TRANSMISSION LINE DESIGN
COST CALCULATOR

VER 1.0.0

USER GUIDE

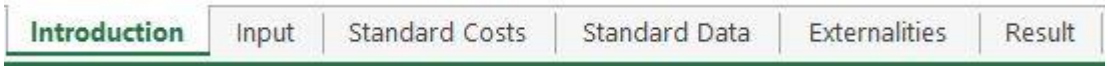
1. Requirements

- Microsoft Excel 2013 or later (2016, 365 etc.)
- Macros must be enabled
- Internet connection is required to update exchange rates during the starting-up of the program, and must be allowed if prompted by a Windows notification.

  NOTE: If internet connection is not established, the exchange rates will be the last updated figures.

2. Program Outlook

This program contains 6 excel worksheets



Introduction	Landing Page of the program
Input	Route Data should be entered here
Standard Costs	Contains cost values of the necessary items
Standard Data	Contains other necessary data including regulations
Externalities	Under Construction
Result	Gives the cost comparison after the Route Data has been entered

3. Using the Program

a. Adding a new Route Data

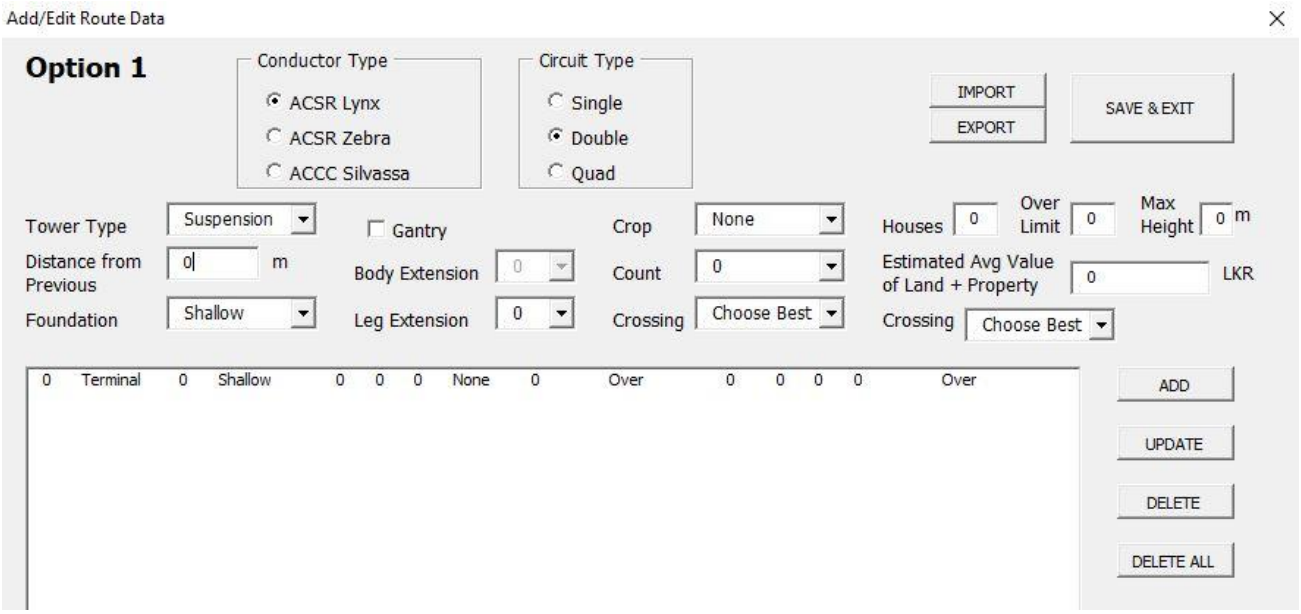
Start by going to the Input page.

Add your company name and project name in the respective cell (OPTIONAL)

Select a Line Voltage from the 3 options: 132, 220 and 400

NOTE: This value can be changed later. But whatever the value selected will be applied for all line routes in the same project. The program does not allow comparison between 2 lines of different voltage levels

Click the **EDIT** Button under OPTION 1 to start adding the Route Data of your first line option. This will open the form corresponding to Option 1



Conductor Type and Circuit Type is common for the Route. All other parameters have to be defined for each tower in the Route.

First tower of the line (Starting Terminal) will be added by default. (You will not need to change its values except maybe for Foundation)

For all other towers, consider the line segment between itself and the previous tower while adding the parameters. Once all parameters for a tower is set, click **ADD** button to add it to the route

> NOTE: Body Extension cannot be added manually by the user. Program will study the other parameters and assign a body extension where necessary
>
> NOTE: Distance (span) is limited to values between 10m and the max span for the selected voltage

For Obstacles found in the line segment,

Trees Select Type of Crop

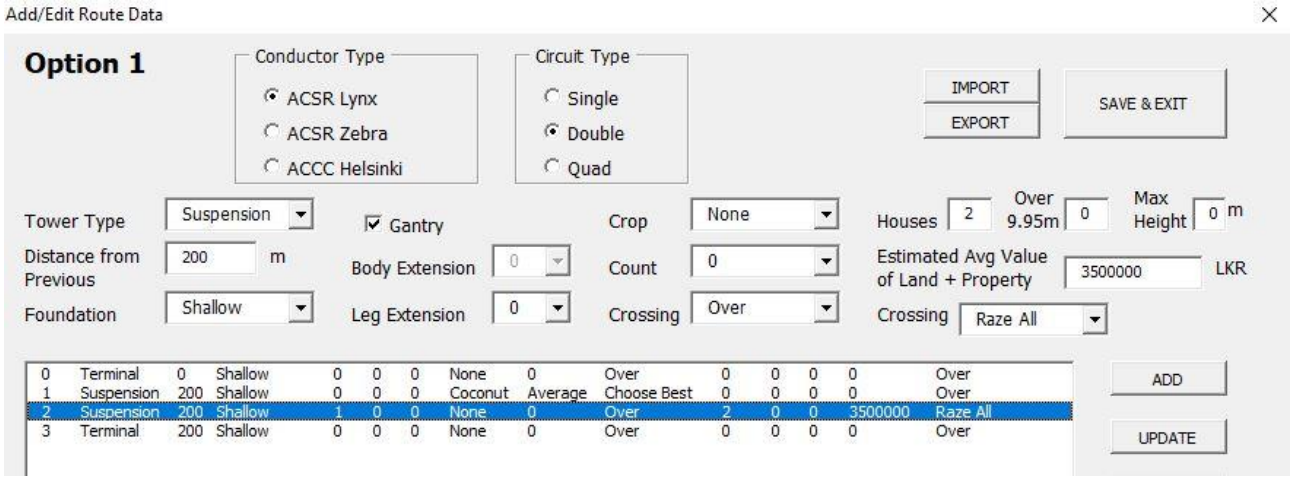
Give a manual count / select Average (program will calculate an average value)

Select how you want to cross (Over / Fell). By selecting 'Choose Best', you can allow the program to decide on the least cost incurring method

Houses Mention the total number of houses in the line segment and the number of houses above the limit (figure is displayed) separately.

Select how you want to cross (Over / Raze). Selecting 'Raze All' will demolish all houses, whereas 'Raze' will demolish only the ones above the limit. By selecting 'Choose Best', you can allow the program to decide on the least cost incurring method

If you select 'Raze' or 'Choose Best', enter the average land+property value of the houses above the limit. If you select 'Raze All', enter the average land+property value of all the houses.

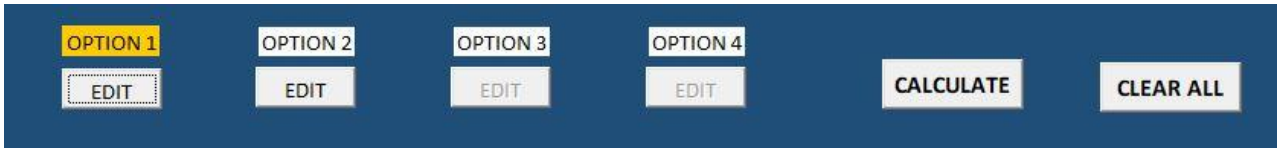


After All towers have been added click **SAVE & EXIT** button. This will save the Line Route as Option 1. Cell corresponding to Option 1 will be highlighted in yellow colour.

NOTE: The last tower of the Route Data should always be of terminal type. The program doesn't allow you to save the Route otherwise.

b. Editing an existing Route Data

When you save one option, the next option will become available for editing, which you can use to add another Route Data in the same way described above.



Clicking the **EDIT** button under a previously added option will load up its Route Data. You can modify individual towers by selecting them from the list, changing their values and clicking the **UPDATE** button.

DELETE button deletes the selected tower. If no tower is selected, it deletes the last tower from the list.

DELETE ALL button deletes all the towers from the list (Including the starting terminal)

c. Importing / Exporting a Route Data

If you need your Route Data to be used in a different project or if you wish to store it for later use, you can export it as a txt file. Click the **EDIT** button corresponding to the Route Data and click **EXPORT** to save it as txt file.

Such files can later be imported into the program using the **IMPORT** button.

d. Calculating Cost

After the Route options have been entered press the **CALCULATE** button to calculate and compare the financial costs incurred by each line. Pressing the button will automatically redirect to the 'Result' sheet.

SAVE AS PDF

(Company Name Here)
(Project Name Here) (132 kV)

COST ESTIMATION REPORT
11-12-19

			OPTION 1		OPTION 2		OPTION 3		OPTION 4	
		Unit Price (LKR)	Qty	Item Cost (LKR)	Qty	Item Cost (LKR)	Qty	Item Cost (LKR)	Qty	Item Cost (LKR)
Construction Costs										
Towers	Suspension	1,449,327.94	2	2,898,655.87	1	1,449,327.94				
	Angle	2,699,373.28			1	2,699,373.28				
	Terminal	2,898,655.87	2	5,797,311.74	2	5,797,311.74				
Foundations	Pile	3,500,000.00		-		-				
	Shallow	1,500,000.00	4	6,000,000.00	4	6,000,000.00				
	Rock Anchored	2,800,000.00		-		-				
Conductor	ACSR Lynx	634,080.97	3.6	2,282,691.50		-				
	ACSR Zebra	960,179.76		-	5.4	5,184,970.69				
	ACCC Helsinki	543,497.98		-		-				
Insulator Strings		108,699.60	132	14,348,346.57	165	17,935,433.21				
Gantries		31,341,716.62		-		-				
Erection & Stringing		540.000.00	3.6	1.944.000.00	5.4	2.916.000.00				

Press **SAVE AS PDF** button to export the comparison as a PDF document.

4. Configuring Built in Data

Standard Costs

CONSTRUCTION							
Towers	132		220		400		
Suspension Tower	8000	USD	10000	USD	12000	USD	
Angle Tower	14900	USD	16000	USD	17500	USD	
Terminal Tower	16000	USD	17000	USD	18000	USD	
Foundations	132		220		400		
Pile Foundation	3500000	LKR	4000000	LKR	4500000	LKR	
Shallow Foundation	1500000	LKR	1750000	LKR	1900000	LKR	
Rock Anchoring	2800000	LKR	3000000	LKR	3400000	LKR	
Conductors (per km)							
ACSR Lynx	3500	USD	132kV options				
ACSR Zebra	5300	USD					
ACCC Helsinki	3000	USD					
ACSR Zebra	5300	USD	220kV options				
ACSR Goat	4100	USD					
ACCC Casablanca	4000	USD					
ACSR Moose	7200	USD	400kV options				
ACSR Camel	6600	USD					
ACCC Oslo	5500	USD					

Exchange Rates (x-rates.com)			
Sri Lankan Rupee	1.00 LKR	inv. 1.00 LKR	LKR
US Dollar	0.00552	181.165992	USD
Euro	0.004985	200.587884	EUR
British Pound	0.004199	238.144047	BPD
Indian Rupee	0.390932	2.557989	INR
Australian Dollar	0.008071	123.898599	
Canadian Dollar	0.007306	136.874984	
Singapore Dollar	0.007508	133.197984	
Swiss Franc	0.005442	183.764402	
Malaysian Ringgit	0.022988	43.501712	
Japanese Yen	0.600146	1.66626	JPY

Change the cost value of any item and the currency type (from the list of given currencies)

NOTE: Do not change the names of Conductors and Trees in this sheet. Those data are automatically updated from 'Standard Data' sheet

Standard Data

Crop	Avg/Sq.km	Height
Coconut	16000	25
Rubber	54000	30
Palm	13500	20

Conductor	w (kg/km)	RTS (N)	TH % at 75°C	
ACSR Lynx	842	79800	0.15	132kV options
ACSR Zebra	1621	131900	0.15	
ACCC Helsinki	481	69090	0.15	
ACSR Zebra	1621	131900	0.15	220kV options
ACSR Goat	1489	135800	0.15	
ACCC Casablanca	823	100990	0.15	
ACSR Moose	1999	161000	0.15	400kV options
ACSR Camel	1747	145900	0.15	
ACCC Oslo	972	147560	0.15	

REGULATIONS

Rated Voltage	132 kV	220 kV	400 kV
Right of Way (m)	27	35	52
Height to lowest conductor(m)	17	20	20
Tower Span (m)	300	350	400
Insulator Disks	11	16	25
Ground Clearance (m)	6.7	7	8.5
Tree Clearance (m)	1.4	2.4	3.8
House Clearance (m)	3.6	4.6	3.8

	0	+3	+6	+9
Body Ext Cost factor (Approx)	0	0.15	0.2	0.3
	0	+1	+2	+3
Leg Ext Cost Factor Approx)	0	0.02	0.05	0.08

Change the Conductor names and Crops (trees) in their appropriate slots

Change any standard data wherever necessary