

# MR. ESTIMATOR® SOFTWARE

## CASE TOOLS

### SOLUTION FOR A TYPICAL CONVEYOR – ILLUSTRATED BELOW

#### Professional Version

- **SIX Different Design Scenarios:** 1) Flat Table, 2) Flat Table with Overhang, 3) Conveyor, 4) Conveyor with Overhang, 5) Inclined Conveyor and 6) Inclined Conveyor with Overhang.
- Several Levels of Help Files built in for easy usage. Each Module has its own HELP associated with it. Definitions are added to help the end user understand the terminology.
- Professional Version of software does calculations in Imperial Units and Metric Units. LITE Versions use both units as well.
- Professional Version Software Price = **\$899.99 CAN (\$971.99 CAN – Includes Taxes)** Both Sets of Units [Approx \$25/Component] + **Taxes** in Ontario all prices.... Or **\$149.99 CAN (\$161.99 CAN – Includes Taxes)** For Individual Conveyor Types + **Taxes** in Ontario all prices....Contact Sapper Software: [sapper1@sympatico.ca](mailto:sapper1@sympatico.ca)
- Illustrates the free Body Diagrams and Shear and Moment Diagram sketches along with the formulas for EACH of them.
- Calculates: Reactions, Shears, Moments and deflections based on DL and LL [factored, or un-factored]. Deflections are calculated based on a) Dead Load, b) Live Load, or c) Dead + Live Load [Default setting – Software assumes with this setting that the steel is not cambered for deflection].
- Compare your deflections with an Allowable deflection.
- Check Table, Columns and Base Plates. These members turn **RED** when REJECTED. When “accepted”, the sketch remains as is and reports ACCEPT DESIGN.
- Consider people on the conveyor, or not?
- Estimate the cost to build the conveyor(s) in question. This cost is displayed on the

Conveyor Type being checked.

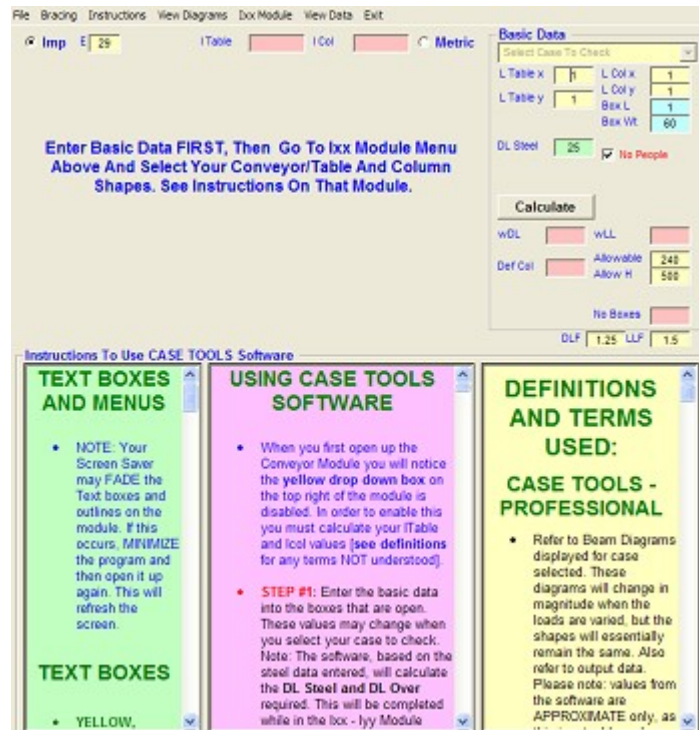
- Ixx and Iyy Module, where you can select W Shapes, HSS Shapes, Channels to use as your column. Choose a Built – Up Shape, or Solid Shape for your Table. Calculate the Ixx for your Conveyor/Table. Calculate Ixx, or Iyy for your column. Include sway action, or not. Software calculates the Dead Load for the steel used.
- The following design parameters are possible: 1) Loads to one side, or in the center, 2) Consider Belt Pull, or Not. 3) Consider a FULL Conveyor/Table, or an Empty Conveyor/Table with a “simulated” point load at the overhang end.
- Consider columns in Strong, or Weak axis. Software assumes a “frame” action: a) Without Belt Pull, and b) With Belt Pull.
- Software illustrates a “sketch” of the Conveyor/Table type being checked.
- Contains a Conversions Module [13 Items to convert: Volume, Area, Force, Length, etc..]
- Bracing Module is available to ADD: 1) a Knee Brace, or 2) a Diagonal Brace. The software calculates the deflection and indicates if it is ACCEPTABLE, or not [when compared with the allowable column deflection].
- The software is FAST and will “add value” to your bottom line. This software DOES NOT design the steel, as this may require a Licensed Professional Engineer [based on your local Codes, Laws, and/or Statutes]. The software “checks” the following: a) the allowable deflections for the Conveyor/Table [as these may govern in many cases] and b) KL/R ratios.
- The software will pay for itself completely after your first use. The CASE TOOLS Version added to the Beam Diagrams Version, can act together to help “automate” your process. These two versions compliment each other very effectively.

## **CONVEYOR PROBLEM**

- **Problem Description: Conveyor Steel:** Solid Shape: 36 inches wide and 7 inches deep @ 0.125 inches thick. **Column Steel:** 2.5 inches x 2.5 inches HSS section @ 0.125 inches thick. Input Data: a) Length = 10 feet, b) Column Height = 9 feet, c) Belt Live Load = 10 pounds/foot, d) Friction Coefficient = 0.3, e) Length of typical box = 1 foot and f) Weight of average box = 60 pounds. The problem is to determine if Conveyor, Columns and Base Plates are ACCEPTABLE, or not? The software will do all of the calculations with a “minimum” of inputted data. See estimate inputs below.

## MAIN MODULE LOOKS LIKE ILLUSTRATED BELOW WHEN FIRST OPENED

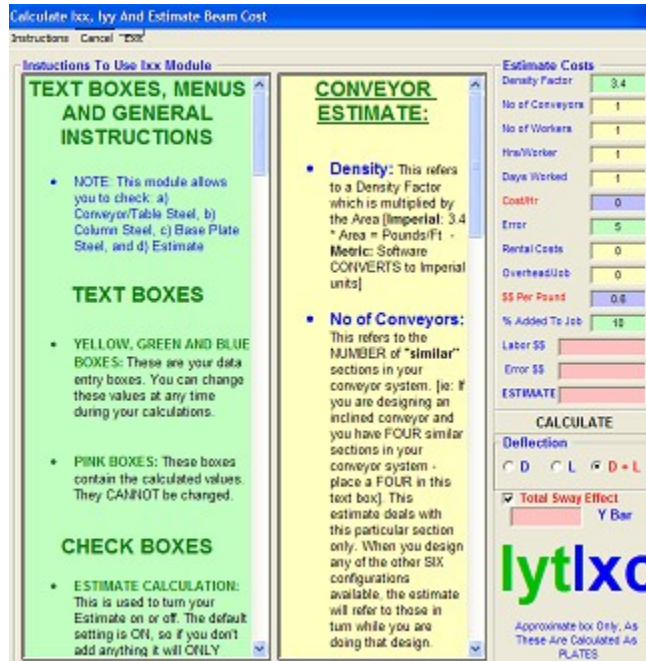
- **STEP #1:** Open Main Module.



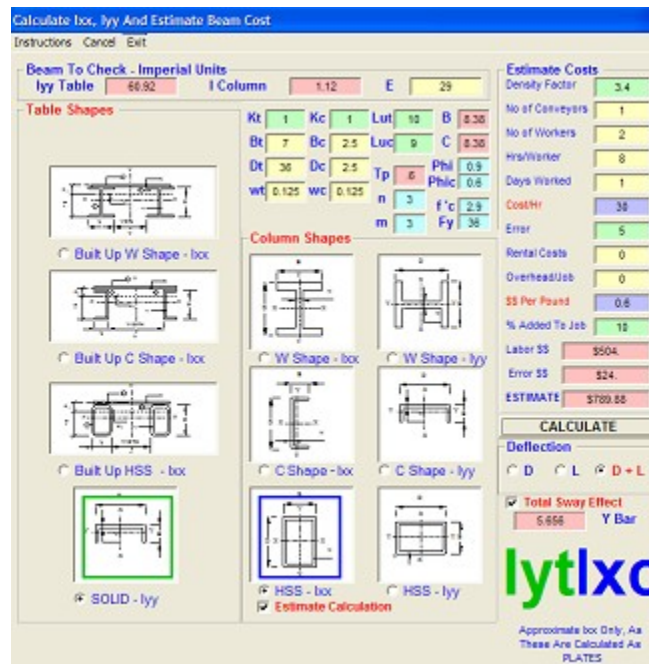
- There are **THREE** HELP screens that will direct the End User. a) One explains the text boxes and menus, etc., b) another explains how to complete EACH of the SIX Conveyor types, and c) the last one describes the symbols and gives the definitions for the proper use of the software.
- After reading these screens, you can hide them from the Instructions menu above. Fill in your basic data: ie L = 10 feet, L Col = 9 feet, Box L = 1 foot and Box Wt = 60 pounds. The software will calculate the Dead Load of the Conveyor steel. Open the Ixx – Iyy Module now from the Ixx Module menu above.

## XX- IYY MODULE LOOKS LIKE ILLUSTRATED BELOW WHEN FIRST OPENED

- **STEP #2:** Open Ixx – Iyy Module.

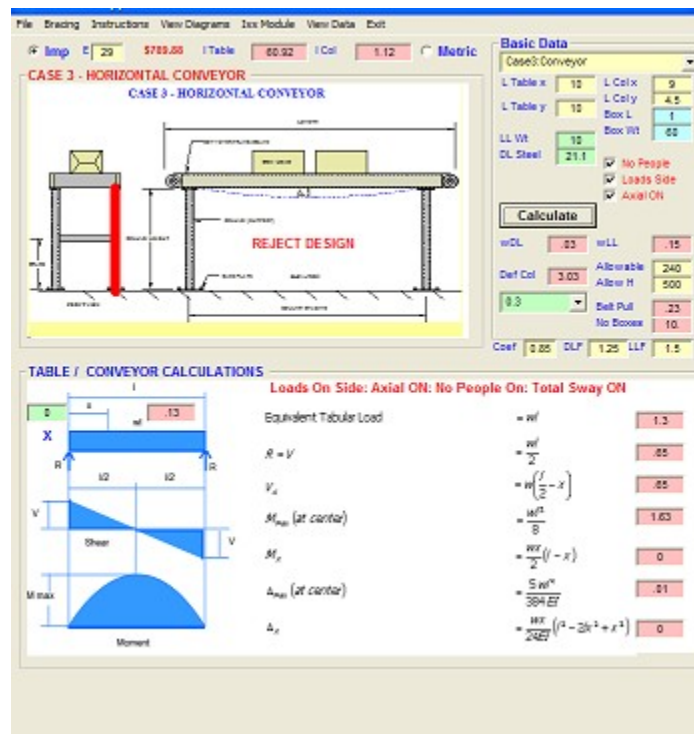


- Notice that this module has its own HELP. a) Text boxes and general instructions and b) Instructions to complete your estimate. In this problem we are going to assume an ESTIMATE is required to build ONE conveyor section. We are assuming the following: a) 1 Conveyor section, b) 2 workers completing a typical 8 hr day @ \$30/Hr. c) 5% Error on the labor, d) Cost/Pound = \$0.60 with 10% Added to the total to cover unexpected events, etc. Note: This may NOT be realistic, but is only used as a sample calculation.
- When this module is open during your design, a RED line will appear over lyy – Conveyor/Table and/or lxc – Column – should either of these be REJECTED by the software. After reading the instructions, you can hide them from the Instructions menu at the top of the module.



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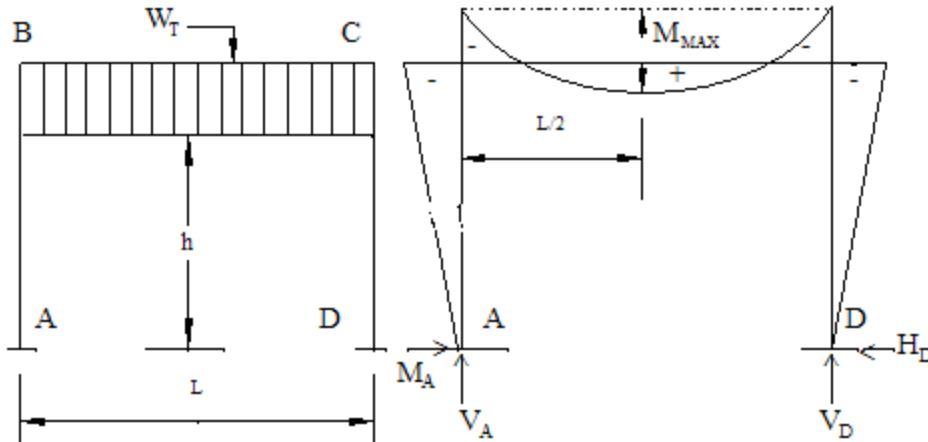
- After selecting our Conveyor – Solid Shape and our Column – HSS lxx, the data was entered above. The values for the Steel mentioned above were entered. The values for the estimate were also entered. The base plates were based on default values for approx 3 inches on each side of the plate to allow for bolts. Press the **CALCULATE** button. Values for B and C for the baseplate are calculated. lxx for the Conveyor = 60.92 in<sup>4</sup> and lxx Column = 1.12 in<sup>4</sup>. Y – Bar for the Solid Channel = 5.66 in. The Dead Load Steel = 21.14 pounds/ft. The estimate = \$789.88 to build this conveyor section. You can now cancel this module, going back to the main module.
- **STEP #3:** Go back to main module and select Case #3.



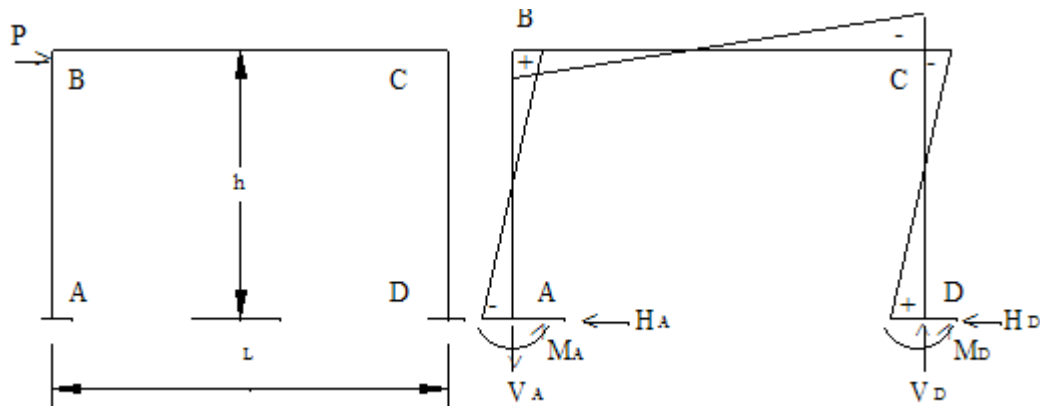
- You will notice your data has been transferred to the main module. Also notice that CASE 3: Horizontal Conveyor (one of the SIX configurations was selected from the drop down box). We then entered the LL Wt = 10 pounds/ft. We then selected our friction factor from the drop down box below the calculation button, where  $F_c = 0.3$ . Note: When our design case is selected the diagrams illustrated become visible. We press the **CALCULATE** button.
- We now calculated: a) Number of Boxes = 10. b) Belt Pull = 0.23 kips [un-factored]. c)  $wT = 0.13$  Kips/ft on the conveyor. d) The deflection of the conveyor table is very small in this case @ 0.01 [approximately] inches. e) The deflection of the FRAME with the Belt Pull is approximately = 3 inches which is GREATER than our Allowable H @  $L/500 = 0.216$  inches. Column **FAILS** – See **RED** Leg.

## FRAME ACTION – BASED ON TWO CASES:

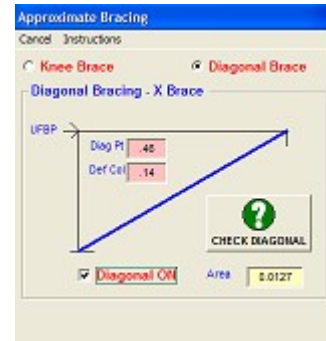
### Assuming No Belt Pull



### Assuming Belt Pull



- **STEP #4:** Attempt to correct this problem by adding a brace. The first choice would be a **DIAGONAL** brace in this case. The bracing module opens with its own instructions [see left diagram]. On the right diagram we chose an area of approximately  $0.0127 \text{ in}^2$  [any larger member would further **REDUCE** the deflection. We find this to reduce the deflection to  $0.135 \text{ in} < L/500$ , therefore **ACCEPTABLE**.



- **STEP #5:** Go back to the main module.

File Bracing Instructions View Diagrams Jcc Module View Data Exit

Temp E 20 \$789.00 1 Table 00.92 1 Col 1.12 Metric

**Diagonal Brace ON**

Case3:Conveyor

L Table x 10 L Col x 5  
L Table y 10 L Col y 4.5  
Box L 1  
Box Wt 60  
LL Wt 10  
DL Steel 21.1

No People  
 Loads Side  
 Axial ON

Calculate

WDL 03 WLL 15  
Def Col 14 Allowable 240  
0.3 Allow H 500  
Def Col 23  
No Braces 16

Coef 0.85 DLF 1.25 LUF 1.5

**CASE 3 - HORIZONTAL CONVEYOR**

**ACCEPT DESIGN**

**TABLE / CONVEYOR CALCULATIONS**

Loads On Side: Axial ON: No People On: Total Sway ON

Equivalent Tabular Load

$R = V$

$V_x$

$R_{Tmax}$  (at center)

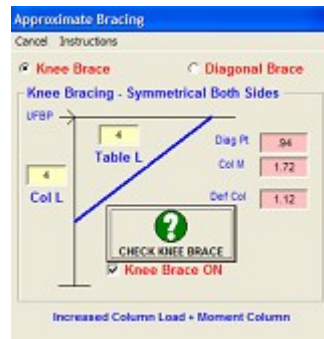
$R_{Tc}$

$\delta_{max}$  (at center)

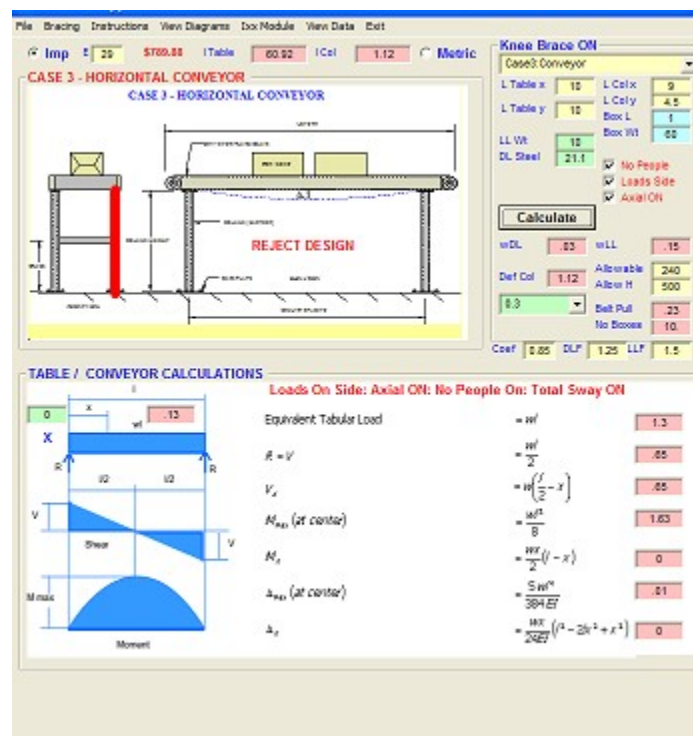
$\delta_c$

$= w l$  1.3  
 $= \frac{w l^2}{2}$  .65  
 $= w l^2 \left( \frac{1}{2} - x \right)$  .65  
 $= \frac{w l^3}{8}$  1.63  
 $= \frac{w x}{2} (l - x)$  0  
 $= \frac{5 w l^4}{384 E I}$  .01  
 $= \frac{w l^3}{24 E I} (l^2 - 2 l x^2 + x^3)$  0

- Notice over the yellow drop down box on the top, it indicates the **DIAGONAL** brace is on. The deflection is rounded off to 0.14 inches, therefore **ACCEPTABLE**. The **RED** leg has now been corrected.
- **STEP #6:** We can try a **KNEE** Brace to see the difference here.



- We can try adding a KNEE brace placed 4 feet over from the column and 4 feet down the column. This would be the same on BOTH sides of the frame. We see our deflection here is 1.12 inches approximately which is GREATER our Allowable @ L/500, therefore **FAILS**.
- **STEP #7:** Go back to the main module.



- Notice the top of the yellow drop down box again. It states a KNEE brace is ON. The deflection is 1.12 inches and the column is **RED** indicating this solution **FAILS**.
- Please note: This is a relatively “simple” problem. Please check with your own hand calculations to ensure all is OK. Calculations that could take several hours, will only take minutes with the software. You can try MANY different scenarios while on the phone with a client. Using this with the Beam Diagrams Version of the software can prove to be a VERY POWERFUL tool.

## WHAT ARE SOME BENEFITS OF THIS SOFTWARE?

### 30 Reasons Why This Product Will “Add Value” to your projects.

- Easy to use. Simple interface.
- Very short learning curve. Don't have to train staff to use this product.
- Easy Instructions and definitions given.
- Very Low Cost per project. Make ALL your money back with one use.
- No Spreadsheets and No 3<sup>rd</sup> Party software required.
- **SIX** different Conveyor Types.
- Reasonably accurate [approximation]. See sample problem above.
- Check loads one One Side, or in Center.
- Uses both Metric and Imperial Units.
- Place people on Conveyor.
- Select to use Frame Action, or Not
- Select to use Belt Pull, or not?
- Conversions calculator comes with the Professional Version.
- Excellent for Small Projects and Larger Projects.
- Excellent for small to medium contractors who want a FAST quote,
- Check Conveyor/Table, Columns and Base Plate in ONE shot.
- Select shapes for Conveyor/Table and Column – Calculate lxx, or lyy.
- Quotes for Conveyor/Table can be given over the phone in minutes.
- **RED** line indicates which member **FAILS**.
- No databases to be updated and maintained.
- No extra training is required. Use immediately to “automate” your design process.
- Simple View Data display and printout.
- Improve your “Bottom Line” immediately with one use.
- Professional Version can be “customized” for your business, or projects.
- Diagrams for each case.
- Free Body Diagram, Shear, and Moment diagrams + Formulas [for easy use].
- Very **LOW** price compared to software using spreadsheets.
- Allows for project flexibility.
- Calculation ERROR is eliminated.
- Professional Version is “Personalized” for you.

If you have any questions, please do not hesitate to ask. We will be pleased to answer all of your questions and concerns.

**OUR PROFESSIONAL VERSIONS OF THE SOFTWARE ARE CUSTOMIZABLE.**  
We can add your own projects to the software to “automate” your design process.