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ENHANCEMENT OF EXISTING ENGINEERING SOFTWARE

VOLUME NO. 4

Brass-Geometry User Documentation

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16. Abstract

Often, a traditional design procedure is used wherein a designer sketches results which are based on computer applications and transmits this information via hardcopy to a drafter, who re-enters it into a CAD system. The inefficiencies are clear and an obvious opportunity exists for productive gain. Recently, an existing design application, BRASS-GEOMETRY used for the computation of screed elevation and horizontal geometry for straight bridges and curved bridges. The technical aspects of this program were written and are maintained by the Wyoming Department of Transportation (WDT). Using the UWGRAPH library, the University of Wyoming linked the program with additional procedures to automatically produce CAD files.

UWGRAPH links to three graphic formats commonly used in engineering DXF (AutoCAD), MICRO-CSL (Intergraph) and GKS (screen graphics) in one application program. The information required to use BRASS-GEOMETRY is described.

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PREFACE

The two major objectives for MPC-007 were:

- Development of effective methods for enhancing the user interfaces for existing transportation software.
- Development of effective methods for the direct linkage of design applications to computer-aided-design.

The purpose of this document is to outline the part of results which were obtained in meeting the second objective. This document is the user documentation for a design application written to demonstrate the applicability of the UWGRAPH graphics library. Complete documentation on UWGRAPH is available in a separate document *UWGRAPH Computer-Aided-Design and Drafting Library*. This application is one of several which use UWGRAPH to easily move design computations into CAD.

The authors encourage those using UWGRAPH to develop other documented design procedures and to share these procedures with design professionals.

ABSTRACT

Often, a traditional design procedure is used wherein a designer sketches results which are based on computer applications and transmits this information via hardcopy to a drafter, who reenters it into a CAD system. The inefficiencies are clear and an obvious opportunity exists for productive gain. Recently, an existing design application, BRASS-GEOMETRY used for the computation of screed elevation and horizontal geometry for straight bridges and curved bridges. The technical aspects of this program were written and are maintained by the Wyoming Department of Transportation (WDT). Using the UWGRAPH library, the University of Wyoming linked the program with additional procedures to automatically produce CAD files.

UWGRAPH links to three graphic formats commonly used in engineering DXF (AutoCAD), MICRO-CSL (Intergraph) and GKS (screen graphics) in one application program. The information required to use BRASS-GEOMETRY is described.

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AVAILABILITY

The program described herein is available on Intergraph workstations under CLIX 3.1. The source and executable code is available upon request.

INTRODUCTION

BRASS-geometry is a computer program developed to provide the bridge engineer with screed elevations, vertical corrections, shop web camber and blocking ordinates for various structure configurations. The program computes elevations and horizontal geometry for straight and curved girders.

The program was developed and is maintained by the Wyoming Department of Transportation. The University of Wyoming added the capability to draw the screed elevation tables, the camber and blocking diagram, and the slab thickening diagram. The graphics are produced with the aid of UWGRAPH, a graphics tool developed as part of this MPC project.

The general features and data definitions are presented first. This is followed by specific command descriptions and examples of graphical output.

ELEVATIONS are computed on:

Straight grade
Vertical curve
Part on straight grade, part on vertical curve
Crown section, constant super
Variable superelevation

GIRDER configurations allowed are:

Straight parallel girders
Curved parallel girders
Chorded parallel girders
Chorded non-parallel girders

SKEWS allowed are:

Radial skews (straight and curved bridges)
Skews to long chord (curved bridges)
Skews can vary from support to support

PROGRAM LIMITS are:

8 Spans
12 Girders
4 Splices per span

Girders may be chorded from support to support only at the present time. It is planned to incorporate other chorded configurations in the future.

SYSTEM INPUT is free form consisting of commands grouped to define bridge basic geometry, control elevations, and the output desired.

OUTPUT data is logically arranged and self-explanatory. The amount of detail is controlled by the user.

LANGUAGE used is FORTRAN 77.

SYSTEM AIDES: Each subroutine in BRASS-GEOMETRY is assigned a number and placed in a numbered component. Built-in trace of intermediate values may be turned on by subroutine number or by component number. Each subroutine is documented by numerous comments.

GENERAL

BRASS-GEOMETRY is designed to provide a bridge engineer with screed elevations, vertical corrections, shop web camber and blocking ordinates.

Basically, the engineer needs to describe:

1. Horizontal alignment
2. Vertical alignment
3. Girder geometry such as spacing, type of girder (straight, chorded or curved)
4. Support geometry such as stations, skew
5. Type of output required.

To use BRASS-GEOMETRY, the engineer creates a data file with a series of "Commands" each followed by one or more parameters.

"Typical Command Sets" are provided to help the engineer become acquainted with the system. These begin on Page 6.

Numerous defaults are built into BRASS-GEOMETRY. If a Command parameter has a default value listed, the parameter may be left blank and the default value will be used. Be sure to enter zero if it is a valid value. Blank and zero entries are treated differently.

Short descriptions of the Commands and their parameters are summarized in the BRASS-GEOMETRY Command Summary Manual found in Appendix B. If additional information is required each short description of a command has the number reference for the full description contained in Appendix A

Each "Command Set" must begin with one or two TITLE commands. Optional COMMENT commands may be used as often as needed to document the input series of commands.

The Commands should be arranged to describe the following in the order shown:

1. Horizontal alignment
2. Vertical alignment
3. Intersect stations
4. Girder offsets
5. Other input data
   . Screed line number
   . Vertical correction line numbers
   . Splice data
   . Deflections

Input Format

Data are entered in a command format. Each line begins with a command which describes up to six data entries hereinafter referred to as parameters. The data may be entered as a real (including a decimal) or integer (excluding a decimal point). Zero is not the same as a blank. Default entries are given with most commands and are employed by a blank field or by omission of the command in those cases where all default values are desired. Each command has a three-character abbreviation which may be used in lieu of the full command name.

Commas are used to delineate parameters. The number of spaces between entries has no meaning. For example, if the third entry of a command is the only entry required, any of the following would be valid.

```
COMMAND-EXAMPLE , , 2.0, , ,
COMMAND-EXAMPLE   ,   , 2
CEX , , 2.0
                        ,       2.0000
CEX ,
```

List of Commands for:

Job Control			
TITLE	TLE	10	Problem Title
COMMENT	COM	20	Input Comments
SYSTEM-1	SY1	30	System Control No. 1
SYSTEM-2	SY2	40	System Control No. 2 Primarily a debugging aid by component
SYSTEM-3	SY3	50	System Control No. 3 Primarily a debugging aid by subroutine no.
CONTROL	CNL	60	Sets flags for input and output control
Geometry			
HORIZONTAL	HOR	70	Sets Degree of curve and skew angles if constant
VERTICAL	VER	80	Sets elevation data required for elevations
STATION	STN	90	Establishes station intersects at end of spans
SKEW-RADIAL	SKR	100	Sets radial angles at intersects if angles are variable
SKEW-LONGC	SKL	110	Sets long chord angles at intersects if angles are variable
OFFSETS-RADIAL	OFR	120	Sets offset distances to C_L
OFFSETS-PARCORD	OFP	130	Sets offset distances to C_L span #1
ELEVATIONS-SCREEDS	ESC	140	Determines which lines screeds are wanted on
ELEVATIONS-VERTICAL	EVR	150	Determines which line and what vertical correction is to be applied
SPLICE-INDIV	SPI	160	Sets splice data required for camber diagram and blocking diagram on individual girder
SPLICE-ALL	SPA	170	Sets splice data on all girders using information on centerline for camber diagrams and blocking diagrams on all girders
DEFLECTIONS	DFL	180	Inputs dead load deflections for each span

Typical Command Sets

Straight Bridge			
COMMAND	ABBR	COMMAND NUMBER	USAGE
TITLE	TLE	10	Required
COMMENT	COM	20	Optional
CONTROL	CNL	60	Required
HORIZONTAL	HOR	70	Required
VERTICAL	VER	80	Required for screed output
STATION	STN	90	Required
SKEW-RADIAL	SKR	100	Optional (1)
OFFSETS-RADIAL	OFR	120	Required
ELEVATIONS-SCREEDS	ESC	140	Required for screed output
ELEVATIONS-VERTICAL	EVR	150	Optional (2) - 2 cards max
SPLICE-INDIV	SPI	160	Optional - 96 cards max
SPLICE-ALL	SPA	170	Optional (3) - 8 cards max
DEFLECTIONS	DFL	180	Optional - 8 cards max

(1) Use if variable skew angle.
(2) For vertical correction. Do not use at present time.
(3) For determining camber and blocking diagrams for all girders. Do not use at present time.

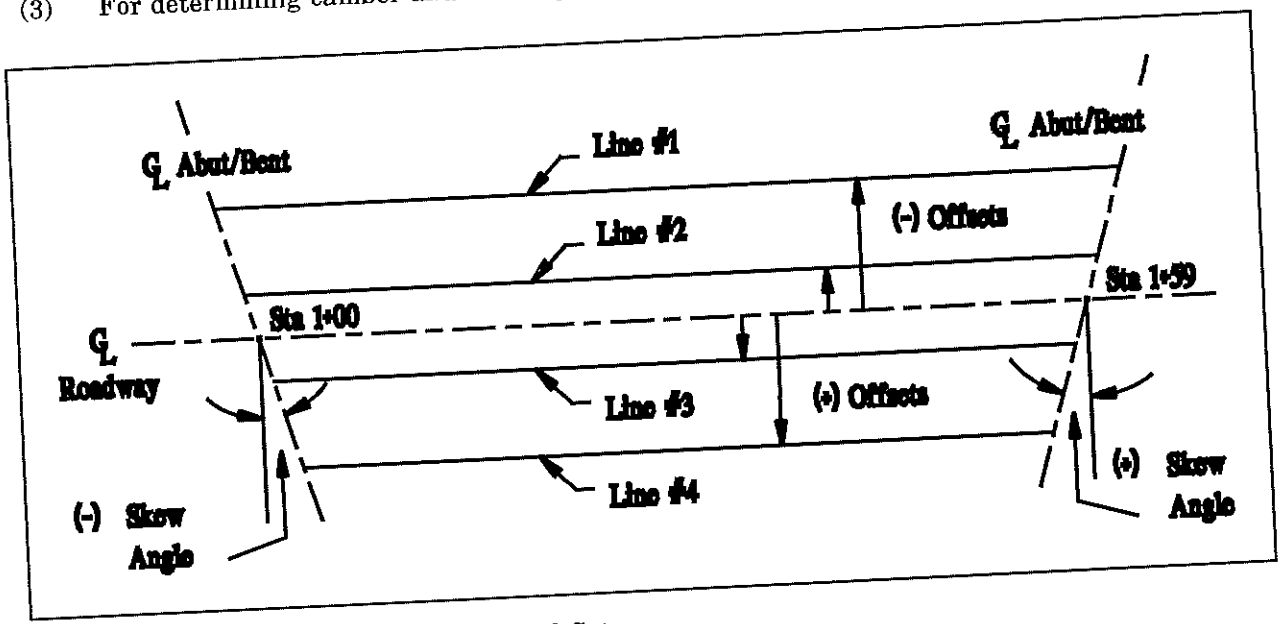


Figure 1. Geometry for Typical Command Sets

Curved Girder Bridge - Radial Skew			
COMMAND	ABBR	COMMAND NUMBER	USAGE
TITLE	TLE	10	Required
COMMENT	COM	20	Optional
CONTROL	CNL	60	Required
HORIZONTAL	HOR	70	Required
VERTICAL	VER	80	Required for screed output
STATION	STN	90	Required
SKEW-RADIAL	SKR	100	Optional (1)
OFFSET-RADIAL	OFR	120	Required
ELEVATIONS-SCREEDS	ESC	140	Required for screed output
ELEVATIONS-VERTICAL	EVR	150	Optional (2) - 2 cards max
SPLICE-INDIV	SPI	160	Optional - 96 cards max
SPLICE-ALL	SPA	170	Optional (3) - 8 cards max
DEFLECTIONS	DFL	180	Optional - 8 cards max

(1) Use if variable radial skew angle.
(2) For vertical correction. Do not use at present time.
(3) For determining camber and blocking diagrams for all girders. Do not use at present time.

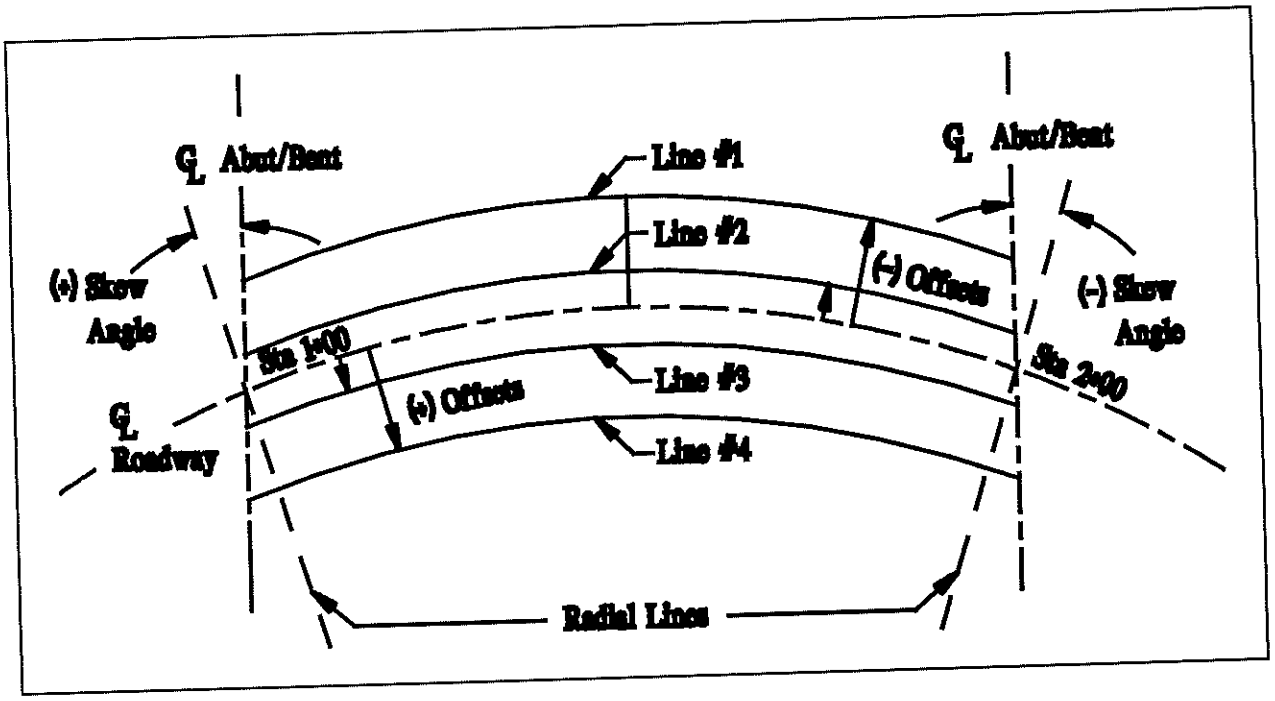


Figure 2. Geometry for Curved Girder Bridge - Radial Skew

Curved Bridge with Non-parallel Chorded Girders- Radial Skew			
COMMAND	ABBR	COMMAND NUMBER	USAGE
TITLE	TLE	10	Required
COMMENT	COM	20	Optional
CONTROL	CNL	60	Required
HORIZONTAL	HOR	70	Required
VERTICAL	VER	80	Required for screed output
STATION	STN	90	Required
SKEW-RADIAL	SKR	100	Optional (1)
OFFSET-RADIAL	OFR	120	Required
ELEVATIONS-SCREEDS	ESC	140	Required for screed output
ELEVATIONS-VERTICAL	EVR	150	Optional (2) - 2 cards max
SPLICE-INDIV	SPI	160	Optional - 96 cards max
SPLICE-ALL	SPA	170	Optional (3) - 8 cards max
DEFLECTIONS	DFL	180	Optional - 8 cards max

(1) Use if variable radial skew angle.
(2) For vertical correction. Do not use at present time.
(3) For determining camber and blocking diagrams for all girders. Do not use at present time.

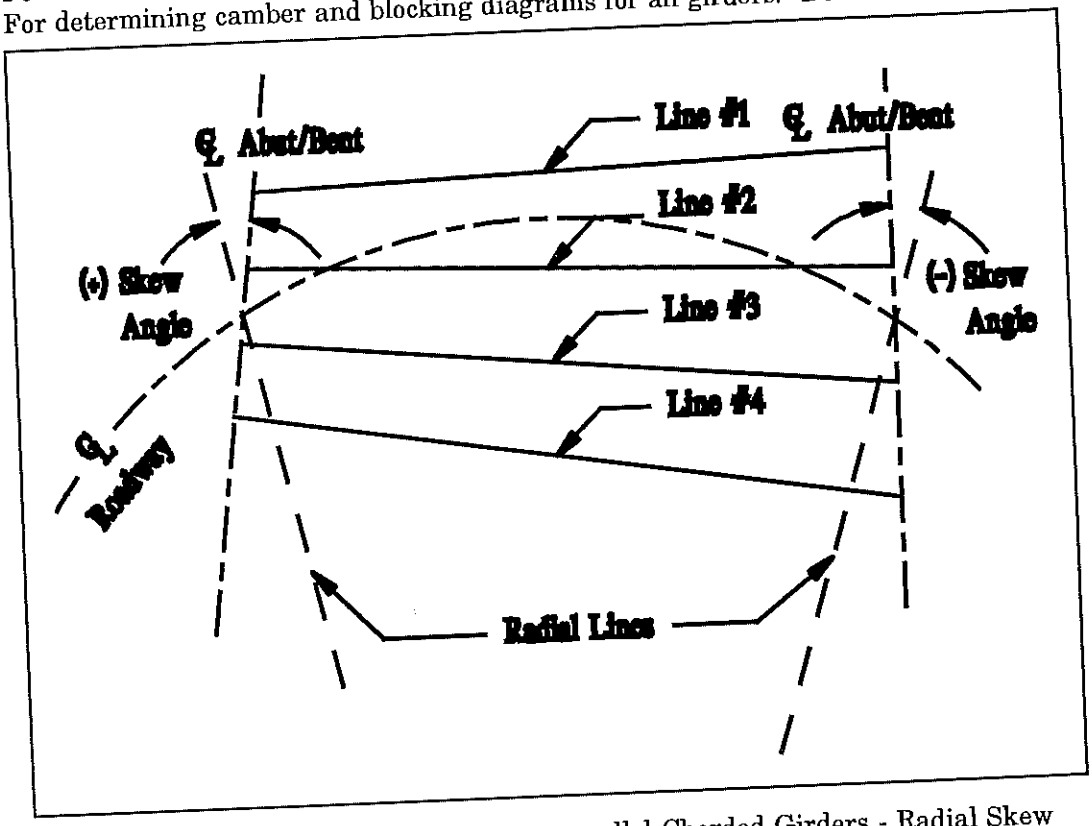


Figure 3. Geometry for Curved Bridge with Non-parallel Chorded Girders - Radial Skew

Curved Bridge with Parallel Chorded Girders- Radial Skew			
COMMAND	ABBR	COMMAND NUMBER	USAGE
TITLE	TLE	10	Required
COMMENT	COM	20	Optional
CONTROL	CNL	60	Required
HORIZONTAL	HOR	70	Required
VERTICAL	VER	80	Required for screed output
STATION	STN	90	Required
SKEW-RADIAL	SKR	100	Optional (1)
OFFSET-PARCORD	OFP	130	Required
ELEVATIONS-SCREEDS	ESC	140	Required for screed output
ELEVATIONS-VERTICAL	EVR	150	Optional (2) - 2 cards max
SPLICE-INDIV	SPI	160	Optional - 96 cards max
SPLICE-ALL	SPA	170	Optional (3) - 8 cards max
DEFLECTIONS	DFL	180	Optional - 8 cards max

(1) Use if variable radial skew angle.
(2) For vertical correction. Do not use at present time.
(3) For determining camber and blocking diagrams for all girders. Do not use at present time.

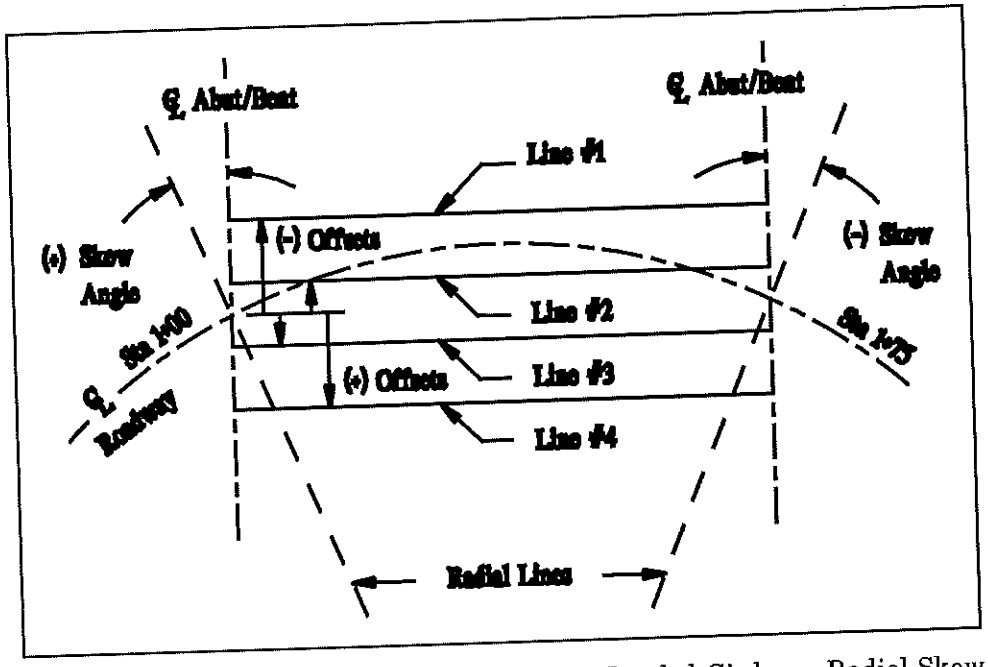


Figure 4. Geometry for Curved Bridge with Parallel Chorded Girders - Radial Skew

Curved Girder Bridge - Skew to Long Chord			
COMMAND	ABBR	COMMAND NUMBER	USAGE
TITLE	TLE	10	Required
COMMENT	COM	20	Optional
CONTROL	CNL	60	Required
HORIZONTAL	HOR	70	Required
VERTICAL	VER	80	Required for screed output
STATION	STN	90	Required
SKEW-LONGC	SKL	110	Optional (1)
OFFSETS-RADIAL	OFR	120	Required
ELEVATIONS-SCREEDS	ESC	140	Required for screed output
ELEVATIONS-VERTICAL	EVR	150	Optional (2) - 2 cards max
SPLICE-INDIV	SPI	160	Optional - 96 cards max
SPLICE-ALL	SPA	170	Optional (3) - 8 cards max
DEFLECTIONS	DFL	180	Optional - 8 cards max

(1) Use if variable long chords skew angle.
(2) For vertical correction. Do not use at present time.
(3) For determining camber and blocking diagrams for all girders. Do not use at present time.

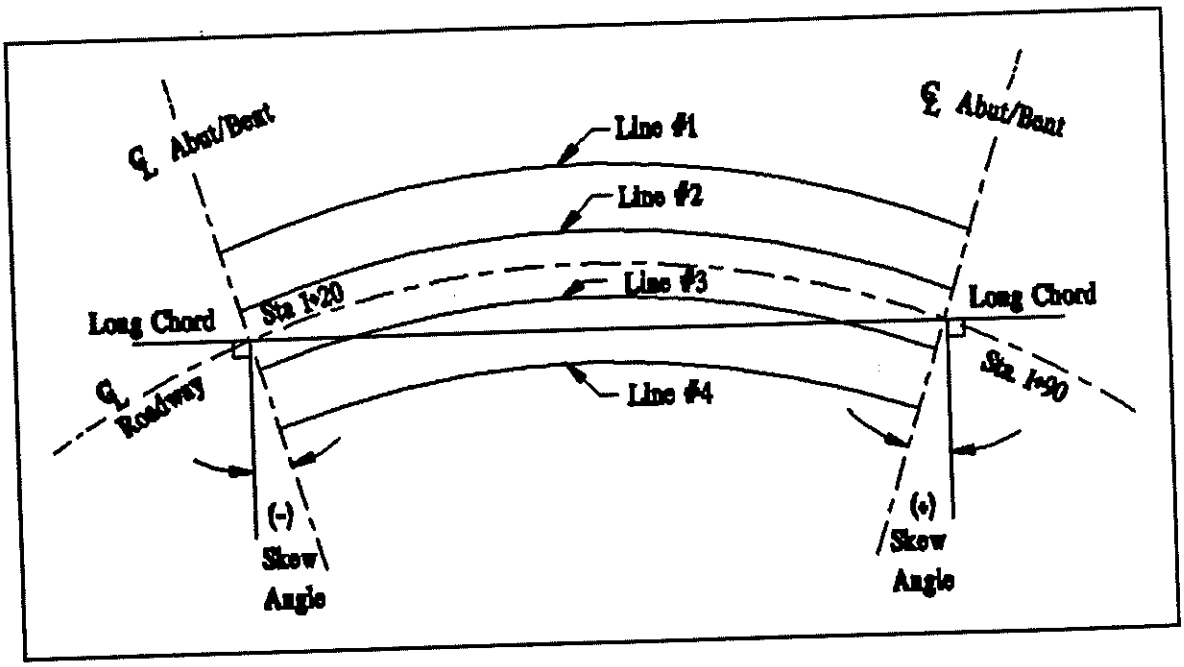


Figure 5. Geometry for Curved Girder Bridge - Skew to Long Chord

Curved Bridge with Non-parallel Chorded Girders - Skew to Long Chord			
COMMAND	ABBR	COMMAND NUMBER	USAGE
TITLE	TLE	10	Required
COMMENT	COM	20	Optional
CONTROL	CNL	60	Required
HORIZONTAL	HOR	70	Required
VERTICAL	VER	80	Required for screed output
STATION	STN	90	Required
SKEW-LONGC	SKL	110	Optional (1)
OFFSETS-RADIAL	OFR	120	Required
ELEVATIONS-SCREEDS	ESC	140	Required for screed output
ELEVATIONS-VERTICAL	EVR	150	Optional (2) - 2 cards max
SPLICE-INDIV	SPI	160	Optional - 96 cards max
SPLICE-ALL	SPA	170	Optional (3) - 8 cards max
DEFLECTIONS	DFL	180	Optional - 8 cards max

(1) Use if variable long chords skew angle.
(2) For vertical correction. Do not use at present time.
(3) For determining camber and blocking diagrams for all girders. Do not use at present time.

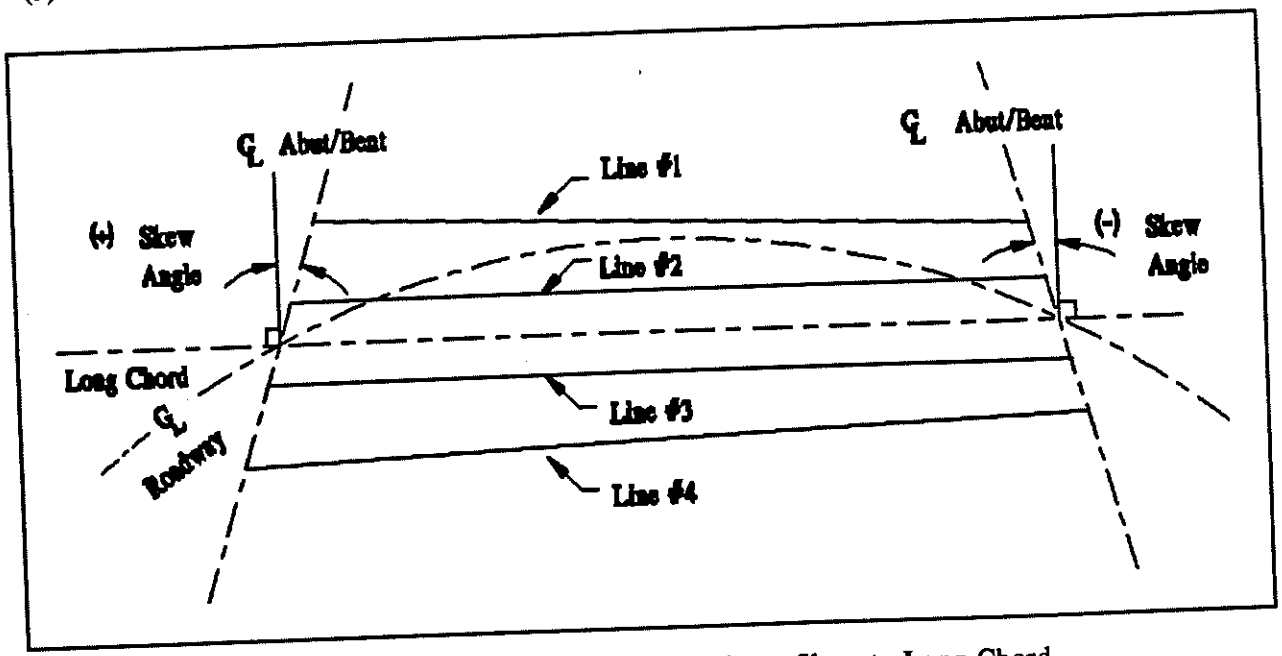


Figure 6. Curved Bridge with Non-parallel Chorded Girders - Skew to Long Chord

Curved Bridge with Parallel Chorded Girders - Skew to Long Chord			
COMMAND	ABBR	COMMAND NUMBER	USAGE
TITLE	TLE	10	Required
COMMENT	COM	20	Optional
CONTROL	CNL	60	Required
HORIZONTAL	HOR	70	Required
VERTICAL	VER	80	Required for screed output
STATION	STN	90	Required
SKEW-LONGC	SKL	110	Optional (1)
OFFSETS-PARCORD	OFP	130	Required
ELEVATIONS-SCREEDS	ESC	140	Required for screed output
ELEVATIONS-VERTICAL	EVR	150	Optional (2) - 2 cards max
SPLICE-INDIV	SPI	160	Optional - 96 cards max
SPLICE-ALL	SPA	170	Optional (3) - 8 cards max
DEFLECTIONS	DFL	180	Optional - 8 cards max

(1) Use if variable long chords skew angle.
(2) For vertical correction. Do not use at present time.
(3) For determining camber and blocking diagrams for all girders. Do not use at present time.

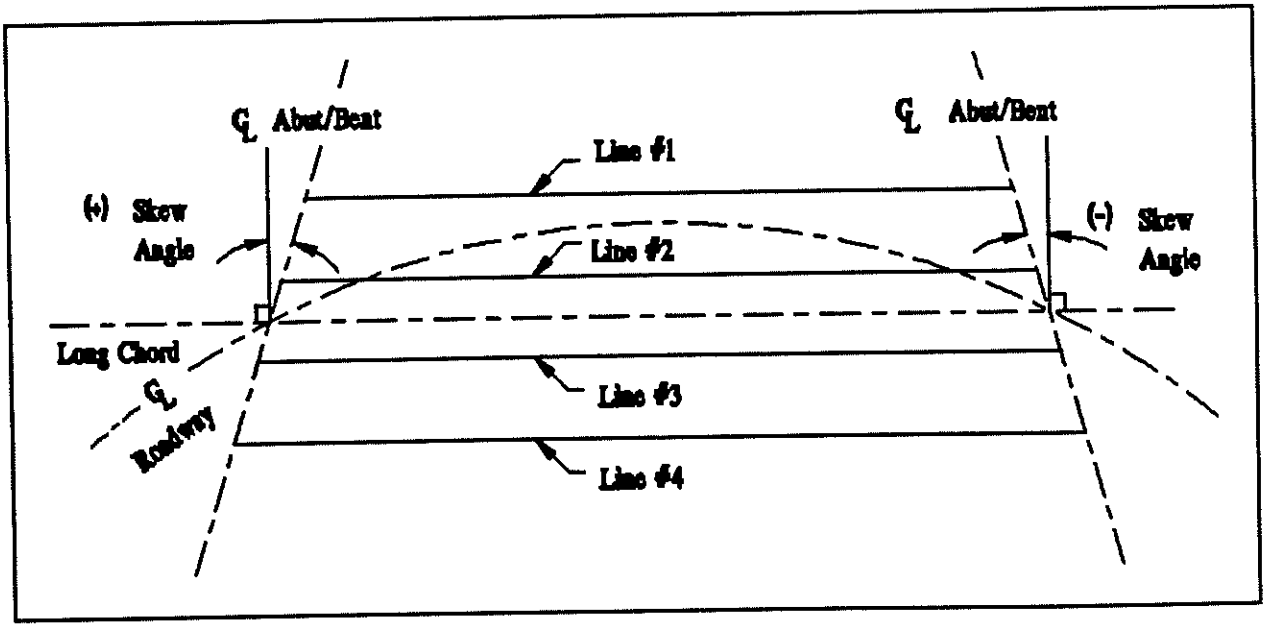


Figure 7. Geometry for Curved Bridge with Parallel Chorded Girders - Skew to Long Chord

COMMAND DEFINITIONS

The BRASS-GEOMETRY command descriptions are given in Appendix A. Each command is defined and the parameters required are given. Where appropriate, an example is given for illustration. Abbreviated command descriptions are given in Appendix B. This Appendix is useful for the frequent user.

CAD DRAWINGS

Examples of the screed elevation table, camber and blocking diagram, and slab thickening diagram are shown in Figures 1, 2 and 3, respectively. This output may be obtained in either DXF or MicroStation CAD formats, or viewed on the workstation in a GKS window. The output format is defined in an interactive query.

TABLE OF SCREED ELEVATIONS

	TENTH POINT OF SPANS																													
Line No.	1.0 : Abut No.1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0 : Pier No.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0 : Pier No.2	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0 : Abut No.2
1	60.12	60.14	60.13	60.11	60.08	60.04	60.00	59.95	59.89	59.85	59.81	59.77	59.74	59.72	59.69	59.64	59.59	59.53	59.46	59.39	59.33	59.29	59.27	59.25	59.22	59.19	59.16	59.12	59.07	59.02	58.96
2	60.12	60.14	60.13	60.11	60.08	60.04	60.00	59.95	59.89	59.85	59.81	59.77	59.74	59.72	59.69	59.64	59.59	59.53	59.46	59.39	59.33	59.29	59.27	59.25	59.22	59.19	59.16	59.12	59.07	59.02	58.96
3	60.12	60.14	60.13	60.11	60.08	60.04	60.00	59.95	59.89	59.85	59.81	59.77	59.74	59.72	59.69	59.64	59.59	59.53	59.46	59.39	59.33	59.29	59.27	59.25	59.22	59.19	59.16	59.12	59.07	59.02	58.96
4	60.12	60.14	60.13	60.11	60.08	60.04	60.00	59.95	59.89	59.85	59.81	59.77	59.74	59.72	59.69	59.64	59.59	59.53	59.46	59.39	59.33	59.29	59.27	59.25	59.22	59.19	59.16	59.12	59.07	59.02	58.96

Figure 8. Screed Elevation Table

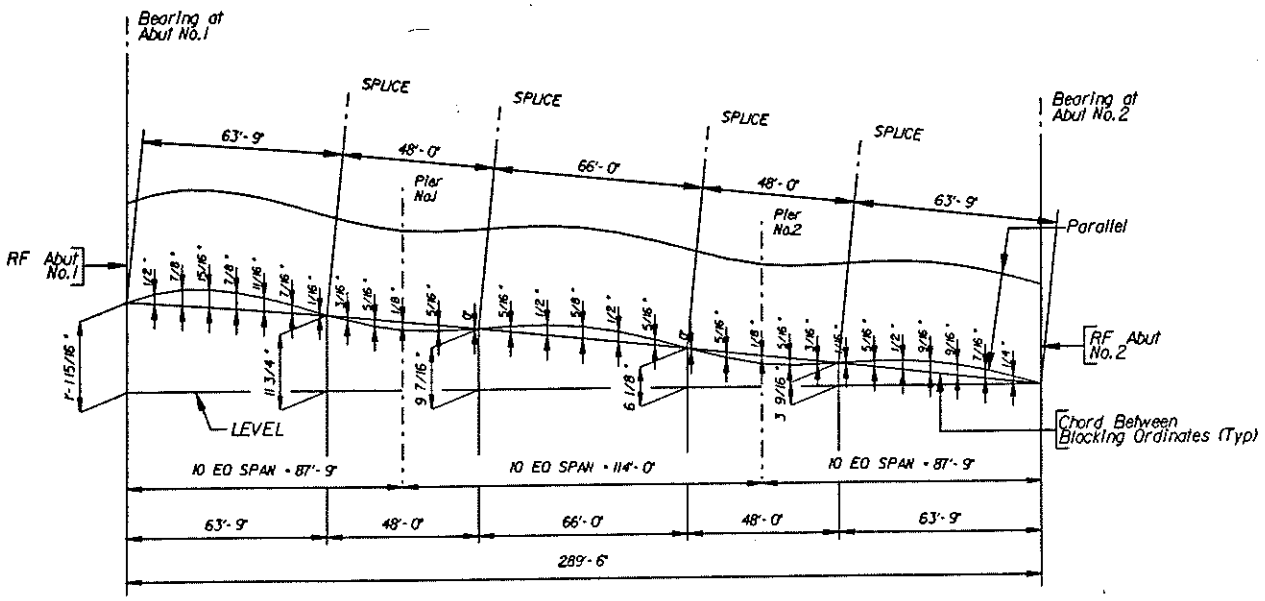


Figure 9. Web Cutting Diagram
(includes Dead Deflection, Grade, Vertical Curvature)

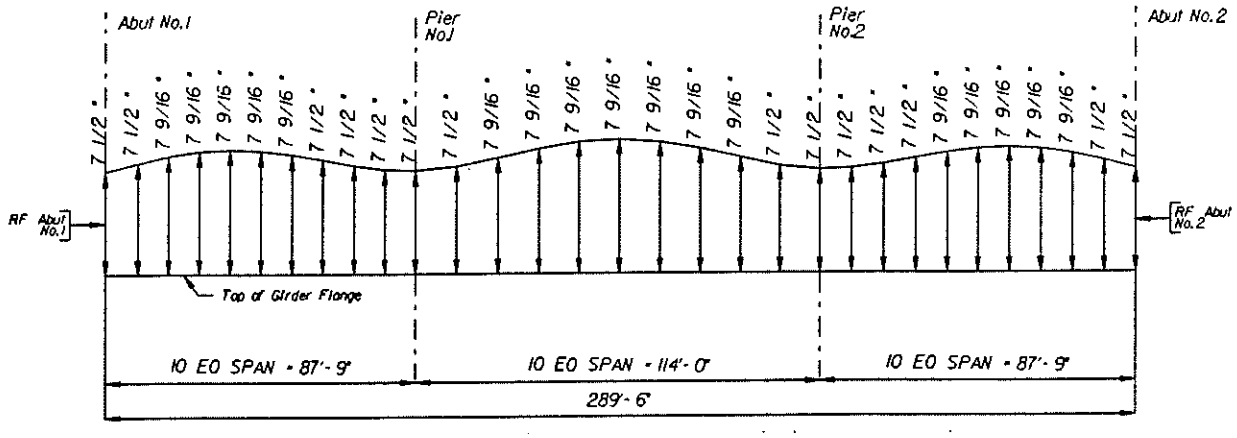


Figure 10. Slab Thickness Diagram
At & Girder (includes correction for dead load defection)

APPENDIX A

COMMAND DESCRIPTIONS

60	BRASS	COMMAND DESCRIPTION

COMMAND NAME	CONTROL (CNL)
PURPOSE	This command controls the input and output for BRASS-GEOMETRY. This command is required.

COMMAND PARAMETERS

Elevations 10th Points	Always required Code 1 if elevations are required. Code 0 if elevations are not required.
Super Type	Always required Code 0 if center crown Code 1 if constant super Code 2 if variable super
Bridge Type	Always required Code 0 if straight bridge Code 1 if left curve Code 2 if right curve
Parallel Girders	Code 1 if girders are parallel Code 0 if girders are not parallel.
Chorded Girders	Code 1 if girders are chorded. Code 0 if girders are curved. Leave blank if straight girders on straight bridge.
Shop Web Camber	Code 2 if shop web camber is wanted on all girders. This command is not available at present time. Code 1 if shop web camber is wanted on specific girder. Code 0 if shop web camber is not wanted.

COMMAND PARAMETERS (Cont.)

% Deflection	No entry assumes 100% Code deflection in percent.
Output data for CADD	Code the Girder Line number for output from CADD. Leave blank if output from CADD is not wanted.
Abutment Type (Not required if Output from CADD is not wanted)	Code 1 for cap type abutment Leave blank if other type abutment.
Intermediate Support Type (Not required if Output from CADD is not wanted)	Code 0 for Pier Code 1 for Bent.
Slab Thickness	Units in In. (Required for wide flange sections only.) Used for slab thickness diagrams.
Top Flange Thickness	Units in In. Enter zero for composite construction.

EXAMPLE

CONTROL 1, 1, 2, 1, 1, 0, 100, 1, 1, 1, 7.5, 1

- 1 — Elevations at tenth points required
- 1 — Constant Super
- 2 — Right Curve
- 1 — Parallel Girders
- 1 — Chorded Girders
- 0 — No Shop Web Camber
- 100 — % Deflection
- 1 — Output CADD Data
- 1 — Cap Type Abutment
- 1 — Bent Support
- 7.5 — Slab Thickness
- 1 — Top Flange Thickness

FIGURES

NOTES

70	BRASS	COMMAND DESCRIPTION

COMMAND NAME	HORIZONTAL (HOR)
PURPOSE	This command inputs degree of curve, skew type and skew angles. This command is required.

COMMAND PARAMETERS

Degree of Curve	Enter as deg-min-sec 030000 = 3°0'0"
Skew Type	Code 0 for radial skew (same all supports) (This value is normally used). Code 1 for long chord skew (same all supports) Code 2 for variable radial skew (Varies from support to support) Code 3 for variable long chord skew (Varies from support to support)
Skew	Code skew angle in deg-min-sec (300000) A negative value indicates a left skew. No entry assumes 000000 (For long chord skew angles with 00 skew use 900000)
Distance Between End of Girdger and RF Abutment No. 1	Always Required Units in Ft Default = 0.0
Distance Between End of Girder and RF Abutment No. 2	Always Required Units in Ft Default = Field No. 4 Above
Girder Length Past The Bearing at Abutment No. 1	Units in Ft Default = 0.0
Girder Length Past The Bearing at Abutment No. 2	Units in Ft Default = Field No. 6 Above

EXAMPLE

HORIZONTAL 300000, 1, 900000, .833, .833, .5, .5

- 300000 — 30 Horizonal curve
- 1 — Long chord skew
- 900000 — 0° skew
- .833, .833 — Dist bet girder end and RF Abut
- .5, .5 — Girder length past bearing.

HORIZONTAL , 0, - 300000, 1.5, , 1.042

- (blank) — Tangent
- 0 — Radial skew
- - 300000 — 30° Left skew
- 1.5, (blank) — Dist bet girder end and RF Abut
- 1.042 — Girder length past bearing.

FIGURES

NOTES

80	**BRASS**	COMMAND DESCRIPTION

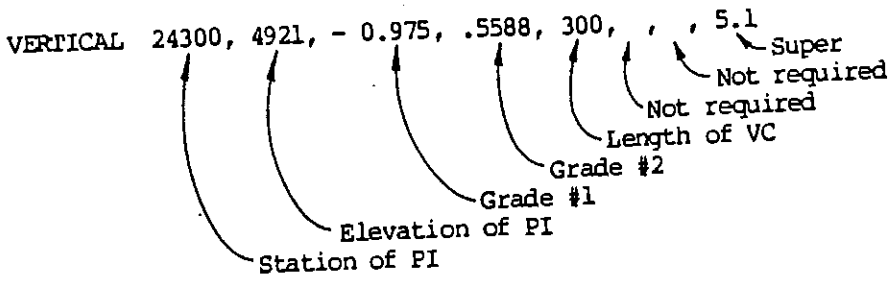
COMMAND NAME	VERTICAL (VER)	

PURPOSE	This command lists vertical elevation data. Required if elevations at tenth points are requested.

COMMAND PARAMETERS

PI Station	Units in Ft (Required)
PI Elevation	Units in Ft (Required)
Grade 1	Units in % (Required)
Grade 2	Units in % (If no entry Grade 2 = Grade 1)
Length of VC	Units in Ft (Optional)
Length of VC before PI	Units in Ft (NOT required for symmetrical Vertical Curve)
Length of VC after PI	Units in Ft (NOT required for symmetrical Vertical Curve)
Super	Units in % (Required if crown section or constant super) (Crown is input as positive No.) (Positive super is down toward right) (Negative super is down toward left)
Beginning Super	Units in % (Required if variable super)
Ending Super	Units in % (Required if variable super)
Beginning Station	Units in Ft (Required if variable super)
Ending Station	Units in Ft (Required if variable super)

EXAMPLE



FIGURES

NOTES

90	BRASS	COMMAND DESCRIPTION

COMMAND NAME	STATION (STN)	
PURPOSE	This command lists stations of intersections. This command is required.	

COMMAND PARAMETERS

Station #1	Units in Ft. (Always required)
Station #2	Units in Ft. (Always required)
Station #3	Units in Ft. (Optional)
Station #4	Units in Ft. (Optional)
Station #5	Units in Ft. (Optional)
Station #6	Units in Ft. (Optional)
Station #7	Units in Ft. (Optional)
Station #8	Units in Ft. (Optional)
Station #9	Units in Ft. (Optional)

EXAMPLE

STATION 23797, 23798.25, 23905.75, 23907

- 23907 — Station of Fourth Intersect
- 23905.75 — Station of Third Intersect
- 23798.25 — Station of Second Intersect
- 23797 — Station of First Intersect

FIGURES

NOTES

100	BRASS	COMMAND DESCRIPTION

COMMAND NAME	SKEW-RADIAL (SKR)	
PURPOSE	This command lists skew angles to radial line at each intersection. This command is required only when skew type is a variable - radial skew.	

COMMAND PARAMETERS

Angle of First Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Second Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Third Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Fourth Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Fifth Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Sixth Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Seventh Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Eighth Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)
Angle of Ninth Intersect	Units in degrees-min-sec i.e., 300000 (Neg = Left Skew)

EXAMPLE

SKEW-RADIAL 300000, 250000, 300000

30° Right skew
Third Intersect

25° Right skew
Second Intersect

30° Right skew
First Intersect

FIGURES

NOTES

110	**BRASS**	COMMAND DESCRIPTION

COMMAND NAME	SKEW-LONGC (SKL)	

PURPOSE	This command lists skew angles to long chord at each intersection. This command is required only when skew type is a variable - long chord skew.

COMMAND PARAMETERS

Angle of First Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Second Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Third Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Fourth Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Fifth Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Sixth Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Seventh Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Eighth Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)
Angle of Ninth Intersect	Units in degrees-min-sec, i.e., 600000 (Greater than 90° = left skew)

EXAMPLE

```
SKEW-LONGC  800000, 900000, 1000000
```

100° skew
Third Intersect

90° skew
Second Intersect

80° skew
First Intersect

FIGURES

NOTES

120	BRASS	COMMAND DESCRIPTION

COMMAND NAME	OFFSETS-RADIALS (OFR)
PURPOSE	This command lists the radial offsets to centerline. Required if girders are not chorded.

COMMAND PARAMETERS

Distance to C_L Line #1	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #2	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #3	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #4	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #5	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #6	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #7	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #8	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #9	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #10	Units in Ft. (Neg. if left of C_L)

COMMAND PARAMETERS (Cont.)

Distance to C_L Line #11	Units in Ft. (Neg. if left of C_L)
Distance to C_L Line #12	Units in Ft. (Neg. if left of C_L)

EXAMPLE

OFFSETS-RADIAL - 9, 0

0 ← Second offset

9 ← First offset = 9' Left

FIGURES

NOTES

130	BRASS	COMMAND DESCRIPTION

COMMAND NAME	OFFSETS-PARCORD (OFP)	

PURPOSE	This command lists the prallel chord offsets for 1st span. Required if girders are parallel and chorded.

COMMAND PARAMETERS

Distance to C_L Line #1	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #2	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #3	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #4	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #5	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #6	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #7	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #8	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #9	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #10	Units in Ft. (Neg. if Left of C_L)

COMMAND PARAMETERS (Cont.)

Distance to C_L Line #11	Units in Ft. (Neg. if Left of C_L)
Distance to C_L Line #12	Units in Ft. (Neg. if Left of C_L)

EXAMPLE

OFFSETS-PARCORD - 14.47, 0, 15.53

Third offset

Second offset

First offset = 14.47' Left

FIGURES

NOTES

140	BRASS	COMMAND DESCRIPTION

COMMAND NAME	ELEVATIONS-SCREEDS (ESC)	
PURPOSE	This command lists the line numbers screed elevations are wanted on. Required if 10th point elevations are requested.	

COMMAND PARAMETERS

Line No.	Up to 12 Line Numbers may be specified.

EXAMPLE

ELEVATIONS-SCREEDS 1, 2, 3

- 3 — Third Line No.
- 2 — Second Line No.
- 1 — First Line No.

FIGURES

NOTES

150	**BRASS**	COMMAND DESCRIPTION

COMMAND NAME	ELEVATIONS-VERTICAL (EVR)	

PURPOSE	This command lists line numbers and vertical corrections above or below finish grade. This command is optional, 2 commands are allowed for maximum of 12 lines Do not use at present time.

COMMAND PARAMETERS

Line No.	Enter the first line a vertical correction is wanted on.
Vert. Corr.	Enter the vertical correction for first line.
Line No.	Enter the second line a vertical correction is wanted on.
Vert. Corr.	Enter the vertical correction for second line.
Line No.	Enter the third line a vertical correction is wanted on.
Vert. Corr.	Enter the vertical correction for third line.
Line No.	Enter the fourth line a vertical correction is wanted on.
Vert. Corr.	Enter the vertical correction for fourth line.
Line No.	Enter the fifth line a vertical correction is wanted on.
Vert. Corr.	Enter the vertical correction for fifth line.
Line No.	Enter the sixth line a vertical correction is wanted on.
Vert. Corr.	Enter the vertical correction for sixth line.
	Repeat command for more than six lines.

EXAMPLE

```
ELEVATIONS-VERTICAL  2,  .5,  4, -.5
                     |   |    |   |
                     |   |    |   Vert. correction
                     |   |    Line number
                     |   Vert. correction
                     Line number
```

FIGURES

NOTES

160	BRASS	COMMAND DESCRIPTION

COMMAND NAME	SPLICE-INDIV (SPI)
PURPOSE	This command lists girder numbers, span numbers and up to four splices per span. A minimum of one command is required with a limit of 96 commands. (12 Girders 8 spans).

COMMAND PARAMETERS

Girder No.	Required input
Span No.	Required input
Dist from Lt end of span to splice No. 1	Required input
Dist from Lt end of span to splice No. 2	Optional input
Dist from Lt end of span to splice No. 3	Optional input
Dist from Lt end of span to splice No. 4	Optional input

Note: If no splice in end span do not use this command for end span.

EXAMPLE

```
SPLICE-INDIV   1,  3,  37.1458,  134.2396
```

Second splice location
First splice location
Span No.
Girder No.

FIGURES

NOTES

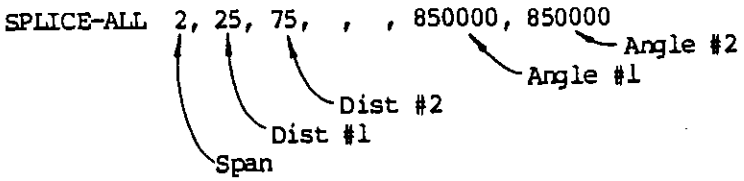
170	**BRASS**	COMMAND DESCRIPTION

COMMAND NAME	SPLICE-ALL (SPA)	
PURPOSE	This command lists span Nos. (8), location of splices (4), angle of splice lines to C_L (4) when shop web camber is to be furnished on all girders. Do not use at present time.	

COMMAND PARAMETERS

Span No.	Required input
Dist. along C_L from Lt end of span to Splice No. 1	Required input
Dist along C_L from Lt end of span to Splice No. 2	Optional input
Dist along C_L from Lt end of span to Splice No. 3	Optional input
Dist along C_L from Lt end of span to Splice No. 4	Optional input
Angle of Splice to C_L of Splice #1	Required input - Angle in Deg-Min-Sec, i.e. 900000
Angle of Splice to C_L of Splice #2	Optional input
Angle of Splice to C_L of Splice #3	Optional input
Angle of Splice to C_L of Splice #4	Optional input
	Repeat for each span

EXAMPLE



FIGURES

NOTES

180	**BRASS**	COMMAND DESCRIPTION

COMMAND NAME	DEFLECTIONS (DFL)	
PURPOSE	This command lists span number and deflections. Repeat for each span deflection is being furnished. (8 max)	

COMMAND PARAMETERS

Span No.	Required
Deflection @ 0.1	Required
Deflection @ 0.2	Required
Deflection @ 0.3	Required
Deflection @ 0.4	Required
Deflection @ 0.5	Required
Deflection @ 0.6	Required
Deflection @ 0.7	Required
Deflection @ 0.8	Required
Deflection @ 0.9	Required

EXAMPLE

```
DEFLECTIONS 2,  .0501, .0919, .1194, .1274, .1219,
                .0994, .0673, .0356, .0074
```

Span No.

FIGURES

NOTES

APPENDIX B

ABBREVIATED COMMANDS

JOB CONTROL

TITLE (TLE)	[10]	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	Job description up to 60 characters. This will title each page of output. Two are allowed.
COMMENT (COM)	[20]	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	Comment up to 60 characters. One or more may be placed between commands to document the input data.

		- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
SYSTEM-1 (SY1) System Control No. 1 (Optional)	[30]	Leave blank	1 - prints name of subroutine entered for all subroutines 2 - prints name of subroutine entered for programs listed on SYSTEM-2 or SYSTEM-3 commands				
SYSTEM-2 (SY2) System Control No. 2 (Optional)	[40]	First Component Number for which trace is desired	Second Component Number for which trace is desired				
SYSTEM-3 (SY3) System Control No. 3 (Optional)	[50]	First Subroutine Number for which trace is desired	Second Subroutine Number for which trace is desired	Third Subroutine Number for which trace is desired	Fourth Subroutine Number for which trace is desired	Fifth Subroutine Number for which trace is desired	Sixth Subroutine Number for which trace is desired

CONTROL (CNL) [60]

(Required)

- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Elevations 10th points 1 = Yes 0 = No	Super Type 0 = center crown 1 = constant super 2 = variable super (Always required)	Bridge Type 0 = St. Bridge 1 = Lt. Curve 2 = Rt. Curve (Always required)	Parallel Girders 1 = Yes 0 = No	Chorded Girders 1 = Yes 0 = No	Shop Web Camber 2 = Ea Girder 1 = Specific Girder 0 = No Shop Web Camber

- 7 -	- 8 -	- 9 -	- 10 -	- 11 -	- 12 -
% Deflection No entry = 100% Enter % Deflection Used (%) Desired	Output data for CADD 0 = No Any Integer = Girder Line	<------- When Output Data = 1 -----> Abutment type 1 = Cap type leave blank for all other cases	Intermediate support type 0 = Pier 1 = Bent	Slab Thickness (In) (Required for wide flange sections only)	Top Flange Thickness (In)

HORIZONTAL (HOR) [70]

(Required)

Angle in degrees minutes, seconds

- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Degree of Curve Required if Bridge Type = 1 or 2 Angle in degrees minutes, seconds Examples: If angle = 30° 00' 00" Code 300000 If angle = 0° Code 000000	Skew Type 0 = Radial skew (Normally used) 1 = Long chord skew 2 = Variable Radial Skew 3 = Variable Long Chord Skew	Skew Angle in degrees minutes, seconds Use only when Skew Type = 0 or 1 (Neg = Left Skew) Examples: If angle = 30° 00' 00" Code 300000 If angle = 0° Code 000000	Distance Between End of Girder and RF Abutment No. 1 (Ft) (Always Required)	Distance Between End of Girdger and RF Abutment No. 2 (Ft) (Always Required)	Girder Length Past Bearing-Abut No. 1 (Ft)

- 7 -
Girder Length Past Bearing-Abut No. 2 (Ft)

VERTICAL (VER) [80]

	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
(Required)	PI Station	PI Elevation	Grade 1	Grade 2 Default = Grade 1	Length of VC	Length of vert. before PI NOT required for symetrical VC
	(Ft)	(Ft)	(%)	(%)	(Ft)	(Ft)

	- 7 -	- 8 -	- 9 -	- 10 -	- 11 -	- 12 -
Pos super is down toward right, Input crown super as positive number	Length of Vert after PI NOT required for symetrical VC	Super Required if Super type = 0 or 1	Beginning Super Required if Super type = 2	Ending Super Required if Super type = 2	Beginning Station Required if Super type = 2	Ending Station Required if Super type = 2
	(Ft)	(%)	(%)	(%)	(Ft)	(Ft)

STATION (STN) [90]

	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
(Required) For double bearing bents/piers, code the C_L of the bent/pier	Station 1 First Intersect Station (Always required)	Station 2 Second Intersect Station (Always required)	Station 3 Third Intersect Station (Optional)	Station 4 Fourth Intersect Station (Optional)	Station 5 Fifth Intersect Station (Optional)	Station 6 Sixth Intersect Station (Optional)
	(Ft)	(Ft)	(Ft)	(Ft)	(Ft)	(Ft)

	- 7 -	- 8 -	- 9 -
	Station 7 Seventh Intersect Station (Optional)	Station 8 Eighth Intersect Station (Optional)	Station 9 Ninth Intersect Station (Optional)

SKEW-RADIAL (SKR)[100]

Required if Radial Skew and Skew Type = 2

- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Angle of First Intersect (Deg-Min-Sec) (i.e. 300000) (Neg = Left Skew)	Angle of Second Intersect (Deg-Min-Sec)	Angle of Third Intersect (Deg-Min-Sec)	Angle Fourth Intersect (Deg-Min-Sec)	Angle Fifth Intersect (Deg-Min-Sec)	Angle Sixth Intersect (Deg-Min-Sec)

- 7 -	- 8 -	- 9 -
Angle of Seventh Intersect (Deg-Min-Sec)	Angle of Eighth Intersect (Deg-Min-Sec)	Angle of Ninth Intersect (Deg-Min-Sec)

SKEW-LONGC (SKL)[110]

Required if Long Chord Skew and Skew Type = 3

- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Angle of First Intersect (Deg-Min-Sec) (i.e. 300000) (Angles greater than 90 Degrees = Left Skew)	Angle of Second Intersect (Deg-Min-Sec)	Angle of Third Intersect (Deg-Min-Sec)	Angle of Fourth Intersect (Deg-Min-Sec)	Angle of Fifth Intersect (Deg-Min-Sec)	Angle of Sixth Intersect (Deg-Min-Sec)

- 7 -	- 8 -	- 9 -
Angle of Seventh Intersect (Deg-Min-Sec)	Angle of Eighth Intersect (Deg-Min-Sec)	Angle of Ninth Intersect (Deg-Min-Sec)

OFFSETS-RADIAL (OFR)[120]

	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Required if Parallel curved or Parallel Straight Neg if left of C_L	Distance to C_L #1 (Ft)	Distance to C_L #2 (Ft)	Distance to C_L #3 (Ft)	Distance to C_L #4 (Ft)	Distance to C_L #5 (Ft)	Distance to C_L #6 (Ft)

- 7 -	- 8 -	- 9 -	- 10 -	- 11 -	- 12 -
Distance to C_L #7 (Ft)	Distance to C_L #8 (Ft)	Distance to C_L #9 (Ft)	Distance to C_L #10 (Ft)	Distance to C_L #11 (Ft)	Distance to C_L #12 (Ft)

OFFSETS-PARCORD (OFP)[130]

	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Required if Parallel Chorded Offsets shown for first span only Neg if left of C_L	Distance to C_L #1 (Ft)	Distance to C_L #2 (Ft)	Distance to C_L #3 (Ft)	Distance to C_L #4 (Ft)	Distance to C_L #5 (Ft)	Distance to C_L #6 (Ft)

- 7 -	- 8 -	- 9 -	- 10 -	- 11 -	- 12 -
Distance to C_L #7 (Ft)	Distance to C_L #8 (Ft)	Distance to C_L #9 (Ft)	Distance to C_L #10 (Ft)	Distance to C_L #11 (Ft)	Distance to C_L #12 (Ft)

	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
ELEVATIONS-SCREEDS (ESC) [140] (Required)	Line # Desired line # for SCREEDS	Up to 12 lines may be requested				
ELEVATIONS-VERTICAL (EVR) [150] (Not currently Operational) 2 cards maximum (Optional)	Line # Desired line # for vertical correction	Vertical Correction (Ft)	Line # Desired line # for vertical correction	Vertical Correction (Ft)	Line # Desired line # for vertical correction	Vertical Correction (Ft)

	- 7 -	- 8 -	- 9 -	- 10 -	- 11 -	- 12 -
	Line # Desired line # for vertical correction	Vertical Correction (Ft)	Line # Desired line # for vertical correction	Vertical Correction (Ft)	Line # Desired line # for vertical correction	Vertical Correction (Ft)

SPLICE-INDIV (SPI)[160]

	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Required if Shop web camber is required on individual lines Up to 96 cards (12 Girders, 8 Spans) Note: If no splice in end span do not enter.	Girder No.	Span No.	Dist from Lt end of Span to Splice No. 1 (Ft)	Dist from Lt end of Span to Splice No. 2 (Ft)	Dist from Lt end of Span to Splice No. 3 (Ft)	Dist from Lt end of Span to Splice No. 4 (Ft)

SPLICE-ALL (SPA)[170]

	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Required if Shop web camber is requested on all lines. 8 cards maximum (Not currently operational)	Span No.	Dist along C_L from Lt end of span to Splice No. 1 (Ft)	Dist along C_L from Lt end of span to Splice No. 2 (Ft)	Dist along C_L from Lt end of span to Splice No. 3 (Ft)	Dist along C_L from Lt end of span to Splice No. 4 (Ft)	Angle of splice to C_L Splice No. 1 (Deg-Min-Sec)

	- 7 -	- 8 -	- 9 -
	Angle of Splice to C_L Splice No. 2 (Deg-Min-Sec)	Angle of Splice to C_L Splice No. 3 (Deg-Min-Sec)	Angle of Splice to C_L Splice No. 4 (Deg-Min-Sec)

DEFLECTIONS (DFL)[180]
Repeat for each span
Up to 8 cards
(Required)

- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -
Span No.	Deflection @ 0.1 (Ft)	Deflection @ 0.2 (Ft)	Deflection @ 0.3 (Ft)	Deflection @ 0.4 (Ft)	Deflection @ 0.5 (Ft)

- 7 -	- 8 -	- 9 -	- 10 -
Deflection @ 0.6 (Ft)	Deflection @ 0.7 (Ft)	Deflection @ 0.8 (Ft)	Deflection @ 0.9 (Ft)