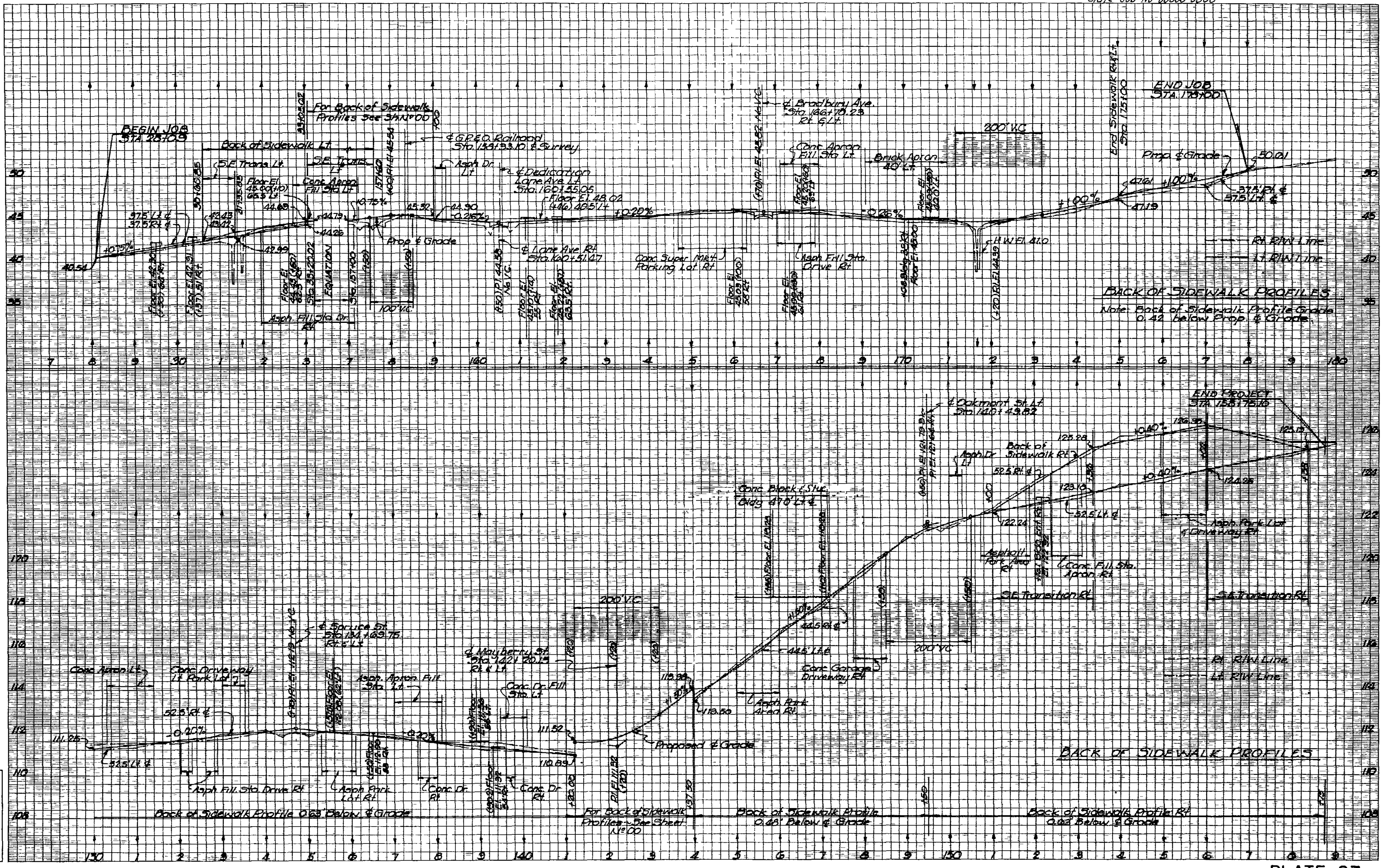
A R COGSWELL
JACKSONVILLE, FLA.

CROSS SECTIONS

~~Scale 1 inch = 5 feet~~

Fed R d D N	State	County	Route	Proj No	Sheet No.
3	Fla	EARNEST	00	F 000 00(0)	00

State Job No 00000 0000



Application N ________

Route No. ________

Original Plotted b ________

Checked by ________

Template by ________

Area by ________

Finals Plotted by ________

Checked b ________

Area by ________

Checked b ________

A R COGSWELL
JACKSONVILLE FLA

PLATE 27

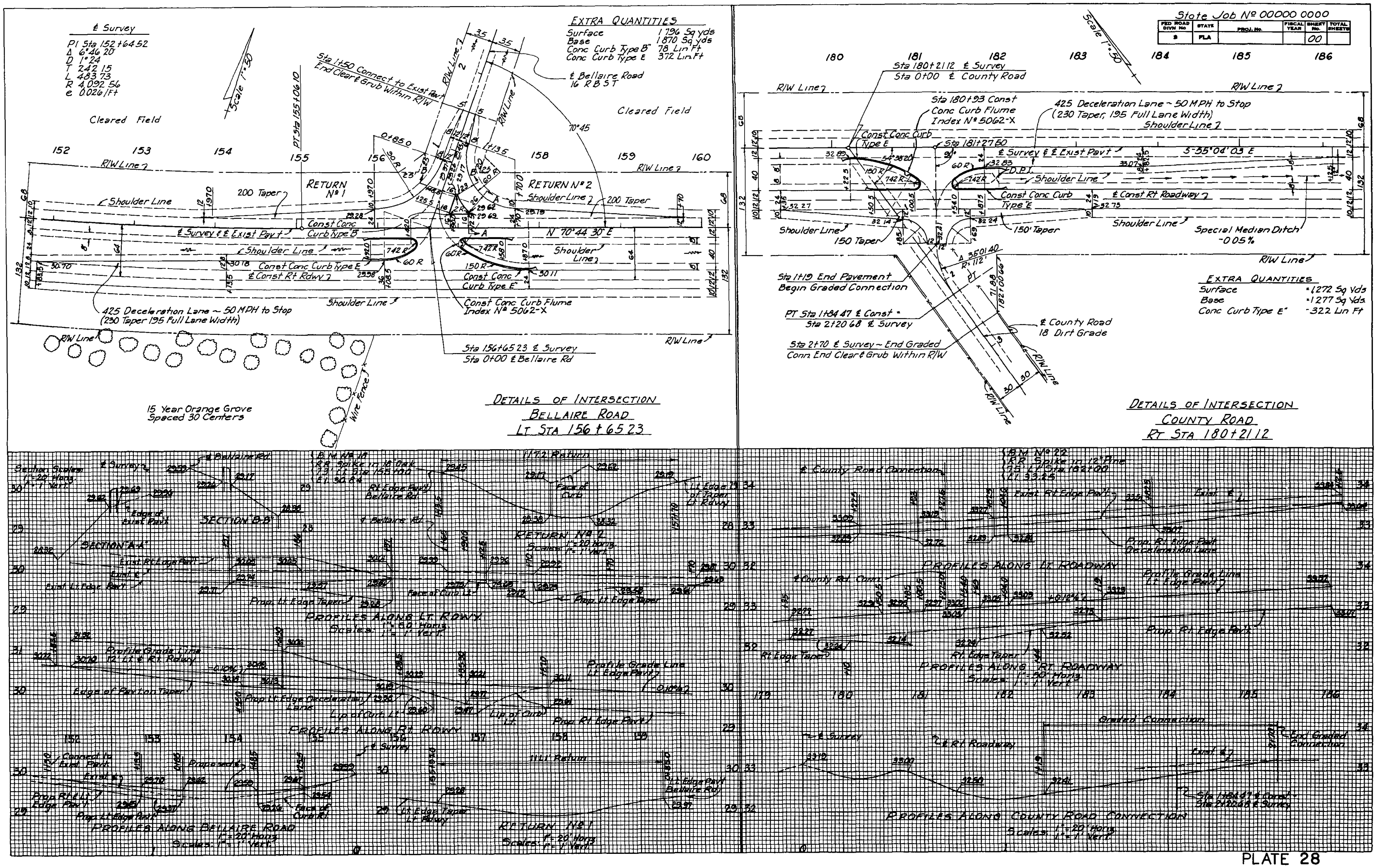
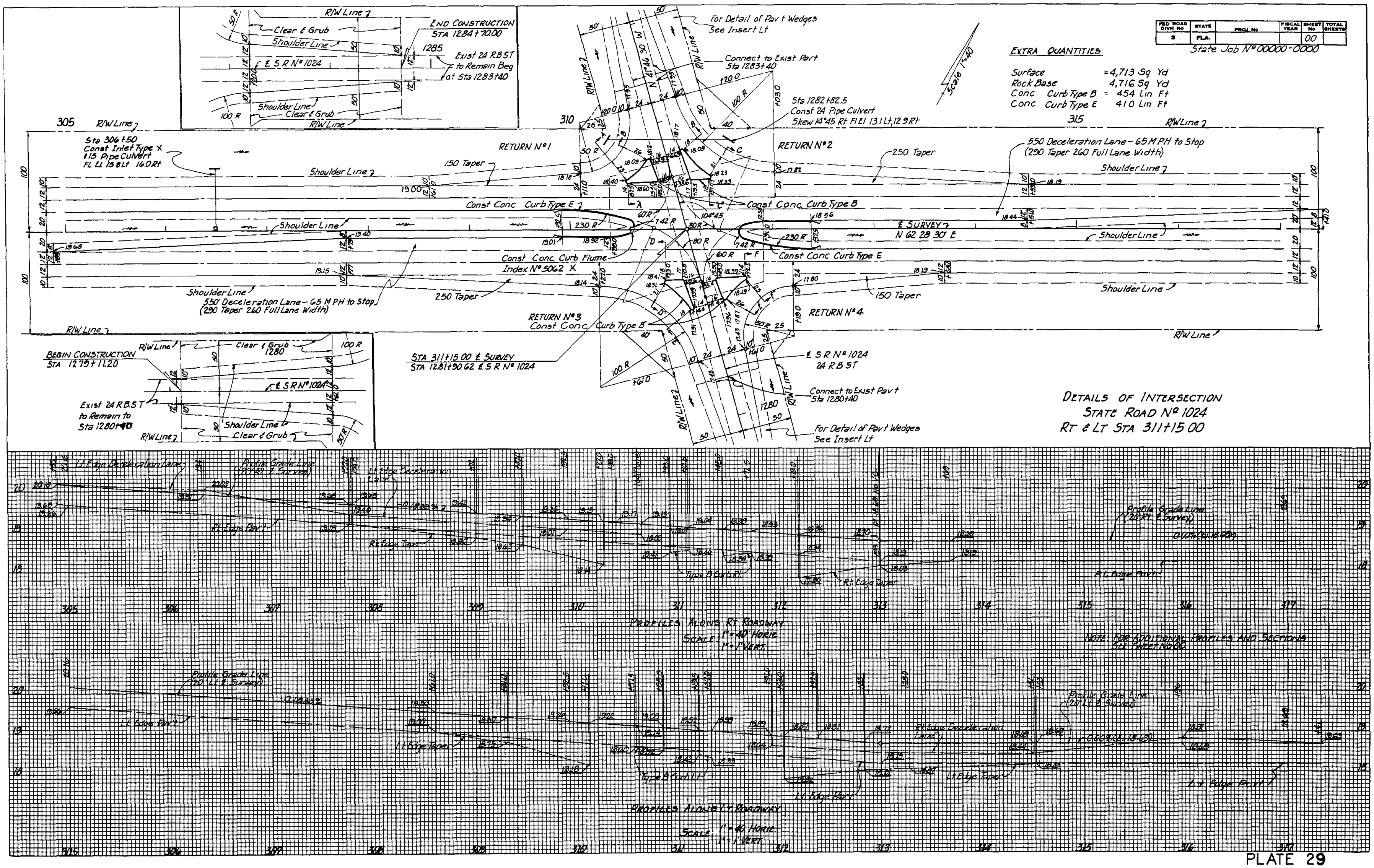


PLATE 28

R. COGSWELL
JACKSONVILLE, FLA



FED ROAD DIVN No	STATE	PROJ No	FISCAL YEAR	SHEET No	TOTAL SHEETS
3	FLA.			00	

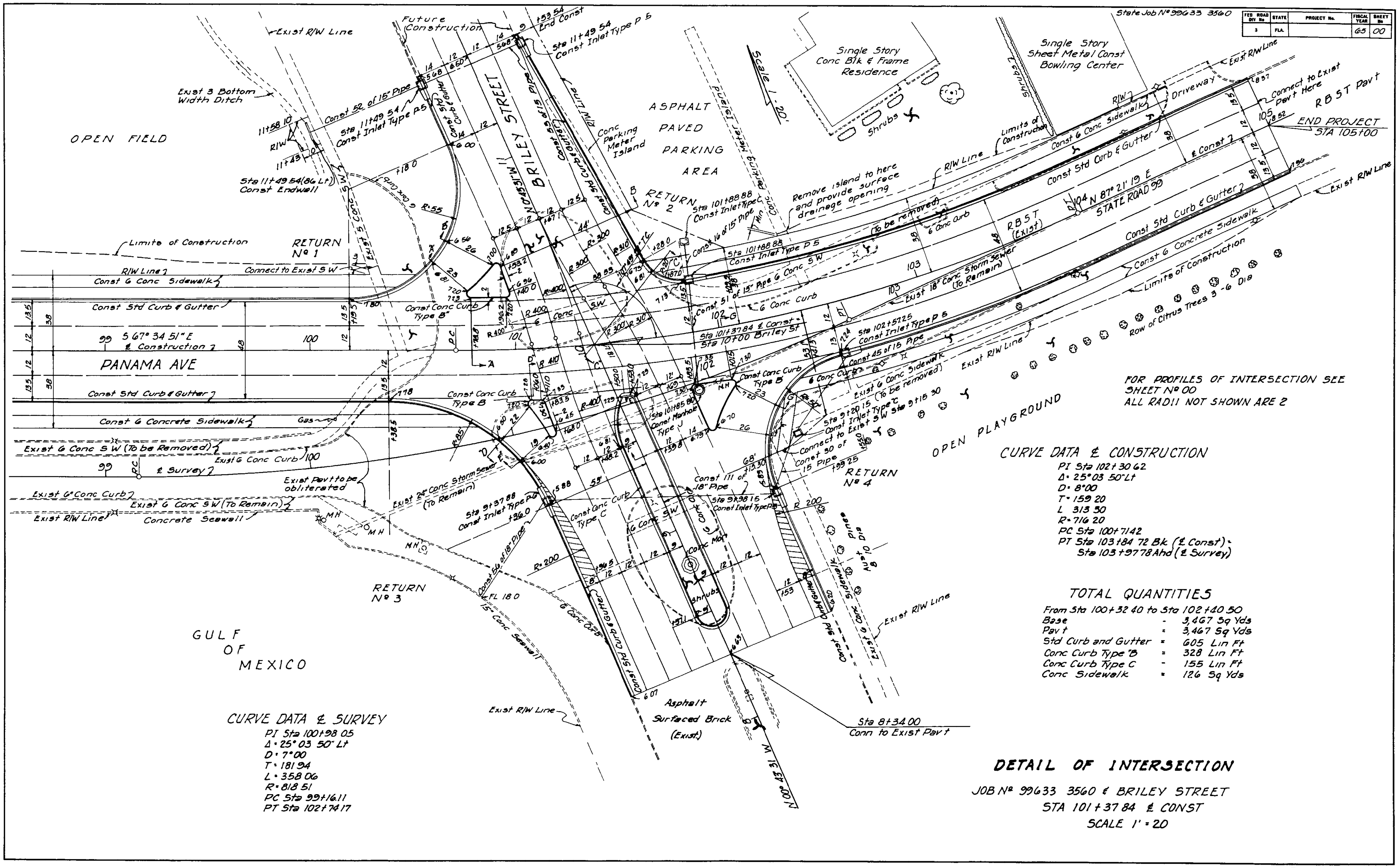
State Job Nº 00000-0000

EXTRA QUANTITIES

Surface = 4,713 Sq Yd
Rock Base 4,716 Sq Yd
Conc Curb Type B = 454 Lin Ft
Conc Curb Type E 410 Lin Ft

DETAILS OF INTERSECTION
STATE ROAD Nº 1024
RT & LT STA 311+15 00

PLATE 29



FOR PROFILES OF INTERSECTION SEE
SHEET Nº 00
ALL RADII NOT SHOWN ARE 2

CURVE DATA ℄ CONSTRUCTION
PI Sta 102+30 62
Δ = 25°03 50" Lt
D = 8°00
T = 159 20
L 313 30
R = 716 20
PC Sta 100+71 42
PT Sta 103+84 72 Bk (℄ Const) =
Sta 103+97 78 Ahd (℄ Survey)

TOTAL QUANTITIES

From Sta 100+32 40 to Sta 102+40 50

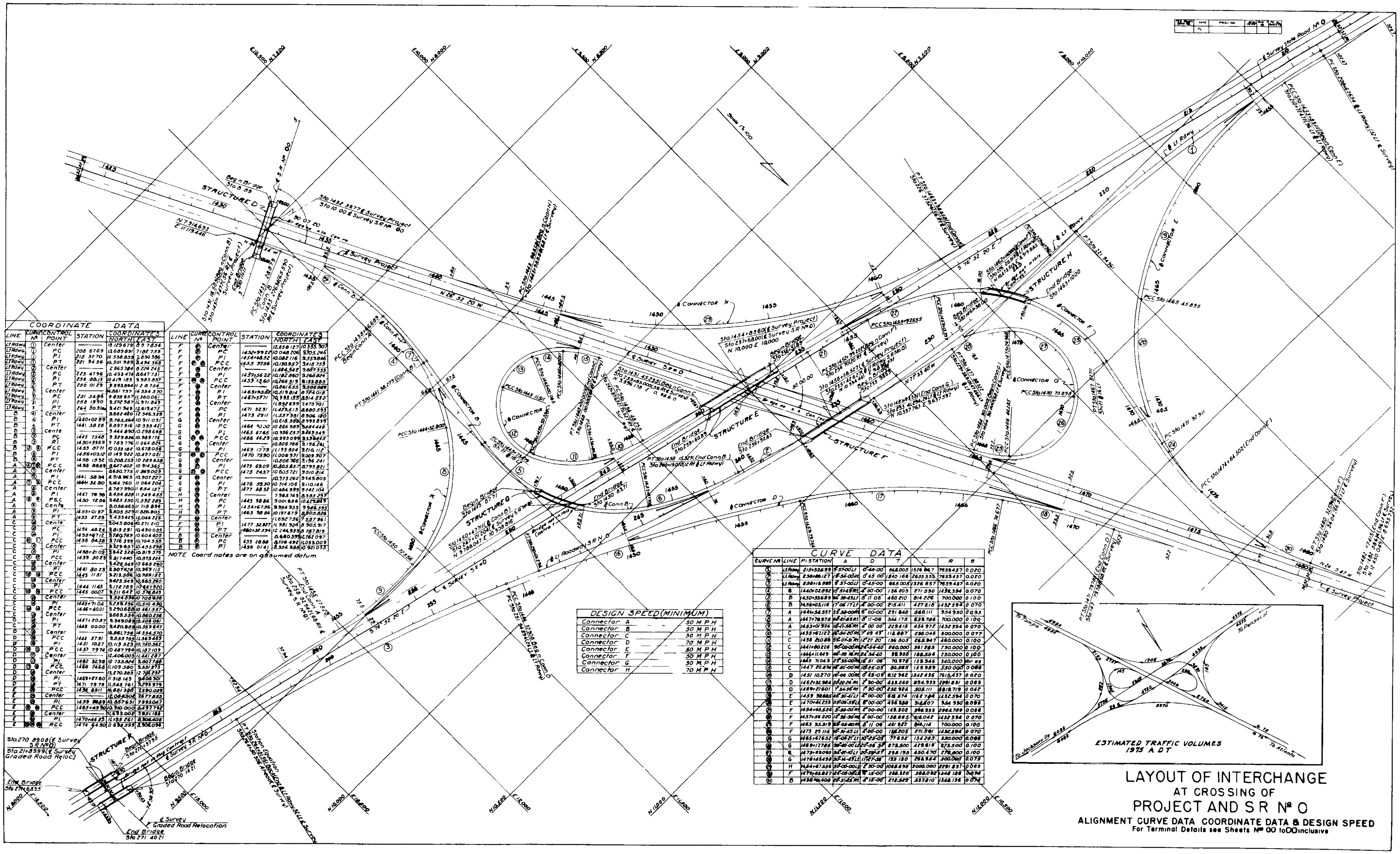
Base	-	3,467 Sq Yds
Pavt	=	3,467 Sq Yds
Std Curb and Gutter	=	605 Lin Ft
Conc Curb Type "B	=	328 Lin Ft
Conc Curb Type C	-	155 Lin Ft
Conc Sidewalk	=	126 Sq Yds

CURVE DATA ℄ SURVEY
PI Sta 100+98 05
Δ = 25° 03 50" Lt
D = 7°00
T = 181 94
L = 358 06
R = 818 51
PC Sta 99+16.11
PT Sta 102+74 17

DETAIL OF INTERSECTION

JOB Nº 99633 3560 & BRILEY STREET
STA 101+37 84 ℄ CONST
SCALE 1' = 20

PLATE 30



COORDINATE DATA					
LINE	CURVE Nº	CONTROL POINT	STATION	COORDINATES NORTH	COORDINATES EAST
Lt Rdwy	①	Center	—	18 129 679	8 9 7854
Lt Rdwy	①	PC	208 67.69	10,689 891	7182 739
Lt Rdwy	①	PI	215 32 70	10 538.855	7,830 386
Lt Rdwy	①	PT	221 94 56	10,501 989	8,494 368
Lt Rdwy	②	Center	—	2 865 784	8 224 245
Lt Rdwy	②	PC	223 47 96	10,493 474	8,647 731
Lt Rdwy	②	PI	236 88.13	10 419 183	9,985.837
Lt Rdwy	②	PT	250 01 29	9 893.864	11 2 8.754
Lt Rdwy	③	Center	—	16,861 737	14 354 570
Lt Rdwy	③	PC	251 54.89	9 833 657	11,360.061
Lt Rdwy	③	PI	258 19 90	9,572 987	11,971 843
Lt Rdwy	3	PT	264 30.51	9,421 949	12,619,475
B	④	Center	—	8,662 460	12 346.329
B	④	PI	1440+02 89	8,765 564	10 911 031
B	4	PT	1441 38 28	8,897 916	10 333 421
B	⑤	Cente	—	9 444 890	10.298 698
B	⑤	PC	1445 73.48	9 329 826	10.989 176
B	⑤	PI	1450+33.69	9 789 776	11 064 824
B	⑤ ⑥	PCC	1453 87.71	10 033 182	10,678.056
B	⑥	PI	1456+03.12	10 149 922	10.497 021
B	⑥	PT	1438 15 32	10,208.253	10 289 658
A	④⑦⑧	PCC	1438 86.69	8,627 402	10 914.365
A	⑦	Center	—	8,650.775	11 869.009
A	⑦	PI	1441 58 34	4 918.963	10,907 227
A	⑦ ⑧	PCC	1444+32.80	9,164 760	11 064 204
A	⑧	Center	—	8,787 990	11 634 157
A	⑧	PI	1447 78 98	9,454 828	11 249 455
A	⑧ ⑨	PCC	1450 72 86	9,485 250	11,592 285
A	⑨	Cente	—	8,058.465	11 718 896
A	⑨	PI	1453+01 97	9,505 529	11 820.803
A	⑨	PT	1455 27.55	9,455 425	12,044 226
C	⑩	Cente	—	9,043 806	10.271 210
C	⑩	PC	1434 48.24	9,813 291	10,490 055
C	⑩	PI	1435+67 12	9,780.769	10 604 405
C	⑩ ⑪	PCC	1436 84.28	9,716 399	10,704 358
C	⑪	Center	—	9,329 657	10.455.298
C	⑪	PI	1438+21 09	9,642 328	10.819 376
C	⑪ ⑫	PCC	1439 30 25	9,817 440	10,875.224
C	⑫	Center	—	9,428 549	10 665 260
C	⑫	PI	1441 80 23	9,307 478	10,969 115
C	⑫ ⑬	PCC	1443 11 51	9,213.586	10,789.152
C	⑬	Center	—	9,423.549	10,665.260
C	⑬	PI	1444 11 45	9,172 789	10 667.920
C	⑬ ⑭	PCC	1445 00.07	9,211 642	10 576 843
C	⑭	Center	—	9,524 896	10 708 826
C	⑭	PI	1445+71 04	9,239.256	10,510 430
C	⑭ ⑮	PCC	1446+40.01	9,290.688	10 461 557
C	⑮	Center	—	9,669.554	10,860.256
C	⑮	PI	1447+20.37	9,349.089	10,408 081
C	⑮	PT	1448 00.00	9,420.935	10,369 647
D	⑯	Center	—	18,861.736	14 354.570
D	⑯	PCC	1444 37.31	9,835 735	11,369 469
D	⑯	PI	1451 10.27	10,113 523	10,750.362
D	⑯ ⑰	PCC	1457 79 74	10 487 794	10,187 109
D	⑰	Center	—	12,406.005	11,441 287
D	⑰	PI	1462 32 98	10 735.824	9,807 758
D	⑰ ⑱	PCC	1466 74.68	11,109 580	9,551 373
D	⑱	Center	—	13,270.283	12 701.292
D	⑱	PI	1469+27.60	11 318 149	9,408.301
D	⑱	PT	1471 73 79	11,548 761	9,293 979
E	⑲	PCC	1458 85 11	10,681 326	7,390.029
E	⑲	Center	—	12,084.508	7,677 855
E	⑲	PI	1459 98.69	10,557 631	7,993.047
E	⑲ ⑳	PCC	1465+45 90	10,910.000	8,437.792
E	⑳	Center	—	11,693.002	7,951.168
E	⑳	PI	1470+44 23	11,193 261	8,906.408
E	⑳ [illegible]	RCC	1474 64.50	11 638 599	8,906.098

LINE	CURVE Nº	CONTROL POINT	STATION	COORDINATES NORTH	COORDINATES EAST
F	㉑	Center	—	12,858 127	10 355.907
F	㉑	PC	1452+99 22	10 048.206	9,705.246
F	㉑	PI	1454+48.52	10,082 116	9,553.846
F	㉑ ㉒	PCC	1455 37.56	10,130.957	9,418 753
F	㉒	Center	—	11,484.542	9,887 333
F	㉒	PI	1457+56 22	10,182 860	9,268.824
F	㉒ ㉓	PCC	1459 13.60	10,266 319	9,133.883
F	㉓	Center	—	10,861 655	9,502.089
F	㉓	PI	1463+95.52	10,519 814	8,724.018
F	㉓	PT	1467+57.71	10,993.133	8,814 552
F	㉔	Center	—	11,892 699	7,473 701
F	㉔	PC	1471 92.91	11,423.613	8,880.593
F	㉔	PI	1473 29 11	11,557 391	8 906 180
G	㉕	Center	—	10.618.388	8 993 839
G	㉕	PC	1464 90.00	10 866.989	9,484 448
G	㉕	PI	1465 67.65	10,936 257	9,449.549
G	㉕ ㉖	PCC	1466 44.29	10,993 099	9,398.445
G	㉖	Center	—	10,806 766	9,196.241
G	㉖	PI	1469 17.79	11,133 504	9,210.112
G	㉖ ㉗	PCC	1470 73.90	11,006 971	9,009 907
G	㉗	Center	—	10,806 766	9,196 241
G	㉗	PI	1473 69.09	10,805 857	8,793 821
G	㉗ ㉘	PCC	1475 24.37	10 605 721	9010 814
G	㉘	Center	—	10,373 262	9,349.805
G	㉘	PI	1476 53.50	10 514 106	9,110.146
G	㉘	PT	1477 88 32	10 484.999	9 242 104
H	㉙	Center	—	7 965.745	8,385 237
H	㉙	PC	1443 98 86	9 001 656	10 429.849
H	㉙	PI	1454+67.56	9,954 955	9 946.595
H	㉙	PT	1463 98 86	10 197 679	8,805.826
F	㉚	Center	—	11,692 756	7 557 961
F	㉚	PI	1477 52.827	11,981 924	8 905.917
F	㉚	PT	1480+32.594	12 244.933	8 787 819
B	㉛	Center	—	8,640.393	12,262 097
B	㉛	PC	1433 28.88	8,106 492	11,033.009
B	㉛	PI	1436 01 41	8,354 988	10 921 033

NOTE Coord notes are on assumed datum

CURVE DATA								
CURVE Nº	LINE	PI STATION	Δ	D	T	L	R	e
①	Lt Rdwy	215+32.699	5°-57-00 Lt	0°-48-00	665.005	1326 667	7639.437	0 020
②	Lt Rdwy	236+88.127	19°-54-00 Rt	0°45 00	1340 168	2655 333	7639.437	0.020
③	Lt Rdwy	258+19.899	5°57-00 Lt	0°-45-00	665.005	1326 657	7639 437	0.020
④	B	1440+02.892	10°51-49 Rt	4°00-00	136 203	271 390	1432.394	0.070
⑤	B	1450+33.689	66°38-45 Lt	8°11 06	460 210	814 226	700.000	0.100
⑥	B	1456+03.116	17°06 17 Lt	4°00-00	215.411	427 618	1432 394	0 070
⑦	A	1441+58.337	33°58-00 Rt	6°00-00	291 848	566.111	954 930	0 093
⑧	A	1447+78.975	52°-21-63 Rt	8°11-06	344 175	639.766	700.000	0 100
⑨	A	1453+01 974	18°-11-56 Rt	4°00 00	229.418	454 972	1432 394	0 070
⑩	C	1435+67.122	16°-54-20 Rt	7°03 45	118.887	236.046	800.000	0 077
⑪	C	1438 21.086	33°-07-31 Rt	12°27 20	136 805	265.947	460.000	0.100
⑫	C	1441+80.228	90°-00-00 Rt	24°-54-40	280.000	351 283	230.000	0 100
⑬	C	1444+11.449	46°-58 16 Rt	24°54-40	99.938	188.554	230.000	0 100
⑭	C	1445 71.043	23°33-00 Rt	16°51 06	70.978	139.946	340.000	Var es
⑮	C	1447 20.874	16°40-00 Rt	10°-25-05	80.565	159.989	550 000	0 088
⑯	D	1451 10.270	10°-06 00 Rt	0°45-09	672 962	1342 436	7615.437	0 020
⑰	D	1462+32.984	22°-22-24 Rt	2°30-00	453.240	894.933	2291 831	0 088
⑱	D	1469+27.601	7°34-36 Rt	1°30-00	252 924	505.111	3819.719	0 042
⑲	E	1459 98.685	46°30-41 Lt	4°00-00	615 874	1162 784	1432.394	0 070
⑳	E	1470+44.233	33°-06-39 Lt	6°00-00	438.338	514.607	954 930	0.093
㉑	F	1454+48.524	5°-58-00 Rt	2°00-00	149.302	298.333	2864.789	0 088
㉒	F	1457+56 220	12°38-30 Rt	4°00-00	158.665	316.042	1432 394	0 070
㉓	F	1463 95.519	66°-05-40 Rt	8°11 06	481 922	814.114	700.000	0.100
㉔	F	1473 29 114	10°-51-43 Lt	4°00-00	136.203	271.391	1432.394	0 070
㉕	G	1465+67.652	16°-04-21 Lt	10°-25-05	77.652	154.283	550.000	0.088
㉖	G	1469+12.785	90°-00-00 Lt	20°-56 57	273.500	429.618	273.500	0.100
㉗	G	1473+69.093	94°-22-10 Lt	20°-56-57	293 195	450.470	273.600	0.100
㉘	G	1476+52.498	30°-14-49 Lt	11°-27-38	135 130	263.954	500.000	0.075
㉙	H	1454+67.556	50°-00-00 Lt	2°30-00	1068.698	2000.000	2291 831	0.089
㉚	F	1477+62.827	24°-05-36 Lt	4°15-00	268.326	368.092	1348 186	0.074
㉛	B	1436+01.408	22°-51-25 Rt	4°15-00	272.929	537.810	1348.136	0 074

DESIGN SPEED (MINIMUM)	
Connector A	50 M P H
Connector B	50 M P H
Connector C	30 M P H
Connector D	70 M P H
Connector E	50 M P H
Connector F	50 M P H
Connector G	30 M P H
Connector H	70 M P H

LAYOUT OF INTERCHANGE
AT CROSSING OF
PROJECT AND S R Nº 0

ALIGNMENT CURVE DATA COORDINATE DATA & DESIGN SPEED
For Terminal Details see Sheets Nºˢ 00 to 00 inclusive

PLATE 31

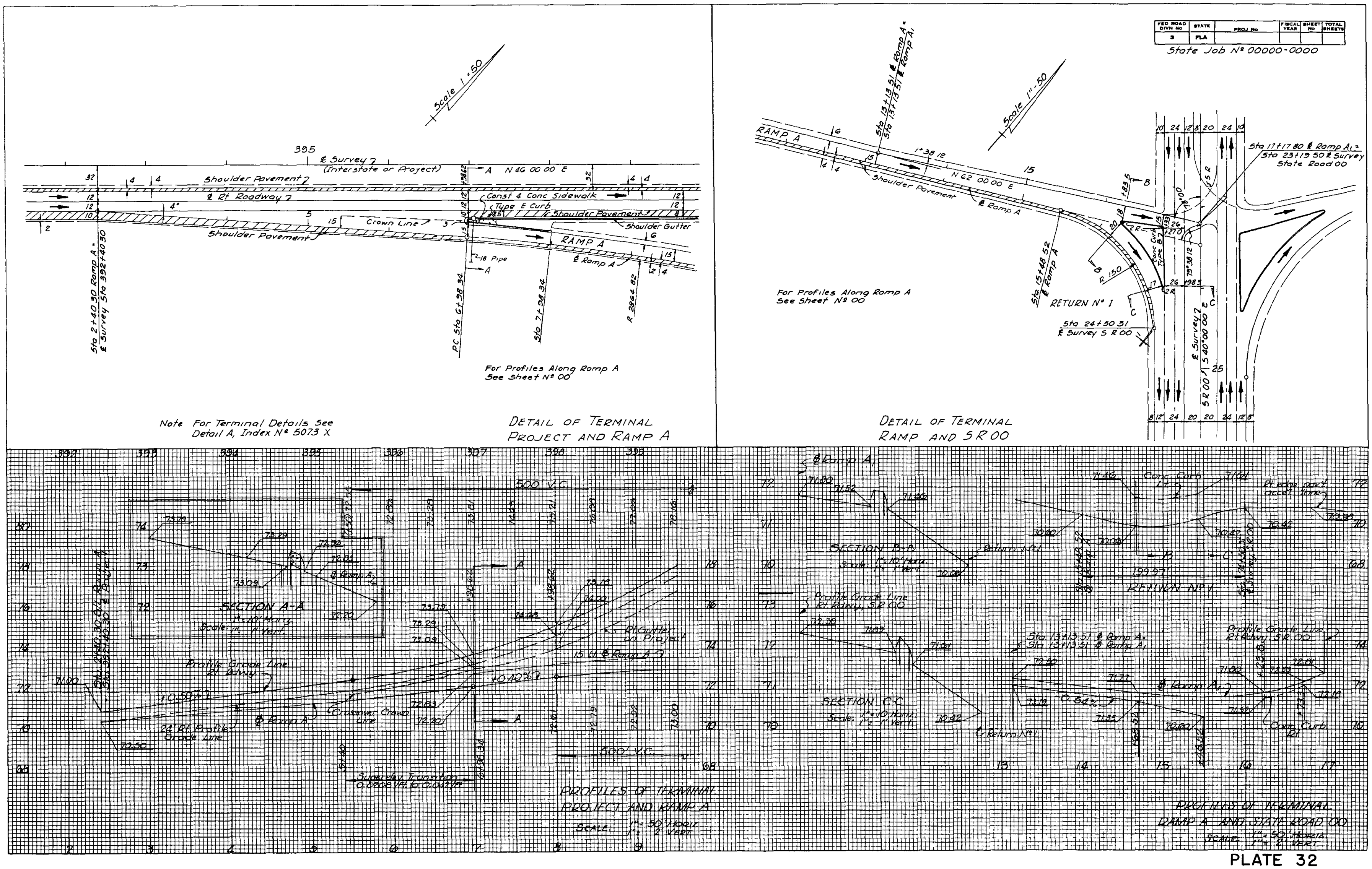
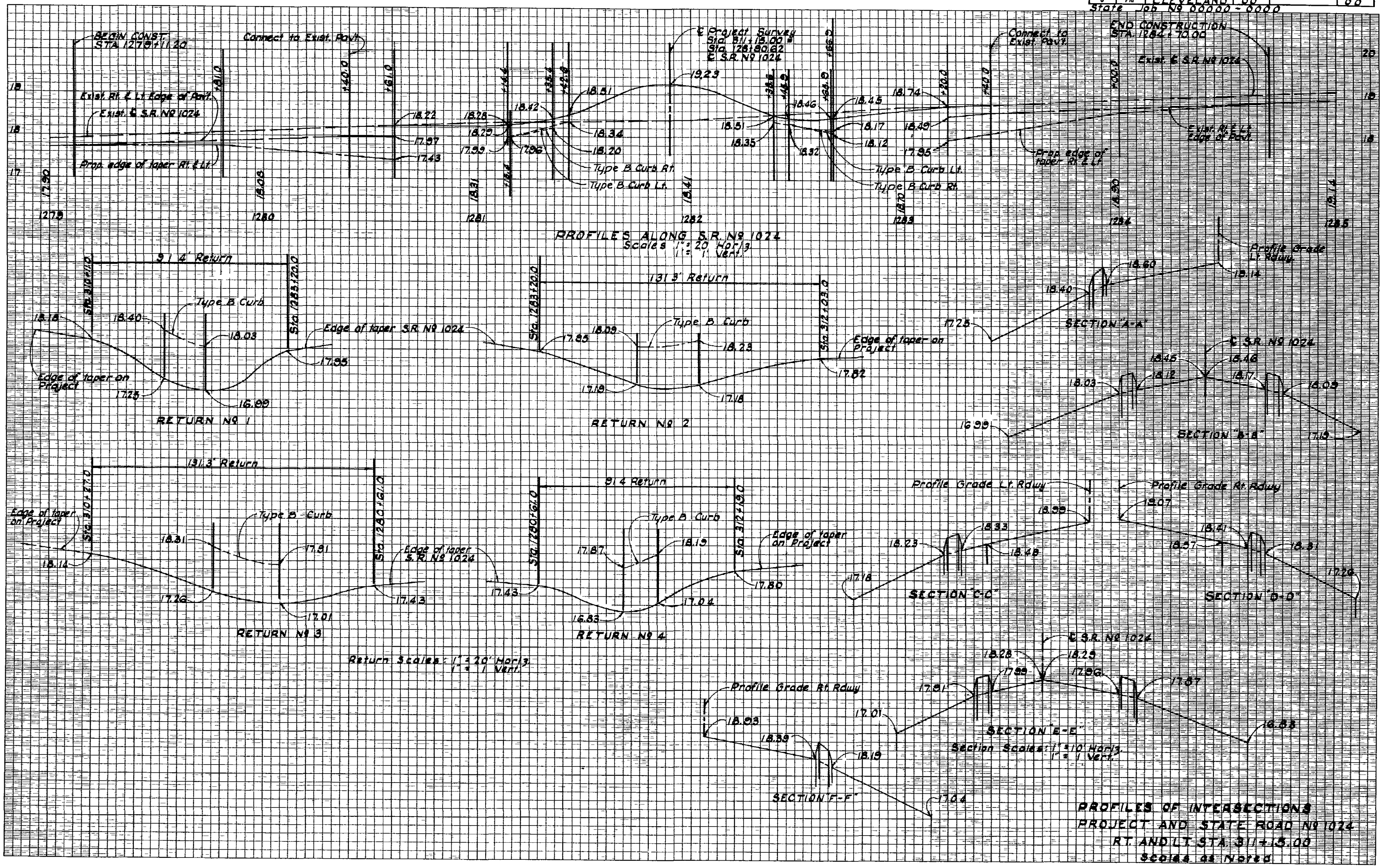

FED ROAD DIVN No 3
STATE FLA
PROJ No
FISCAL YEAR
SHEET No
TOTAL SHEETS
State Job Nº 00000-0000
Scale 1"=50'
395
℄ Survey 7 (Interstate or Project)
N 46 00 00 E
Shoulder Pavement 7
℄ Rt Roadway 7
Const 4 Conc Sidewalk
Type E Curb
℄ Shoulder Pavement 3
Shoulder Gutter
Crown Line
Shoulder Pavement
RAMP A
℄ Ramp A
18 Pipe
Sta 2+40.30 Ramp A = ℄ Survey Sta 392+40.30
PC Sta 6+98.34
Sta 7+98.34
R 2864.82
For Profiles Along Ramp A See Sheet Nº 00
Note For Terminal Details See Detail A, Index Nº 5073 X
DETAIL OF TERMINAL PROJECT AND RAMP A
RAMP A
Sta 13+13.51 ℄ Ramp A = Sta 13+13.51 ℄ Ramp A1
1°38 12
N 62 00 00 E
Shoulder Pavement
℄ Ramp A
Sta 15+48.52 ℄ Ramp A
R 150
RETURN Nº 1
Sta 24+50.31 ℄ Survey S R 00
Sta 17+17.80 ℄ Ramp A1 = Sta 23+19.50 ℄ Survey State Road 00
℄ Survey 2 S 40°00 00 E
S R 00
Conc Curb Type B
For Profiles Along Ramp A See Sheet Nº 00
DETAIL OF TERMINAL RAMP AND S R 00
500' V.C.
SECTION A-A
Scale 1"=10' Horiz 1"=1' Vert
Profile Grade Line Rt Rdwy
24' Rt Profile Grade Line
℄ Ramp A
Crossover Crown Line
Rt Gutter on Project
15 Lt ℄ Ramp A
+0.50%
+0.40%
Superelev Transition 0.0208 Ft/Ft to 0.0417 Ft/Ft
PROFILES OF TERMINAL PROJECT AND RAMP A
SCALE: 1"=50' Horiz 1"=2' Vert
℄ Ramp A1
SECTION B-B
Scale 1"=10' Horiz 1"=1' Vert
Return Nº1
Profile Grade Line Rt Rdwy S R 00
SECTION C-C
Scale 1"=10' Horiz 1"=1' Vert
℄ Return Nº1
Conc Curb
Rt edge pvmt accel lane
RETURN Nº 1
199.97
Sta 13+13.51 ℄ Ramp A = Sta 13+13.51 ℄ Ramp A1
Profile Grade Line Rt Rdwy S R 00
0.54%
℄ Ramp A1
Conc Curb
PROFILES OF TERMINAL RAMP A AND STATE ROAD 00
SCALE: 1"=50' Horiz 1"=2' Vert

PLATE 32

CROSS SECTIONS

Fed Road D No.	State	County	Route	Proj No	Sheet No.
3	Fla	CLEVELAND	00		00

State Job Nº 00000 - 0000



PROFILES OF INTERSECTIONS
PROJECT AND STATE ROAD Nº 1024
RT. AND LT. STA. 311+13.00
Scales as Noted

A plica to N ____
Rou N ____
Original Pla d b ____
Checked b ____
Tem I to b ____
Area b ____
Final Pla ad b ____
Check d b ____
Are b ____
Checked b ____

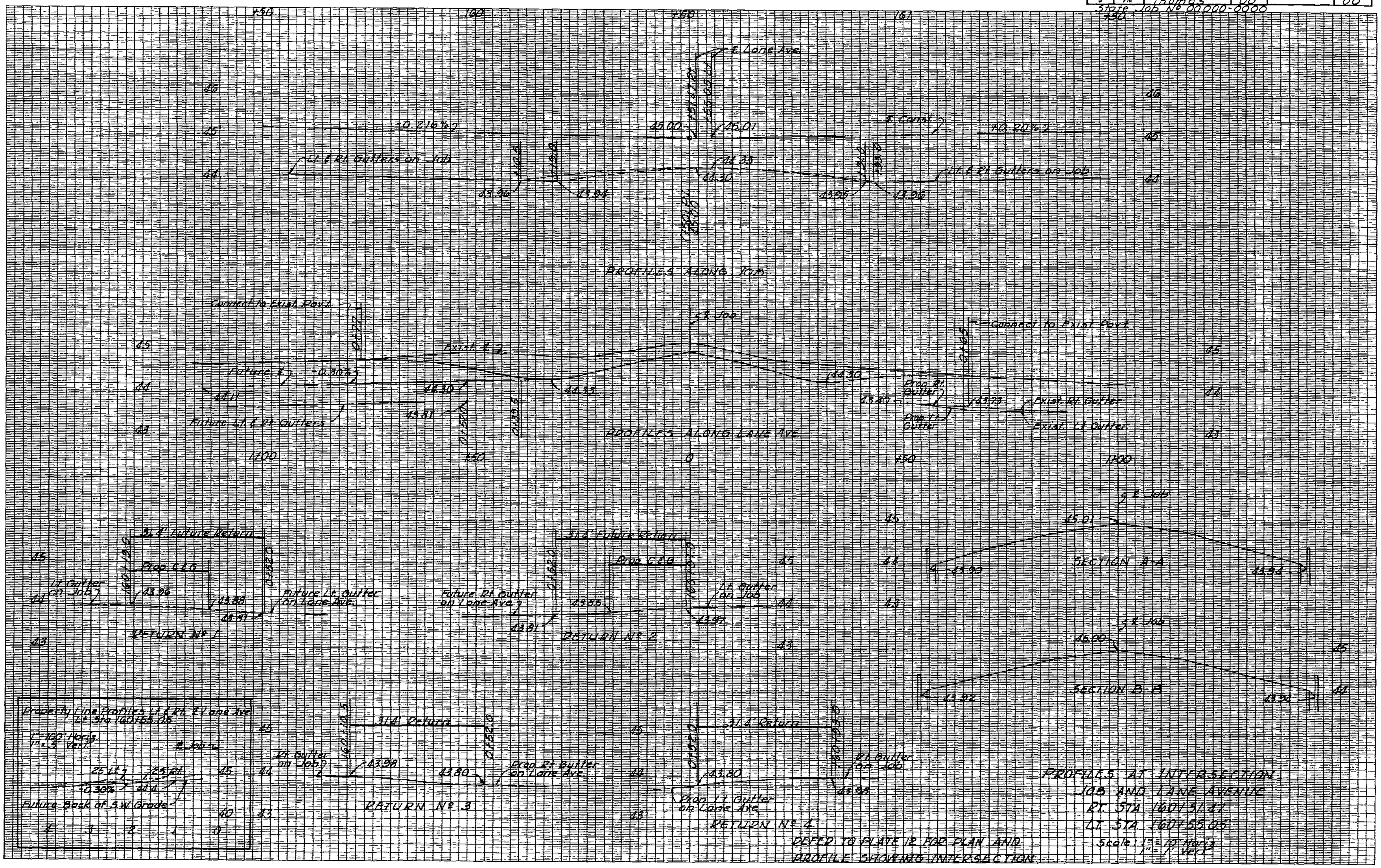
R OG W

CROSS SECTIONS

~~Scale 1 inch = 5 feet~~

Fed Road Dis No.	State	County	Route	Proj No.	Sheet No.
3	Fla	Thomas	00		00

State Job Nº 00000-0000



Application No. ________

Route No. ________

Original Plotted b ________

Checked b ________

Template by ________

Area b ________

Finals Plotted b ________

Checked b ________

Area b ________

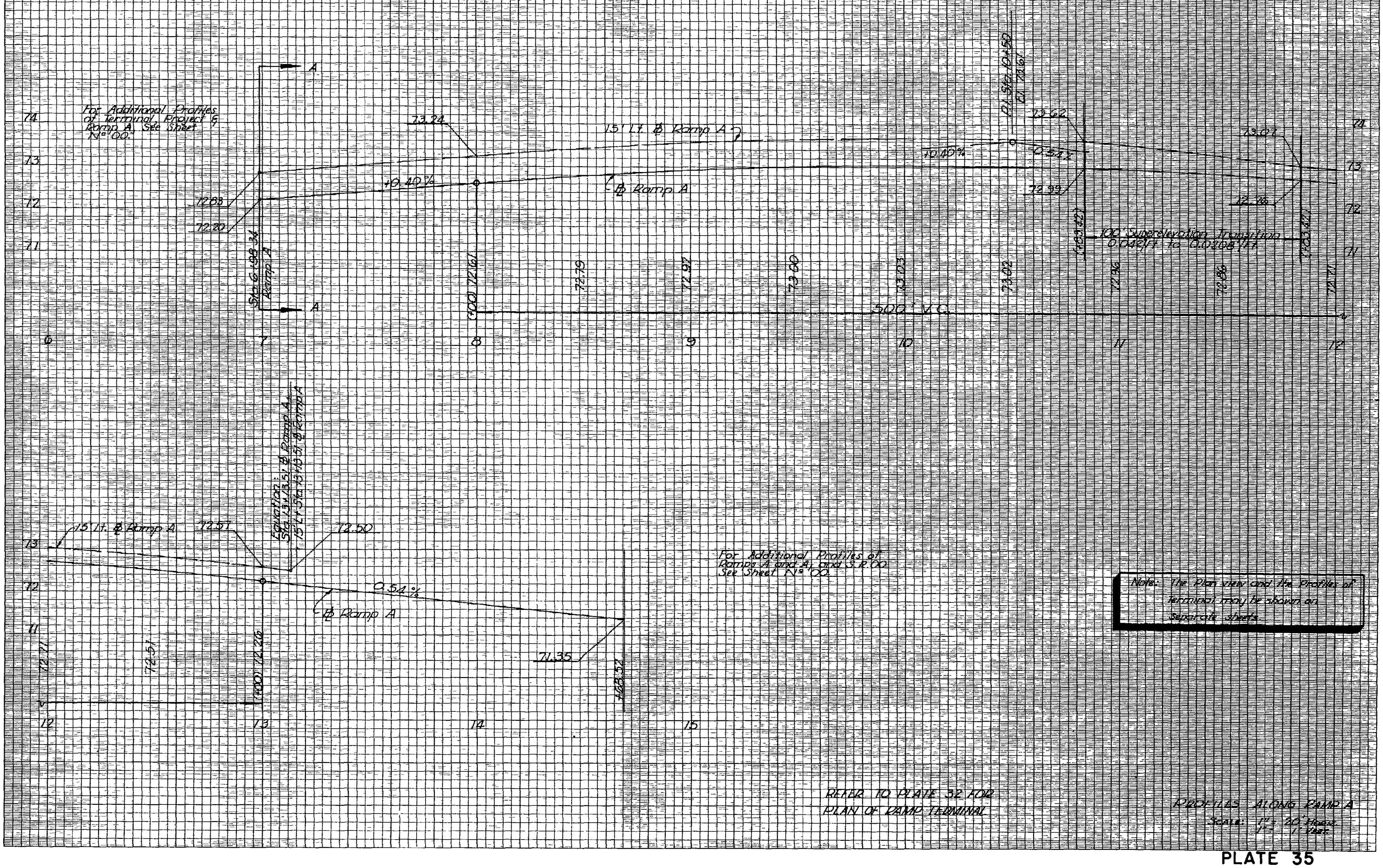
Checked by ________

A. R. COGSWELL
JACKSONVILLE FLA

PLATE 34

Fed Road Dvn No.	State	County	Route	Proj No.	Sheet No.
3	Fla	GLENN	00		00

State Job Nº 00000-0000



For Additional Profiles of Terminal, Project & Ramp A, See Sheet Nº 00.

For Additional Profiles of Ramps A and A₁ and S.R. 00 See Sheet Nº 00.

Note: The Plan view and the Profiles of terminal may be shown on separate sheets.

REFER TO PLATE 32 FOR
PLAN OF RAMP TERMINAL

PROFILES ALONG RAMP A
Scale: 1" = 20' Horiz.
1" = 1' Vert.

PLATE 35

Application No.________
Route No.________
Original Plotted by________
Checked by________
Template b________
Area by________
Finals Plotted b________
Checked b________
Area by________
Checked by________

R. COGSWELL
JACKSON LLE. FLA

FED. ROAD DIV No.	STATE	PROJECT. No.	FISCAL YEAR	SHEET No.
3	FLA.			

CONVENTIONAL SYMBOLS

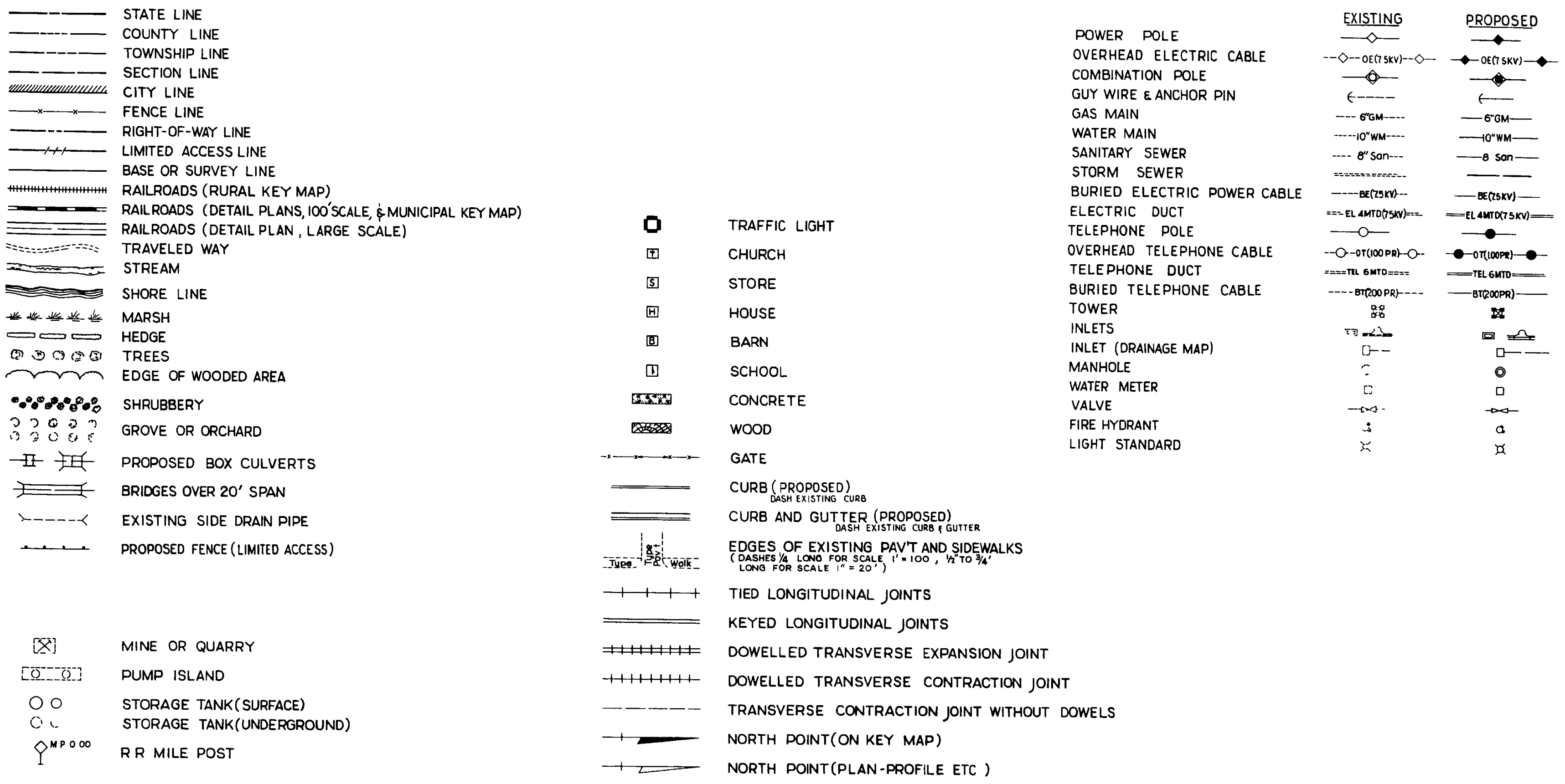
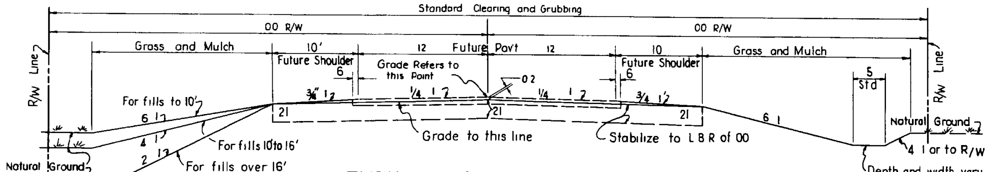


PLATE 36

FED. ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.	00000-0000	76	00

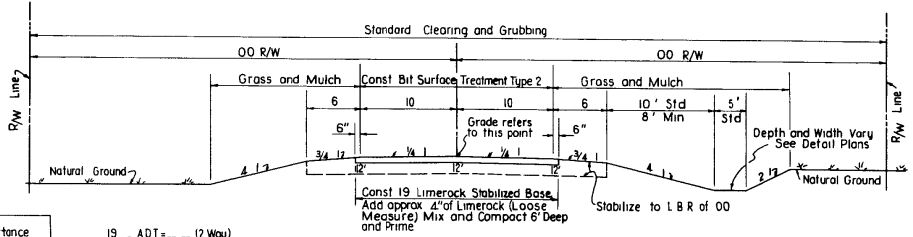
TYPICAL SECTION Nº 1



TYPICAL GRADING SECTION

For additional details see Index Nºs 1101 X & 5010 X
DESIGN SPEED 00 MPH

TYPICAL SECTION Nº 2



Except for roads of minor importance and resurfacing jobs, show the Current Traffic, Design Year Traffic and the K D and T factors on all Typical Sections if applicable

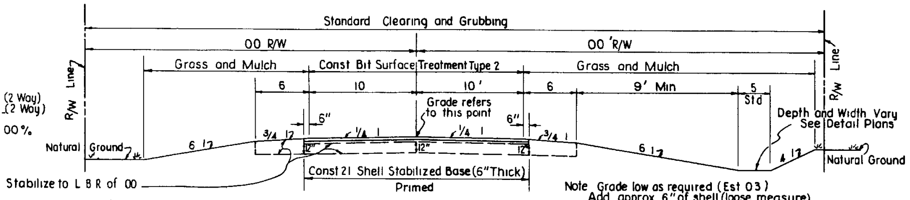
19 _ ADT=___ (2 Way)
Est 19__ ADT=___ (2 Way)
K 00%, D 00%, T 00%

TYPICAL SECTION

LIMEROCK STABILIZED BASE (6" THICK) PRIMED, WITH
BITUMINOUS SURFACE TREATMENT, TYPE 2
For additional details see Index Nºs 1101 X & 5010-X
DESIGN SPEED 00 MPH

All limerock stabilized bases will be 1' wider (6" each side) than the proposed surfacing

TYPICAL SECTION Nº 3



19___ ADT-_____ (2 Way)
Est 19___ ADT-_____(2 Way)
K 00% D-00% T 00%

Note Characteristics of local subgrade material may be of such a nature that more or less shell may be required than indicated above. The amount to be used will be specified by the Engineer

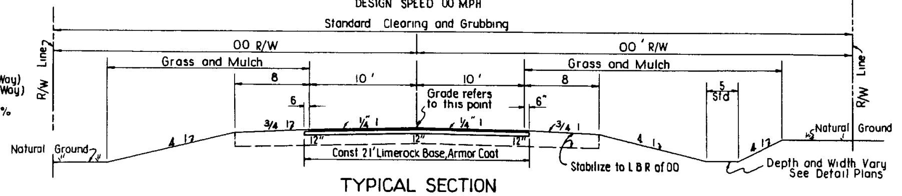
Note Grade low as required (Est 0.3)
Add approx 6" of shell (loose measure), mix, shape and compact 6 deep and prime

TYPICAL SECTION

SHELL STABILIZED BASE (6" THICK) PRIMED, WITH
BITUMINOUS SURFACE TREATMENT, TYPE 2
For additional details see Index Nºs 1101-X & 5010 X
DESIGN SPEED 00 MPH

All shell stabilized bases will be 1 wider (6" each side) than the proposed surfacing

TYPICAL SECTION Nº 4



19___ADT=_____(2 Way)
Est 19___ ADT=_____(2 Way)
K= 00%, D=00% T=00%

TYPICAL SECTION

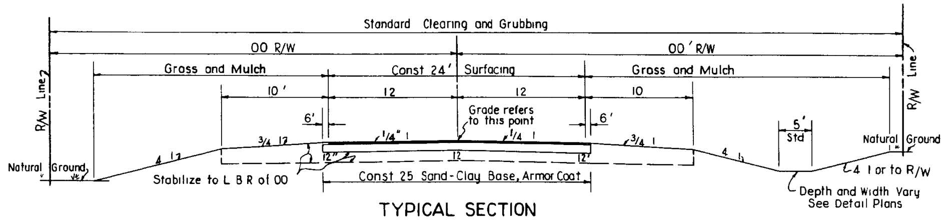
LIMEROCK BASE (6½" THICK) ARMOR COAT, WITH TYPE I
ASPHALTIC CONCRETE SURFACE COURSE (1 ¼" THICK)
For additional details see Index Nºs 1101 X & 5010 X
DESIGN SPEED 00 MPH

PLATE 37

FED. ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.		76	00

State Job № 00000 0000

TYPICAL SECTION № 5



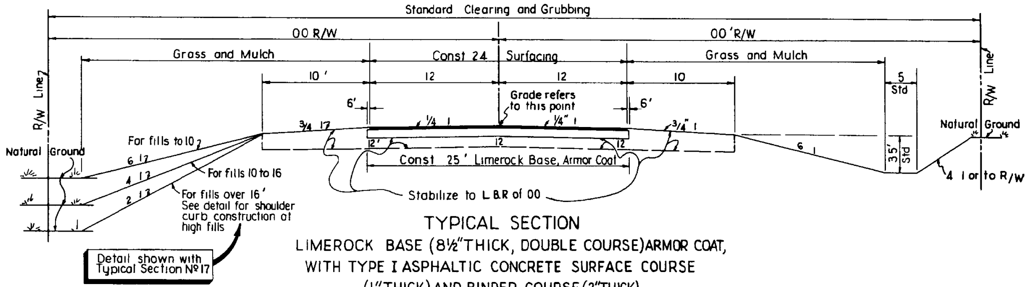
TYPICAL SECTION

SAND-CLAY BASE (8½"THICK, DOUBLE COURSE) ARMOR COAT,
WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE
(1"THICK) AND BINDER COURSE (2"THICK)
For additional details see Index Nos 1101 X & 5010 X
DESIGN SPEED 00 MPH

19_ ADT= (2 Way)
Est 19 ADT (2 Way)
K-00%, D 00% T 00%

All sand-clay bases to be 1 wider (6'each side) than the proposed surfacing

TYPICAL SECTION № 6

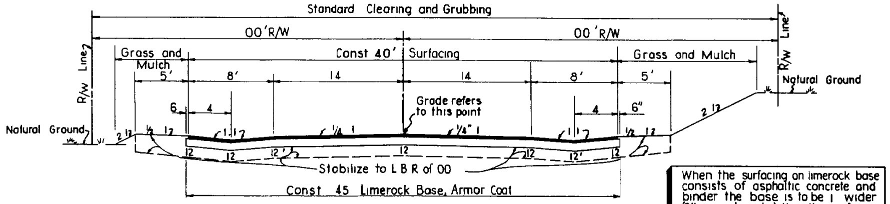


TYPICAL SECTION

LIMEROCK BASE (8½"THICK, DOUBLE COURSE) ARMOR COAT,
WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE
(1"THICK) AND BINDER COURSE (2"THICK)
For additional details see Index Nos 1101 X & 5010 X
DESIGN SPEED 00 MPH

19 ___ADT-____(2 Way)
Est 19___ ADT=____(2 Way)
K=00%, D=00%, T=00%

TYPICAL SECTION № 7



When the surfacing on limerock base consists of asphaltic concrete and binder the base is to be 1 wider (6"on each side) than the surface

TYPICAL SECTION

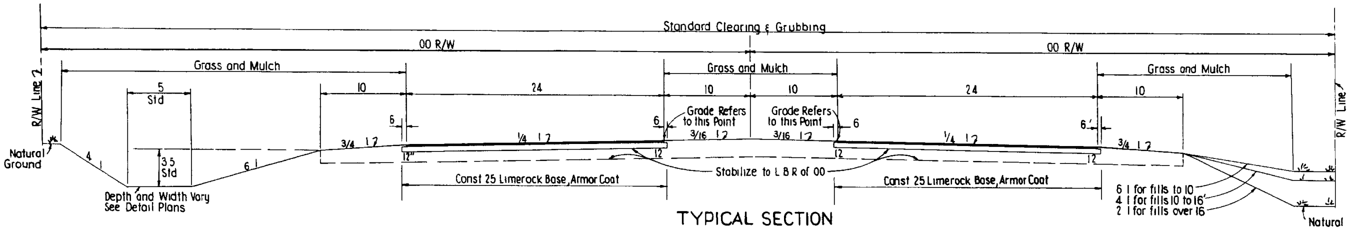
LIMEROCK BASE (8½"THICK, DOUBLE COURSE) ARMOR COAT,
WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE
(1"THICK) AND BINDER COURSE (2"THICK)
For additional details see Index № 1101 X
DESIGN SPEED 00 MPH

19___ADT ___ (2 Way)
Est 19___ADT=__ (2 Way)
K- 00%, D 00%, T-00%

FED ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No
3	FLA.	F 000 00 (o)	76	

State Job Nº 00000 0000

TYPICAL SECTION Nº8



TYPICAL SECTION

LIMEROCK BASE(10½"THICK, DOUBLE COURSE)ARMOR COAT, WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE(1"THICK) AND BINDER COURSE(2"THICK)

For additional details see Index Nos 1101 X ₤ 5010 X

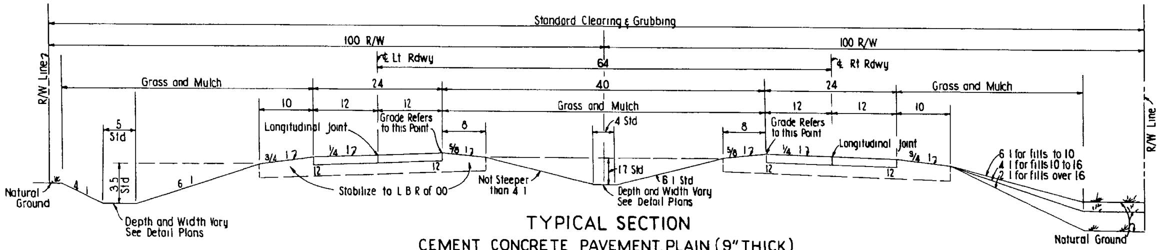
DESIGN SPEED 00 MPH

19 ADT ____ (2 Way)
Est 19___ ADT _____(2 Way)

K= 00% D 00%, T 00 %

See Plate 42 for details of Shoulder Gutter Const at High Fills

TYPICAL SECTION Nº9



TYPICAL SECTION

CEMENT CONCRETE PAVEMENT, PLAIN (9"THICK)

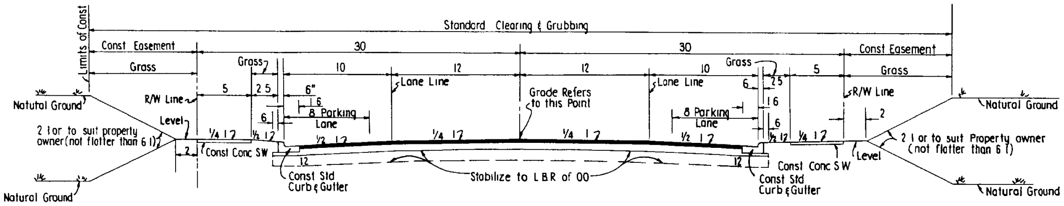
For additional details see Index Nos 1101 X, 5010 X ₤ 5071 X

DESIGN SPEED 00 MPH

19__ ADT=_ _ (2 Way)
Est 19 __ADT=_____(2 Way)

K= 00% D 00%, T-00 %

TYPICAL SECTION Nº10



TYPICAL SECTION

LIMEROCK BASE(8½"THICK, DOUBLE COURSE)ARMOR COAT, WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE(1"THICK) AND BINDER COURSE(2"THICK)

For additional details see Index Nos 1101 X, 1915 X ₤ 5071 X

DESIGN SPEED 00 MPH

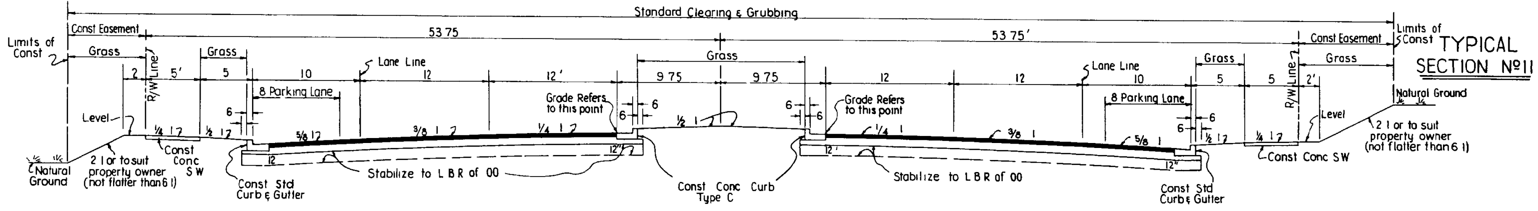
19___ADT- __ _(2 Way)
Est 19___ADT ____ (2 Way)

K 00%, D 00%, T-00 %

FED. ROAD DIV No	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.	F-000-00 (0)	76	00

State Job № 00000-0000

TYPICAL SECTION №11



TYPICAL SECTION

LIMEROCK BASE(10½"THICK, DOUBLE COURSE)ARMOR COAT WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE(1' THICK) AND BINDER COURSE(2' THICK)

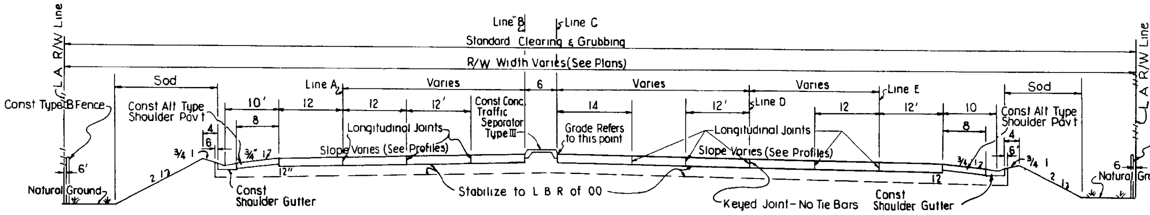
For additional details see Index Nos 1915 X & 5080 X

DESIGN SPEED 00 MPH

19 __ADT=____ (2-Way)
Est 19__ ADT _____(2 Way)

K 00%, D=00%, T=00 %

TYPICAL SECTION №12



TYPICAL SECTION

CEMENT CONCRETE PAVEMENT, PLAIN (9" THICK)

For additional details see Index Nos 1101 X, 5010 X, 5071 X, 5072 X, 5073 X & 5080 X

DESIGN SPEED 00 MPH

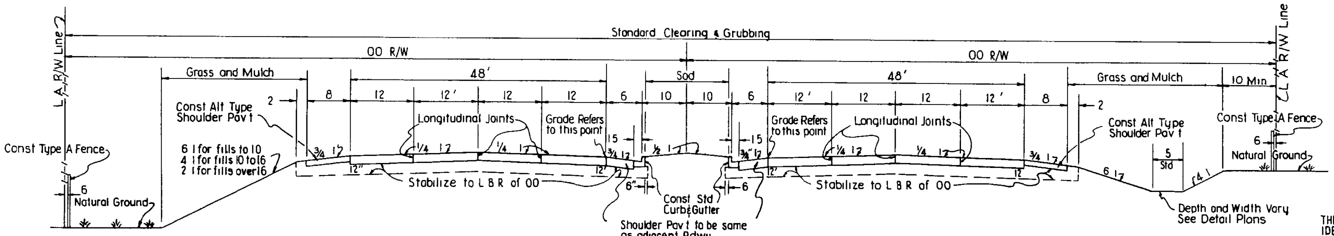
19___ ADT=_____(2 Way)
Est 19__ ADT=_____(2 Way)

K- 00%, D 00%, T=00 %

NOTES BELOW APPLY WHEN ADJACENT TO CEMENT CONCRETE PAVEMENT

Note
Shoulder Pavement will be either Limerock Base (6½ thick) Primed with Type I Asphaltic Concrete Surface Course (1 Thick) (Alt__) or Sand-Asphalt Hot Mix (5 Thick) 800 lb Stability with Type I Asphaltic Concrete Surface Course (1" Thick)(Alt __)

TYPICAL SECTION №13



TYPICAL SECTION

CEMENT CONCRETE PAVEMENT, PLAIN (9" THICK)

For additional details see Index Nos 1101 X, 5010 X 5071 X 5072-X & 5080-X

DESIGN SPEED 00 MPH

19__ ADT=_____(2 Way)
Est 19__ ADT=_____(2 Way)

K 00%, D=00% T=00 %

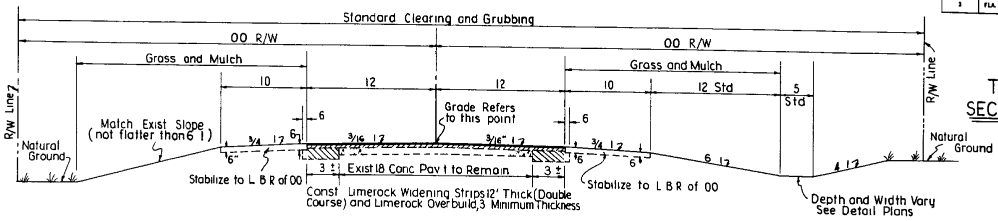
See Plate 42 for details of Shoulder Gutter Const at High Fills

THE ALT SHOULDER PAVEMENT IS IDENTICAL TO THAT SHOWN FOR TYPICAL SECTION № 12

PLATE 40

FED ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.	00000-0000	61	00

TYPICAL
SECTION Nº14

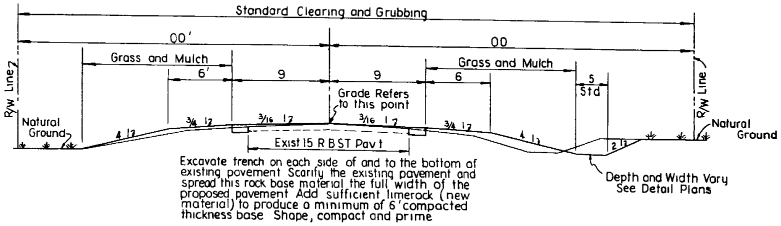


TYPICAL SECTION

LIMEROCK WIDENING STRIPS, RIGHT AND LEFT (12" THICK, DOUBLE COURSE) AND LIMEROCK OVERBUILD (3" MIN COMPACTED THICKNESS) PRIMED, WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE (125 LBS PER SQ YD) or (1¼" THICK)

For additional details see Index Nºs 1101 X & 5010 X

TYPICAL
SECTION Nº 15



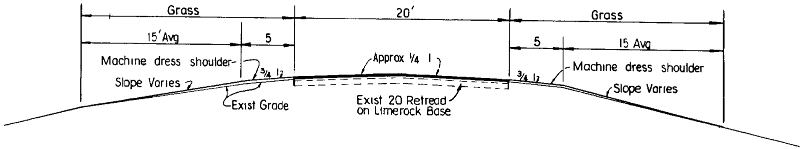
Excavate trench on each side of and to the bottom of existing pavement Scarify the existing pavement and spread this rock base material the full width of the proposed pavement Add sufficient limerock (new material) to produce a minimum of 6' compacted thickness base Shape, compact and prime

TYPICAL SECTION

RE-WORK AND WIDEN ROCK BASE (8" THICK) PRIMED, WITH TYPE 2 BITUMINOUS SURFACE TREATMENT

For additional details see Index Nºs 1101-X & 5010 X

TYPICAL
SECTION Nº16



TYPICAL SECTION

TYPE I ASPHALTIC CONCRETE SURFACE COURSE (175 LBS PER SQ YD)
(APPROX 75 LBS AS LEVELING COURSE AND 100 LBS AS SURFACE COURSE)

EXC FOR GRADING ROADWAY EST AT 000 ¢ PER MILE

NOTE

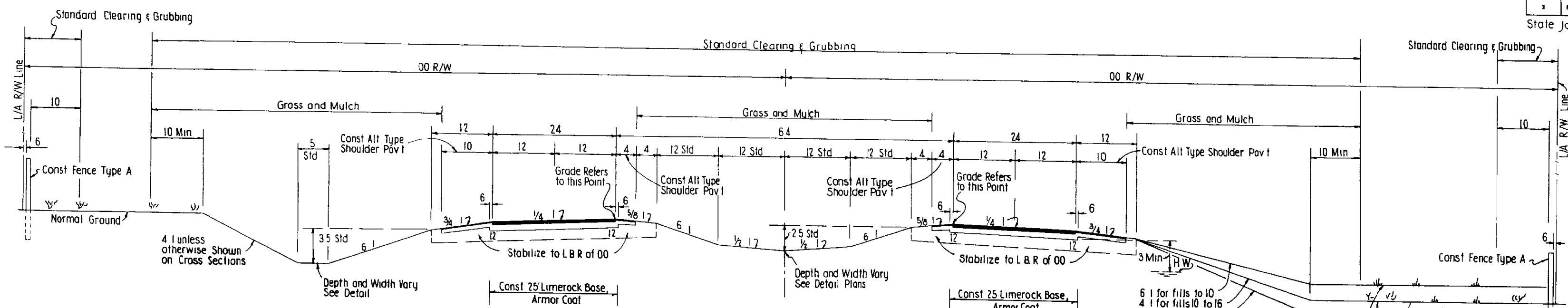
THE QUANTITY INDICATED FOR LEVELING REPRESENTS AN AVERAGE FOR THE ENTIRE JOB THE RATE OF APPLICATION OF LEVELING MAY BE INCREASED OR DECREASED AS NECESSARY AT LOCATIONS DESIGNATED BY THE ENGINEER

PLATE 41

FED ROAD DIV No	STATE	PROJECT No.	FISCAL YEAR	SHEET No
3	FLA.	F 000 00 (o)	76	

State Job Nº 00000 0000

TYPICAL SECTION Nº17



TYPICAL SECTION

LIMEROCK BASE(10½"THICK,DOUBLE COURSE)ARMOR COAT, WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE(1"THICK) AND BINDER COURSE(2"THICK) FIRST STAGE TYPE I ASPHALTIC CONCRETE COURSE OVER PAVEMENT AND SHOULDER, SECOND STAGE (SECOND STAGE CONSTRUCTION NOT IN THIS CONTRACT) (150 LBS PER SQ YD AVERAGE FOR PAVEMENT)(100 LBS PER SQ YD AVERAGE FOR SHOULDER)

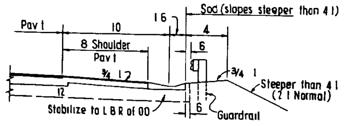
For additional details see Index Nºs 1101 X ¢ 5010 X

DESIGN SPEED 00 MPH

19_ __ADT ___ (2 Way)
Est 19___ ADT=_____(2 Way)

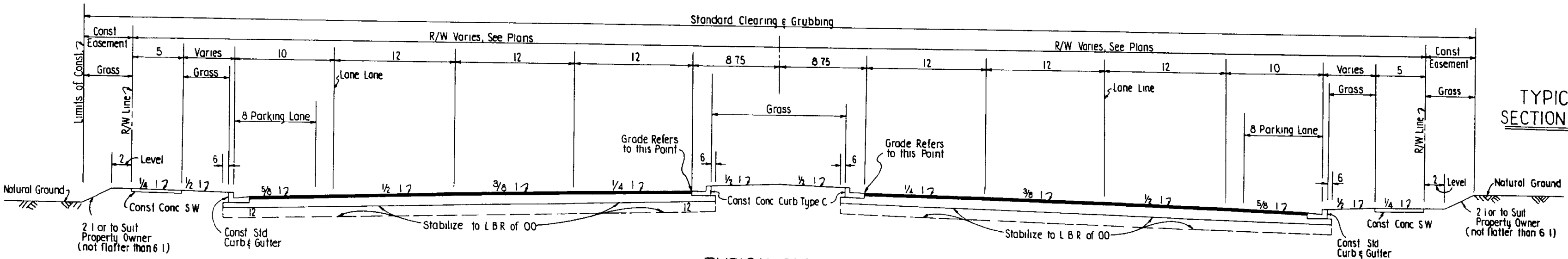
K- 00%, D 00%, T 00%

Note
Shoulder Pavement will be either Limerock Base (6½ Thick)Primed with Type I Asphaltic Concrete Surface Course(1 Thick)(Alt __) or Sand Asphalt Hot Mix(6"Thick) 800 lb Stability (Alt __)



PARTIAL SECTION
SHOWING CONSTRUCTION OF
SHOULDER GUTTER ON FILLS STEEPER
THAN 4 1

TYPICAL SECTION Nº18



TYPICAL SECTION

LIMEROCK BASE(10½"THICK,DOUBLE COURSE)ARMOR COAT WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE(1"THICK) AND BINDER COURSE(2"THICK)

For additional details see Index Nºs 1915 X ¢ 5080 X

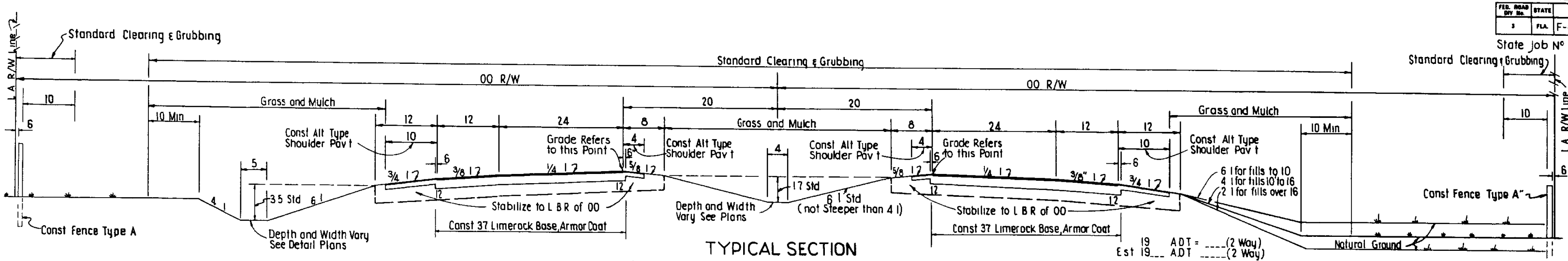
DESIGN SPEED 00 MPH

19__ ADT=_____ (2 Way)
Est 19__ ADT=_____ (2 Way)

K=00%, D=00%, T=00%

FED. ROAD DIV No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.	F-000-00 (0)	76	

State Job No 00000-0000



TYPICAL SECTION

LIMEROCK BASE(10½"THICK, DOUBLE COURSE)ARMOR COAT, WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE(1 THICK) AND BINDER COURSE(2"THICK)

For additional details see Index Nos 1101 X & 5010 X

DESIGN SPEED 00 MPH

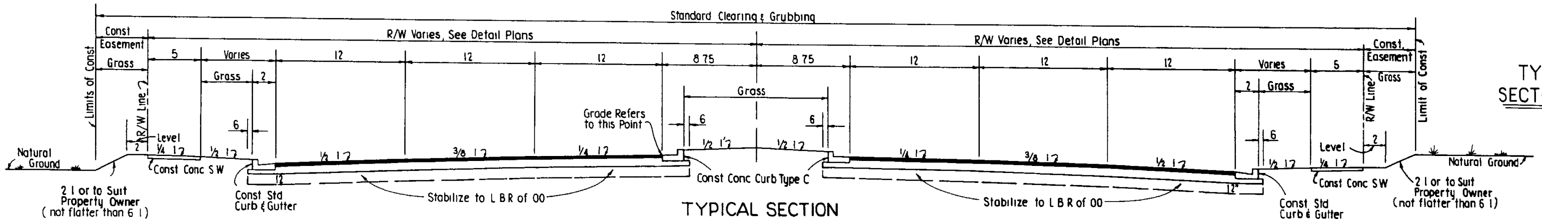
19 ADT = ____(2 Way)
Est 19___ ADT _____(2 Way)

K = 00%, D 00%, T 00%

THE ALT SHOULDER PAVEMENT IS IDENTICAL TO THAT SHOWN FOR TYPICAL SECTION No 17

TYPICAL SECTION No 19

See Plate 42 for details of Shoulder Gutter Const at High Fills



TYPICAL SECTION

LIMEROCK BASE(10½"THICK, DOUBLE COURSE)ARMOR COAT, WITH TYPE I ASPHALTIC CONCRETE SURFACE COURSE(1"THICK) AND BINDER COURSE(2"THICK)

For additional details see Index Nos 1915 X & 5080 X

DESIGN SPEED 00 MPH

19 ___ADT - ____(2 Way)
Est 19 __ ADT = _____(2 Way)

K = 00%, D = 00%, T - 00%

TYPICAL SECTION No 20