

United States Department of Agriculture
Natural Resource Conservation Service

X S E C

Cross - Section

Plots / Profiles / Areas / Quantities

Version 2.01

March 2001

written by:
Clinton W. Liezert PE
Civil Engineer
(retired)

Table of Contents

| | |
|---|----|
| Introduction | 1 |
| Program Features..... | 1 |
| Program Limits | 1 |
| Supporting Files | 2 |
| Loading XSEC..... | 2 |
| Main Menu..... | 3 |
| Input of Data..... | 3 |
| Original Data Entry..... | 3 |
| Template Design..... | 5 |
| Template Formula | 5 |
| Sample Templates..... | 9 |
| As-Built Data Entry..... | 10 |
| Data File Management..... | 10 |
| Retrieving Data..... | 10 |
| Saving Data | 10 |
| Removing Data Files | 10 |
| Saving Template Points..... | 11 |
| View of Data..... | 12 |
| Template plotted over original ground | 12 |
| Special keys..... | 13 |
| As-built plotted over original ground..... | 15 |
| Original, Template & As-built plot | 15 |
| Profiles | 15 |
| Cut / Fill Distribution | 16 |
| Reports..... | 18 |
| Quantity Computations | 18 |
| Data Points | 19 |
| Slope Stakes | 19 |
| Plotting Sections | 19 |
| Options | 20 |
| Clearing Memory | 20 |
| Modify Parameters | 20 |
| Program Limits | 21 |
| Switching active printers..... | 22 |
| Temporary exit to DOS | 22 |
| Quitting XSEC..... | 22 |
| Data file format..... | 23 |
| Support Files | 24 |
| Error Messages..... | 25 |

**** NOTE ****

"XSEC" REQUIRES GRAPHICS CAPABILITY !!

Introduction:

XSEC is a menu driven program that accepts survey information in a standard cross-section format and displays the cross-section on the screen as the data is entered. Design templates and/or as-built cross-sections can then be added and the resulting cross-sectional areas and volumes displayed. Alternative grades or templates can be introduced with the resulting quantities displayed almost instantly. The program will accept a variety of templates.

Program Features:

- Computation of planned earthwork quantities.
- Computation of as-built earthwork quantities.
- Graphical representation of planned vs. as-built cross-sections.
- Modifications to planned alignment.
- Profile plots of various alignments.
- Ability to save data as elevations or rod readings.
- Saving of design template coordinates.
- Graphical display of earthwork distribution (mass curve)
- Expandable list of selectable template formulae
- Variety of extrapolation scenarios.

Program Limits:

| | |
|---------------------------------|-----|
| Original cross-sections per job | 100 |
| As-built cross-sections per job | 100 |
| Points per cross-section | 52 |
| Design reaches per job | 30 |
| Intercepts per cross-section | 10 |

XSEC.EXE
Version 2.0

Supporting Files:

The cross-section quantities program is contained in a file called "**XSEC.EXE**". In order to run, it must be supported by four additional files on the default drive. They are:

| | |
|---------------------|---|
| BRT71EFR.EXE | This is a runtime module that is copyrighted to Microsoft Quick BASIC™ |
| OH_ENG.CFG | The file containing all of the specifics about your computing system such as type of printer. |
| XSEC.STD | This file contains the default values or any standard values that may apply to this program. These values can normally be controlled from within the program. |
| XSEC.ST2 | Default and control values for the program that are not as volatile are contained in this file. This file requires a text editor in order to make modifications. |
| XSEC.HLP | A file that contains the help information for this program. The program will run without this file but there will obviously be no help information available and a file with this name that contains no data will be created. |
| TEMPLATE.XSC | This file is not required for the program to run. The program is generated by the program and provides a list of available template formula that can be selected. By using this feature, templates that are typically used can be saved and never have to be redefined. |

Loading XSEC:

"**XSEC**" can be loaded in one of two ways. Make certain that you are in the subdirectory where the engineering programs reside. The main "**Ohio Engineering Menu**" can be loaded first by entering "**ENGMENU**" at the DOS prompt (C>) and then selecting the "Cross-sections w/ Quantities" program from the choice list. The second option is to simply enter "**XSEC**" at the DOS prompt.

XSEC Main Menu -

When the program is first activated, a menu similar to that below will be displayed. The marker identifies the function that is currently active. Pressing "F1" will display a small description of the function. Pressing "Enter" (↵) or left mouse button will activate the current function. The first letter can also be used to activate any of the specific selections. The right and left arrow keys or the mouse can be used to move the marker.



Input:



This option from the main menu provides the means of entering most of the data that is required by the program. This data falls within three basic groups; that which is part of the original survey, that which relates to the design or proposed project (template) and that which was constructed.

Original Data Entry:

With this selection, the user is able to enter the original or existing cross-section survey information. The input screen will vary depending upon the way in which you have setup the program. The following discussion will cover all of the possible entries. Should you not want or not have the portions that are being discussed, return to the main menu and visit the "Modify Parameters" choice under "Options".

Centerline Station:

Enter the centerline station associated with this cross-section in feet. Any positive number up to 9999999 is acceptable. The program will automatically display the value in a station format. Sections do not need to be entered in order, as the program will sort them automatically by station. If this particular project uses a baseline,(see "modify parameters") the centerline station can be skipped initially and entered later during the design stage. A centerline station will be required before any computations will be made using other features of the program.

Elevation or Rod Reading (E/R):

The program can accept data as either elevations or rod readings. If an "E" is entered, the program will treat subsequent entries as elevations. An "R" will cause the same entries to be treated as rod readings.

HI:

If this data is requested, an "R" was entered previously. Enter the instrument height (HI) that was used when this particular cross-section was surveyed. The program uses the height of instrument in later computations to convert ground shots into elevations.

Baseline Station:

If there is no entry for the centerline station, an entry is required for the baseline station. If the centerline station has a value, no entry is required for the baseline. If all the sections have centerline station data, the program will sort the sections based on the centerline station. If all the baseline stations have values and none of the centerline stations have values, the program will sort on the baseline stations. If there is a mixture of sections with centerline and baseline station data, the program will not sort the sections.

BL to CL Distance:

Enter the distance that the proposed cross-section will be offset (+ or -) from the baseline. Most often this value will not be known until the design stage so it can be skipped when entering initial data.

Angle of Skew:

There are times, when a baseline is used, when a cross-section that is perpendicular to the baseline will intersect the centerline alignment on an angle (skew). This will cause a distorted computation of the real cross-sectional area of the section. By entering the angle that the cross-section is "skewed", proper adjustments will be made within the program. The entry must be between zero and ninety degrees. This entry must be between zero and ninety degrees. No entry assumes that the section is perpendicular to the baseline or centerline. If an entry is made, the computations are adjusted to deal with the angle.

Dist Rod (or Dist Elev):

The remainder of the entries on this screen are the coordinates of the cross-section. Once again, it is not important that they be entered in any specific order as they are sorted during the processing. Each point on a cross-section consists of two pieces of information. (a distance and either an elevation or a rod reading). Although there are two bits of data, they are edited, counted and processed as one. The distances are entered as negative values when they are left of the center and positive when they fall on the right side. Upon entering each coordinate, the cross-section will be displayed and will grow with each subsequent coordinate. Sometimes the sections look rather strange until all the data is entered, but errors can be easily depicted and corrected. If two points with the same distance are entered, the program will rebel because the sorting process relies on the distances being different. If this happens, you will need to make a minor adjustment in one of the distance values that results the section that you desire. Once the entire screen is filled, it will scroll until the maximum number of points have been used.

There are several special purpose keys that are active on this screen. Their function is described below.

- F4** if there is more than one cross-section in the system, the F4 key will present a list of the sections. Selection of a station will cause the program to move directly to that section.
- F6** if the data was originally entered as rod data, the F6 key toggles the display between elevation and rod readings.

XSEC.EXE
Version 2.0

Alt A - provides a means of adjusting all of the elevations in a cross-section to be adjusted by the value that is entered. This feature can be used to raise an entire cross-section a foot for example.

Alt C - cause the current cross-section to be copied to a new station. By using this feature in combination with "Alt A", a complete cross-section can be added to a job to create what might be felt to be a better solution.

Alt D - this combination of keys will cause a point (distance and elevation or rod) to be deleted from the cross-section. The affected point is the one where the cursor is positioned when the keys are pressed. This can be used when duplicate points have been entered or a point needs to be removed simply because you don't like it.

Alt P - will cause the display on the screen to be printed on the attached printer.

Alt R - this operation causes the current cross-section to be completely removed from the job.

Template Design:

This selection provides the means of defining the template that will be overlaid on the original ground. The program has a lot of versatility but it is important that the techniques of defining the template are understood. Computation reaches are defined and used by the computation process. The grade, elevation and template are required for each reach.

Beginning Station:

The program has been designed to accommodate several sign conventions. While this creates versatility, it also adds a certain amount of confusion. It is **very important** that consistency be maintained throughout a job. Stationing can increase going upstream or downstream (see modify parameters). If the stationing increases going upstream, the computations start at the largest station and proceed toward the smaller ones. If the stations increase going downstream, the converse is true. This is important when the "beginning station" is entered. If stations increase going upstream and 0+00 is used as the beginning station, all of the subsequent stations will be rejected. (I told you it could get confusing).

Beginning Elevation:

Enter the elevation that is associated with the planned project at the beginning station. With this elevation, the grade and stations, all of the subsequent elevations can be calculated.

STA:

The left edge of the screen contains two columns of stations which define the extent of the design reach. The left or beginning station is determined from the previous reach or from the beginning station. The second or ending station is entered. The value of this station is normally determined by a design process outside of this program. Stationing typically changes because of changes in the template or grade.

Template Formula:

The template formula is a procedure or technique that can be used to define a design template. It is a little tricky at first but is relatively simple once you get the hang of it and it

XSEC.EXE
Version 2.0

offers a great deal of power and flexibility to this program. Basically, it allows you to design or build almost any template or design cross-section that you want to.

Several parameters are used to build a template formula and a few rules that need to be followed. They are:

1. The template formula has to begin with one of the following:
 "C" for a channel
 "P" for a parabolic channel
 "D" for a dam.

The program can be used for other than channels and dams but this feature determines whether the controlling gradeline is at the top or the bottom of the template section. It should be **remembered** that the program **will not accept** any intercepts that fall above the elevation of the top of dam or that fall below the elevation of the bottom of a channel when the rules are on (rules will be covered later). If you are attempting to build a terrace on a rather steep slope, it is conceivable that some of the downslope intercepts may be below the grade of the channel and therefore would not be recognized by the program. In this case, there are some "tricks" that can be employed. These tricks will be covered later.

2. Unless a **Parabolic** template is used, the next characters in the template formula have to be the slope (/ for positive slope ; \ for negative slope) and the slope ratio.
3. Now you can use any of the following parameters to build the remainder of the template formula.

L n -

where -

"L" indicates level section

"n" is the length of level section in feet.

C -

 which locates the centerline of the template section.

/ s,d -

where -

"/" indicates a positive slope

"s" indicates the slope ratio

"d" is the vertical distance covered by this slope

XSEC.EXE
Version 2.0

\ s,d -

where -

"\" indicates a negative slope

"s" indicates the slope ratio

"d" is the vertical distance covered by this slope

4. The formula **must** end with a slope and a slope ratio unless it is a parabolic template section.

5. Parabolic templates are unique in that their template formula is entered as **Pw,d**

where

w = the width of the parabolic section.

d = the design depth of the parabolic section.

When the template is entered, a graphical representation of the entry will be displayed in a window at the top of the screen. This will help to determine if the template has been properly defined.

If you want to use the same template as appears on the previous line, entering a "+" will cause the previous template formula to be copied to this line.

***** NOTE *****

It should be noted that when the template gets more complicated, with multiple berms and compound slopes for example, the computation of the intercepts can get pretty tricky. If you design such a template, it is a good practice to use the "View" feature on every section to see that you are getting what you really want.

Grade:

Grade is entered as feet per foot for the template on each reach. Values can be positive or negative.

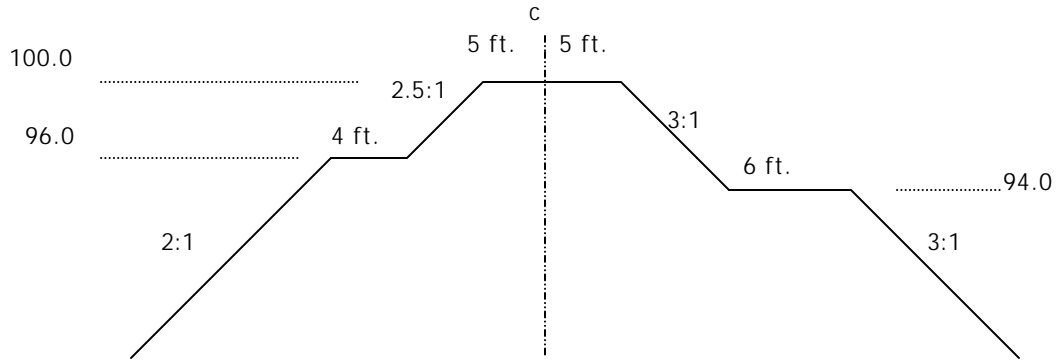
Special Purpose Keys:

There are a few special purpose keys on the template entry screen.

- F4** if the cursor is in the template formula position and there is a "template.xsc" file available, pressing this key will cause a list of template formula to appear. Any of the template formula that are presented can be selected negating the need to define a new template for each reach.
- Alt A** these keys will provide a means of adding the template formula on the line where the cursor is to be added to a file "template.xsc", so that it can be selected again at a later time.
- Alt D** this combination of keys will delete the template line where the cursor is positioned.
- Alt I** these keys will open appropriate spaces so that a line of template information can be inserted.
- "-1"** Since the program initializes all stations with a value of negative one, a station can sometimes be cleared by entering a "-1" when the cursor is in a station field.

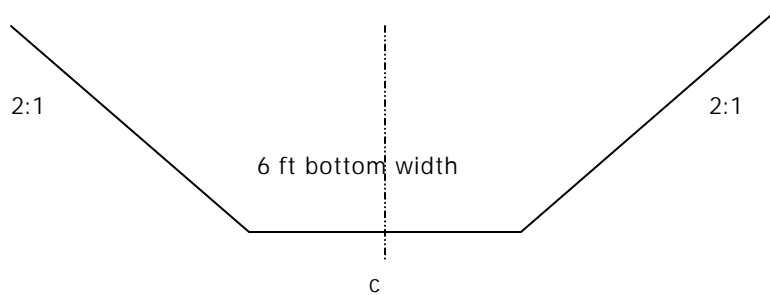
XSEC.EXE
Version 2.0

The following two figures demonstrate the template formula:



Template formula = D/2L4/2.5,4L5CL5\3,6L6\3

- D..... dam
- /2..... positive 2:1 slope
- L4 level for 4 feet
- /2.5,4..... positive 2.5:1 slope for 4 feet (100.0 - 96.0)
- L5 level for 5 feet
- C..... centerline of section
- L5 level for 5 feet
- \3,6..... negative 3:1 slope for 6 feet (100.0 - 94.0)
- L6 level for 6 feet
- \3..... negative 3:1 slope



Template Formula = C\2L3CL3/2

- C..... channel section
- \2..... negative 2:1 slope
- L3 level for 3 feet
- C..... centerline of section
- L3 level for 3 feet
- /2..... positive 2:1 slope

As-Built Data Entry (or edit) -

This feature is much the same as the original data entry routine. The cursor can not be moved to some of the header information as it must remain the same as the original data. The stations that were used for the original cross-sections must be the same for the as-built.



Data File Management:

Get a job:

This feature allows data that has been stored or saved on previous occasions, to be retrieved. The data may have been saved by this program (XSEC) or it may have come from other sources such as electronic equipment that has been downloaded in an XSEC format. (SSRP and DNL have this capability). A list of the data files that are available on the default drive will be displayed. If the desired data is on a different drive or in a different subdirectory than the default, pressing **Alt C** will afford an opportunity to select an alternative drive and a new list will appear. Cursor to the job that is desired and press return (↵) and the data will be retrieved.

There have been several modifications to saving XSEC data over the years. An effort has been made to made the program backward compatible but some of the earlier versions are not readily identifiable. If earlier data is selected, the program might need some help determining which version of the program saved the original data. Make an educated guess and see what happens. If an error message appears, someone messed up. If no error message appears, something positive happened but it is a good policy to scan through the screens and assure yourself that everything looks alright.

Save a job:

This selection will provide the information required to save the data for the job that is currently in computer memory. It is wise to visit this area frequently while a large job is being entered so that portions of your work are not lost. It takes a lot of time to enter the data for 100 cross-sections, so don't wait until the last section has been entered to save your work.

A screen will appear that identifies the data that is to be saved. Refer to the main guide for the Ohio Engineering programs for discussion related to the file naming procedures and assistance related to the information that is requested on this screen. The code used to identify XSEC data in the file naming scenario is "XSC".

Remove a job:

XSEC.EXE
Version 2.0

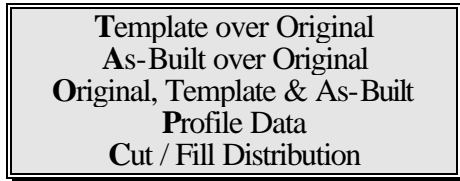
Many of us do not like to throw anything away but occasionally reality sets in and we concede to the need. There might be test jobs, old jobs or duplicate jobs that are no longer of use. This selection works in a similar manner to retrieving data files. Once the desired file has been selected, you will be asked to confirm your request.

It is desirable to remove data files using this procedure rather than simply erasing them with DOS commands. This procedure also will properly manage other related files that the DOS procedures do not know about.

Template Points Saved:

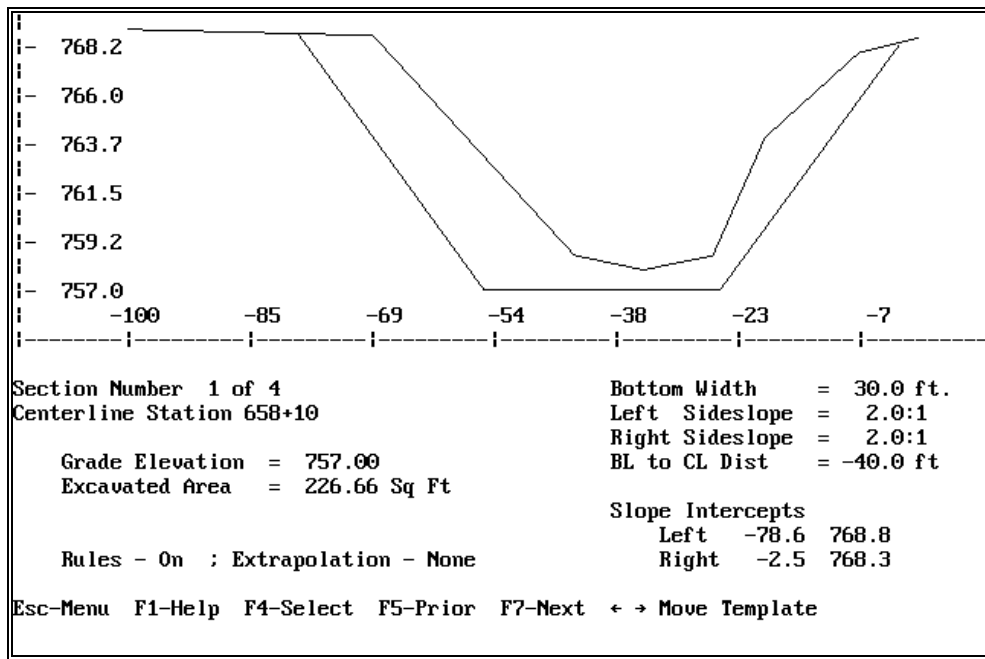
This feature will cause the data points for the "planned" project to be saved. The program will select all of "original" cross-section coordinates left and right of the extreme intercepts and the "template" coordinates between the extreme ground intercepts, and save them in an ASCII file using a "TEM" prefix. This data can then be utilized by other applications without going through all of the computations again. Other applications might include CAD systems, water surface profile programs, etc.

View:



Template over Original:

If the original ground and the template are in tune with one another, the program will display the first original cross-section, with the design template cross-section superimposed over it. In addition to the graphics, the grade elevation at this station, the ground intercepts and the cross-sectional area of excavation and/or fill will be computed and displayed.



If the original section is skewed to the project centerline, the section will appear in a distorted view. The angle of skew will also appear on the screen.

While an enormous amount of work was done to generate the values that are displayed, many more benefits are available with a few key strokes that are available at this time. They are each discussed below.

→ or Ⓜ Either of the right or left arrow keys will cause a question asking how far in the specified direction the template should be moved. Once the question has been answered, the template will be repositioned according to the instructions and all of the computation done again. This is an excellent way to balance earthwork or evaluate one sided construction.

F4 Presents a list of cross-sections (stations) that can be selected for viewing. This provides a means of moving from the first section to the last section without having to calculate quantities for all the intermediate sections.

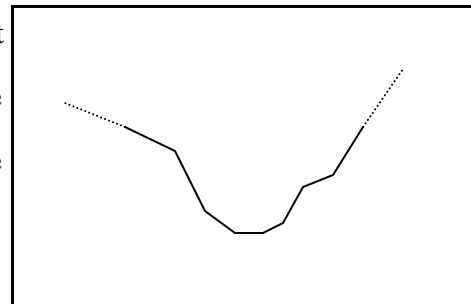
PgUp
or
F5 Causes the processing to move to the **previous** cross-section.

PgDn
or
F7 Causes the processing to move to the **next** cross-section.

Alt E This combination of keys provides several options that deal with the manner in which the original ground can be extrapolated or modified to meet the needs of the particular situation. If sufficient survey is gathered initially, this would never be an issue, but occasionally the survey comes up a little bit short. Extrapolation only affects the original ground line. The rule discussed earlier indicating that the first and last line segment of a template must be a slope, negates the need to extrapolate a template. Those segments that are the result of an extrapolation do not show in the graphical display. If they are blank areas, there has probably been an extrapolation.

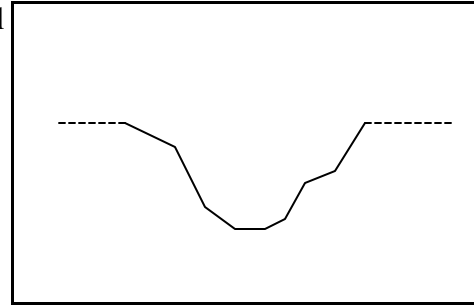
Several extrapolation scenarios available so that almost any real life situation should be able to be dealt with. Each of these options are discussed below. Even though all of these possibilities are available, keep in mind that the **best option** is to gather enough original survey initially that extrapolation is not required.

Extension of End Segments -
causes the left most line segment to be extended to the left and the right most line segment to be extended to the right. These segments are extended using the same slope as the original line segment.

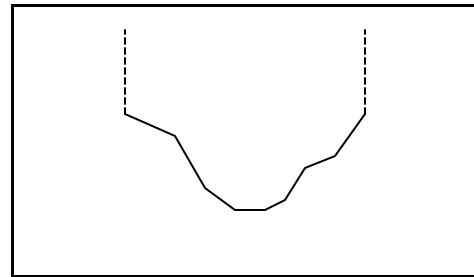


Horizontal from End Points -

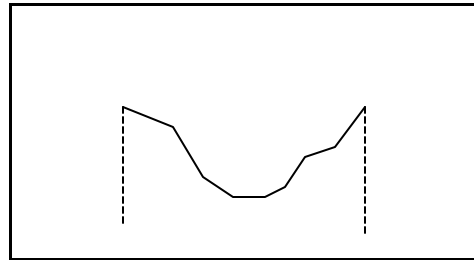
the left most point on the original cross-section is extended to the left and the right most point is extended to the right.



Up on End Points - the end points of the original cross-section will be extended straight up.

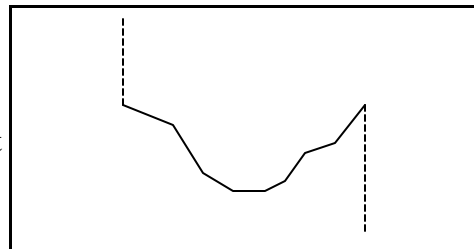


Down on End Points - the end points of the original cross-section will be extended straight down.



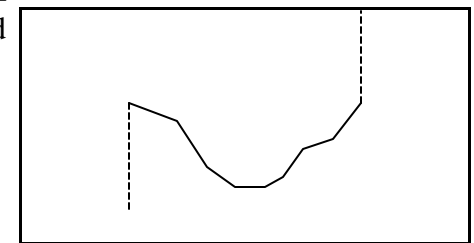
Left End Up; Right End Down -

- this choice will cause the left end of the section to be extended straight up and the right end to be extended straight down.



Right End Up; Left End Down -

- this choice will cause the left end of the section to be extended down and the right end to be extended up.



XSEC.EXE
Version 2.0

- Alt I** In some instances, several intercepts are involved when a template is overlaid on an original cross-section. Pressing Alt and I will cause a table listing the coordinates of **all** of the intercepts involved in a computation.
- Alt P** This combination of keys causes the data on the screen to be printed on the printer.
- Alt R** When computations are related to natural events or conditions, all kinds of crazy things can occur. In order to maintain a semblance of order, a few rules had to be established. These rules say such things as "on a dam, not calculated intercept with an elevation higher than the dam will be accepted" or " on a channel, if an intercept is computed with an elevation lower than the channel grade will be allowed". While these rules are valid **most** of the time, there are exceptions. Pressing Alt and R will turn the rules "on" and "off". When rules are "off" all of these validation tests are ignored. This will provide some insight as to why computations are either non existent or not appropriate for your needs. It is **NOT a good idea to leave the rules turned off** as some of the computations could become faulty. If you find that valid intercepts are being ignored, it is better to trick the program by placing "bogus" segments in the template rather than turning the rules off. An example might to place a two foot deep "v" section in the bottom of the channel that might be 0.1 feet wide. This will satisfy the program rules and not significantly affect the computations. Another option might be to calculate that particular cross-section using long hand procedures. This will help further an appreciation for the program.
- Alt S** Pressing these keys allows the slope on either or both ends to the template to be reversed. This can be used in cases where a template section temporarily goes from excavation to fill or visa versa. By using this procedure, the need to create several template design reaches is negated.

As-Built over Original:

This selection works much the same as the one above (template) except the as-built section is superimposed on the original ground and the appropriate cross-sectional area(s) displayed. This is an excellent way to determine the actual quantities that were involved in a project. It can also be used to determine quantities for intermediate pay estimates.

There are only two key combinations, other than those shown on the screen, that work on this display. They are **Alt I** and **Alt P** which both have the same functionality as described above.

Original, Template & As-Built:

This choice will display the template and as-built data superimposed on the original ground but no computations will be made. This allows an evaluation as to whether the project was constructed as planned. **Alt-P** will print the display on the printer.

Profile Data:

XSEC.EXE
Version 2.0

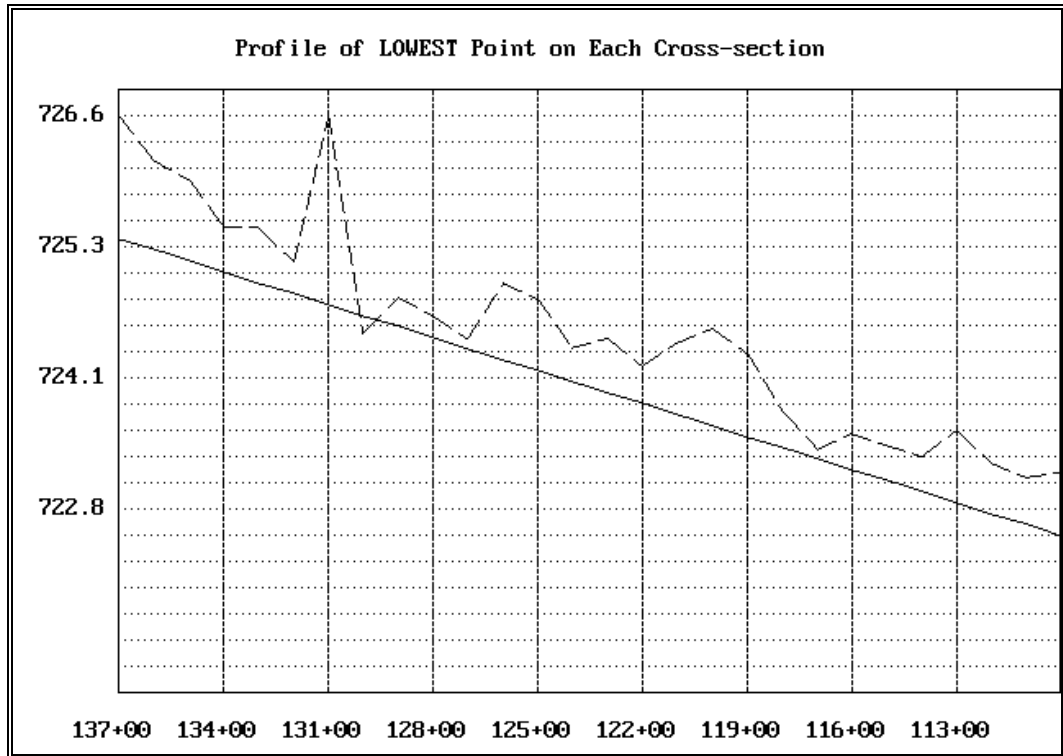
This option takes advantage of the data that has been entered and allow it to be viewed in another manner. Upon choosing this option, another choice will ask which coordinate point on each cross-section should be used. The choices are:

- the lowest point on each cross-section.
- the highest point on each cross-section.
- a point that is parallel to the baseline. (if a baseline is not being used, this point will be referenced to the zero point or center line of the cross-sections). If this option is selected, the distance from the baseline will be requested.

A point will be selected , interpolated or extrapolated from each cross-section based on the above selection and plotted in a profile view. If a design template has been defined for this job, the design profile will be included in the display. This feature not only allows that data to be viewed from another vantage point but also serves as an excellent way to intercept possible errors in data. For example, if the HI were entered with a two foot error, it would not be obvious on the data entry screen but it would certainly stand out in the profile view.

The **Alt P** key combination will cause the display to be printed in the same manner as described above.

A sample profile might look like the following:



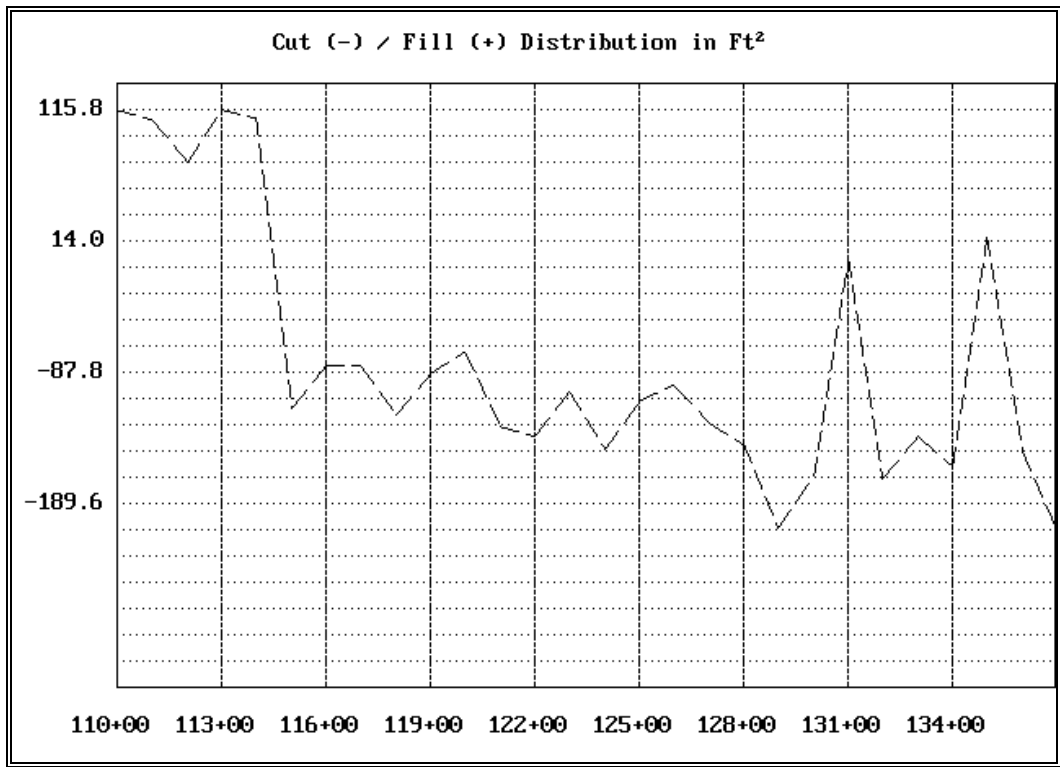
Cut / Fill Distribution:

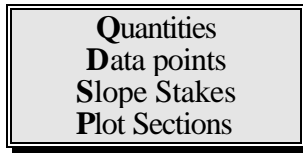
XSEC.EXE
Version 2.0

The last choice under this option is also a bi-product of having the data and computing capability available. Many times is desirable to be able to evaluate those areas within a job where excavation exceed fill or visa versa. This type of information affects haul distances and positioning of borrow or disposal areas. This selection will create a plot of the net excavation / fill at each cross-section. This type of display is many times referred to as a "Mass Curve".

The **Alt P** key combination will cause the display to be printed in the same manner as described above.

A sample distribution or mass curve might look like the following:





Reports:

No job is complete until the paperwork is done. This selection from the main menu generates the reports and documentation that is typically involved. In addition to printing, most of the reports can be generated on the screen or in an ASCII file.

Quantities:

The actions of this choice will vary depending upon the user's response.

The first response will declare whether **all** or **selected** cross-sections be involved in the computations. All sections refers to all of the sections that fall within the stations included in a defined template. If only one or two reaches from a job are to be considered, "selected" is the proper choice.

If the job that is currently loaded (in memory) contains both as-built and template data, a decision will need to be made as whether the computations should be based on the as-built information or the template information.

Should the calculations be based on a portion of the cross-sections (selected), the next exercise is to identify the beginning and ending stations for the computation. If you have a good memory, the stations can be entered or the F4 choice list can be used to identify the desired stations.

Once the destination of the report has been determined the computations will begin. It is a good practice to print the report on the screen the first time. This will identify "bugs" and alternatives can be persued without wasting paper. There are also occasions when intercepts can not be located or a section might contain bad data. This may cause an error condition and the computation process will abort. Once the computation has been satisfactorily completed on the screen, the printed report can be generated with more confidence. When the report is generated on the screen, the arrow keys will allow movement around on the form and the "Esc" key will return the process back to the menu.

After going through these hoops, the computation process will begin based on the above choices. The quantities are computed using an average end area method. No features are included to account for eccentricity or for large variations in the cross-section sizes.

Data Points:

This report causes the cross-section data points to be printed on the desired device. Comparing a printed copy of the data with the original survey book is an excellent method of verifying that the data was entered into the program correctly. Once again it will be necessary to declare whether the report should include **all** or **selected** sections.

If the data was originally entered as rod readings, there will be an opportunity to generate the report in either a rod reading or elevation format. If elevations were originally entered, rod readings are not a viable report option.

Slope Stakes:

Once again this report simply takes advantage of the information that is available because of the computing capabilities of the program. As before, the extent of the desired report has to be declared. Following that declaration, the report tabulates the extreme left and right ground intercepts that are computed using the design template. This information can be used to show the contractor where the design will fit on the ground. Typically slope stakes are not set exactly at the intercept location because they would be in the way during construction, but if they are offset from the reported values they should work just fine.

In addition to the slope stake information, the report identifies the template that is to be constructed and computes the horizontal projection of the area contained within the slope stakes.

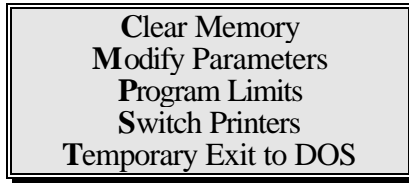
The body of the generated report should look something like the following:

| ***** Slope Stakes ***** | | | | | | | | |
|---------------------------|------|-------|-------|--------|-------|-------|-------|-------|
| Bot | Left | Right | BL-CL | CL | Left | | Right | |
| Width | SS | SS | (ft) | Sta | Dist | Elev | Dist | Elev |
| 30 | 2:1 | 2:1 | -40.0 | 658+10 | -78.6 | 768.8 | -2.5 | 768.3 |
| 30 | 2:1 | 2:1 | -42.0 | 657+60 | -80.1 | 768.6 | -5.3 | 767.9 |
| 30 | 2:1 | 2:1 | -45.0 | 657+10 | -82.9 | 768.5 | -9.5 | 767.3 |
| 30 | 2:1 | 2:1 | -52.0 | 656+80 | -89.4 | 768.3 | -17.1 | 767.0 |
| Surface Area = 0.22 acres | | | | | | | | |

Plot Sections:

As has been mentioned on several occasions previously, many of the graphics screens can be printed by pressing **Alt P** while the screen is being displayed. This procedure can be quite tedious and even boring when there are several cross-sections to process. This selection under reports will simplify the procedure immensely. After going through processes similar to those described above, such as identifying the desired sections and which combination of template overlays the program will "que" up all of the desired cross-sections and print the graphics on the printer one at a time. While this might take a while, it is automatic and you will have sufficient time to get, or get rid of, fresh coffee.

| | | | | | |
|-------|-------|------|---------|---------|------|
| Input | Files | View | Reports | Options | Quit |
|-------|-------|------|---------|---------|------|



Options:

This list of features covers a few items that may or may not be directly related to the XSEC program but collectively make it more friendly and easier to use.

Clear Memory:

This feature allows the user to clear all the data from the computer memory and begin a new job. If the data or recent edits has not been saved, you should receive a warning and depending upon your response, it will be lost forever. If one job has been worked on and an attempt to load a new job is attempted, the same clearing routine will be done automatically. In other words, you do not have to clear

Modify Parameters:

This selection will present an input screen containing some of the values that control the manner in which the program responds to certain situations or computation requests. Following is some discussion on each of these items.

Stations increasing Upstream or Downstream (U/D) - Simply respond with a "U" if the stations increase going upstream or a "D" if they increase going downstream. If you are working on a dam, you will probably want to set the stationing direction to that which you are most familiar. It is desirable to establish the stationing direction prior to entering data. If the direction is changed after data has been entered, strange things can happen and in some instances, the template data will need to be re-entered.

Use a baseline? (Y/N) - This response controls whether a baseline station is requested on the original cross-section data entry screen.

Allow sections skewed to the baseline - As might be expected, this question is not asked if a baseline is not used. A "Y" response allows the surveyed section to cross the project centerline at an angle (skew).

Enter data as Elevations or Rod readings (E/R) - This tells the program whether elevations or rod readings are normally used and preferred. This will serve as a default value that can be overridden if need be.

Rules set to ON as a default (Y/N) - Setting the "rules" default to "yes" or "on" is the recommended options as it subjects all of the potential intercepts to validity testing.

XSEC.EXE
Version 2.0

Preferred extrapolation method - By pressing the F4 key, one of the extrapolation methods can be selected as the default. As previously mentioned, the best alternative to extrapolation is to collect sufficient survey that it is not needed.

Preferred scale for cross-sections - The F4 key will present three choices for this option. They are:

Fill Plotting Area - A certain portion of the screen has been dedicated as the "plotting area". With this section, the dimensions each cross-section will be determined and a scale computed that will optimize the "plotting area". This option fully utilizes the screen but conceivably, every section in a job could be plotted at a different scale.

Set Based on Job Data - With this option, the program will search through all of the sections and determine the dimensions of the most restrictive section. A scale will be computed based on this section and used for the entire job. This will cause all of the sections to be displayed at the same scale and therefore graphically comparable to one another. The hazard with this option is that if there is one large section in a job, it will control the scale used on the smaller sections.

User Selected Values - The user has control of the scale that is used in this option. The width and height of the plotting area can be set by the user. Some weird plots can be attained, but you are in control. As an example, if a width is selected that is not as wide as the section, part of the plot will be truncated from the plot.

Preferred scale for profiles - This function works much the same as described above except that it applies to profile displays rather than cross-section plots.

Default Template Formula - this affords an opportunity to select or enter a template formula that will be used as a default.

When exiting from this screen,(if changes were made) there will be an option to save the information for future use. A "yes" response will save the data and the data will be loaded the next time XSEC is used. A "no" will cause the changes to be used until XSEC is exited.

Program Limits:

This selection from the options menu will display some of the controlling or limiting values in this program.

Switch Printers:

If you have the ability to use two different printers with your system, this option will allow you to change the identity of the printer that the program uses. Basically, this action changes the value of the codes that control the manner in which the printer behaves. For example, the codes that cause the printer to print in compressed code, etc.

Temporary Exit to DOS:

Many times it would be nice or even necessary to execute a DOS command while in the program. As an example, you can't remember the subdirectory where your data is so you need to check several subdirectories or even diskettes. This option will quickly return to the system prompt and still keep your program and data in memory. When you are ready to return to the program, simply enter "exit". There is one **important point** to remember! Be certain that you have returned to the subdirectory that contains the engineering program before entering "exit".



Quit:

Several options are available to you when you have completed your work in XSEC. The first will exit the XSEC program and return you to the main engineering program (if it is loaded with XSEC) and allow you to run any of the applications that are on it. The second option will completely leave the world of engineering and return you to the system prompt. If there are other Ohio Engineering applications on your system, they will be included in the list and selecting one will lead the computer directly to that program.

XSEC.EXE
Version 2.0

***** Technical Information *****

Format of Data Files:

The following information is provided for those of you who like to dig into the program files and figure out how they work or possibly make some sneaky edits to the data. The list below is a typical saved data file. Each line is followed by a line(s) contained in brackets ([]) that explain the line above. These "bracketed" lines will not be found in an actual data file. Some spaces have been added below to make it easier to read. **Keep in mind** that the quote and comma symbols are **very important** to the program.

```

"Ver-2.01"
"Landowner ..... ", "Sample Job "
"County ..... ", "Medina"
"Designer ..... ", "cwl"
"Job/Project Identity ..... ", "Test"
"Station Direction (0=Up;1=Dn) .. ", 0
"Baseline ..... (0=No; 1=Yes).... ", 1
"Skew Allowed . (0=No; 1=Yes) ... ", 0
""

"Centerline Station .....",      65810
"Baseline Station .....",      -1
"Baseline Offset Distance ",      -40
"Angle of Skew ..... " , 0
"Rule ..... (0=On; 1=Off) " , 0
"Extrapolation Method ..... " , 0
"SideSlope Revision ..... " , 0
"Original HI Elevation ..... " , 0
"Elev or Rod Code ..... " , 0
    0.00, 768.50
   -100.00, 769.00
    -69.00, 768.70
    -43.50, 758.60
    -34.50 ,757.90
    -26.00, 758.50
999999
" As-Built HI Elevation .. ", 0
"Elev or Rod Code ..... ", 0
    -80.00, 769.00
    -70.00, 763.50
    -56.00, 757.00
    -45.00, 756.60
    -25.00, 756.00
    -15.00, 762.00
999999
"NoMoreSections"
"Template Starting Elev . ",757
"Template Starting Sta .. ",65810
65710, "C\2L15CL15/2",      6.000001E-04
65680, "C\2L15CL15/2",      6.000001E-04
-1,      "",      0

```

- Version of the data format.

- the number indicates which method was used.
- a number indicates the type of slope revision.
- HI used for original cross-section
- 0 = was elev - now elev ; 1 = was rod - now rod
- 2 = was elev - now rod ; 3 = was rod - now elev
- distance and elevation / rod reading data for each coordinate in the original cross-section.

- indicates the end of the original cross-section.
- HI used for the as-built cross-section.

- distance and elevation / rod reading data for each coordinate in the as-built cross-section.

- this data format repeats for all cross-sections.

-indicates the end of the as-built cross-section.
-there are no more sections.

- station / template formula / grade
- repeats for ALL possible template reaches

XSEC.EXE
Version 2.0

Supporting Files:

XSEC.STD

The data contained in this file are managed by the Modify Parameters feature. It is unlikely that modifications to the file using any other means would be necessary. An example of this file is shown below.

```
"* Initial X-section Width ..... *", 50
"* Initial X-section Height ..... *", 5
"* Initial Profile Width ..... *", 500
"* Initial Profile Height ..... *", 10
"* Default Template Formula .....
* ", "d/3l4c14\2"
"* Default Skewed Section Alignment (0 = No; 1 = Yes) *", 0
"* Default Baseline ..... (0 = No; 1 = Yes) *", 0
"* Default Elevation or Rod Reading (0 = Elev; 1 = Rod) *", 0
"* Default Direction of Increasing Sta (0 = Up; 1 = Dn) *", 0
"* Extrapolation Method ..... *", 0
"* Rule ..... (0 = On; 1 = Off) *", 1
```

XSEC.ST2

This file is a standard ASCII file and contains information that controls some features in the program. The values can be changed using a standard text editor or most word processors. It is important, however, that the structure of the file be maintained in order for the program to run properly. An example of the file and file structure follows:

```
"* Program Version or Identifier ... .. *", "OH-Vers-2.01"
"* Minimum Template Grade ..... *", -1
"* Maximum Template Grade ..... *", 1
"* Date of last minor change ..... *", "3/15/01"
```

TEMPLATE.XSC

This ASCII file contains the list of templates that are available using F4 on the template design screen. The file is created (and appended to) by the Alt A key combination on that screen. While the file is created using that feature, any maintenance would need to be done using a separate editor.

```
"d/3l4c14\2", "Simple dam / dike section"
"c\4l2c12\4", "Simple channel section"
"p30,1.5", "Parabolic section"
"d/2l4c14\3,3l5\3", "Dam with berm"
"c/2l5\2,8l2c12\2,8l5\2", "channel with spoil piles"
```

*** ERROR MESSAGES ***

The following messages may appear on the screen from time to time. Further explanation is listed next to each one.

- "I can't take any more points !!!"** - a maximum of 52 points are allowed to define a cross-section
- "I have NO DATA to display."** - there is no data available for the section that has been requested. Either enter the data or retrieve a file using the "file" features.
- "I have TWO SECTIONS with the SAME STATION .. please correct"** - cross-sections are identified by the value of their station. If two have the same station, one of them will be lost.
- "I need assistance !!!"** - this is kind of a catch all error statement so that the program will stop execution without losing all of the data. If it should appear review the data and attempt to find abnormal conditions.
- "Need an Elev. Difference for the slope !!!"** - all the slope symbols except the first and last ones, require an elevation difference for the range in which they apply. This is separated from the slope ratio by a comma. For example, /2,4 indicates a positive 2:1 sideslope that applies over a 4 ft. vertical interval.
- "Sect #nn has NO INTERCEPTS, please check data !"** - this might occur if the design channel cross-section is smaller than the existing cross-section. If this happens the program cannot deal with it. A solution is to modify the existing data (with a little white lie) so that the sections intersect or change the extrapolation method. Be careful that you don't create a large error in the total volumes.
- "Sect #nn has TOO MANY intercepts !!!"** - the program allows for a maximum of 10 intercepts per cross-section. If this is exceeded, the data will have to be changed to correct the situation.
- "Section #nn does NOT fall within the range described by the template"** - the section that you are attempting to view, is outside the range that is defined by the DEFINE TEMPLATE SECTION feature. Either give up on this section or edit the template range.
- "Sideslope CANNOT be `0' !"** - the number following the slope indicator (`/ or `\\) was either zero or omitted. Re- enter the template formula.

- "Template NOT defined !!!"**
- an attempt has been made to either view or compute a section with the template section, but the template section that matches the section selected does not exist. Use the DEFINE TEMPLATE SECTION feature.
- "Template must begin with `C', `D' or `P'"**
- the template formula must begin with a "C" if the section resembles a channel section, "D" if the section resembles a dam, or "P" when a parabolic section is desired. Re-enter the template formula.
- "The second character in a template MUST be `\' or `/'"**
- the second entry in the template formula (other than parabolic sections) must be either a positive "/" or negative "\" slope. Re-enter the template formula.
- "The ORIGINAL DATA for Sect #nn does NOT extend far enough to the RIGHT/LEFT"**
- there is no original data for the left or right sideslope to intersect. Either add to the original data, alter the extrapolation method or move the template the appropriate direction.
- "This is a duplicate of a previous coordinate"**
- an attempt has been made to enter two points with the same "x" and "y" values. Proceed to the next point.
- "This template is TOO COMPLEX !!!"**
- you have entered a template that is too complex to evaluate. Try again with a more simple template formula.
- "You DIDN'T give me a CENTER !!!"**
- unless a parabolic template is being used, the center of the template cross-section must be identified by placing a "C" at the appropriate place in the template formula.
- "You didn't give me a sideslope for the RIGHT END of the template !"**
- each non parabolic template formula must end with a sideslope symbol ("/" or "\") and a slope ratio. Re- enter the template formula.
- "You have MORE than ONE center !"**
- more than one center ("C") was placed in the template formula. Re-enter the template formula.
- "You have TWO POINTS at the SAME DISTANCE, please adjust !!!"**
- two points with the same "x" distance were entered. A proper adjustment needs to be made so the program knows which one comes first in the section. This can be done by adding a tenth of a foot to the proper distance and the resulting error will be minor.