

DEVELOPMENT OF SOFTWARE FOR DESIGN OF SURPLUS WEIR

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Abstract: Usage of application software in civil engineering for various jobs such as design, drawing, estimation and planning is inevitable now a day. Design software such as STAAD.Pro, ETABS, SAP and RISA – 3D; drawing/drafting software such as Auto CAD, 3D Home, Architectural Desktop and construction management software such as Primavera, M S Projects, RIVET are quite popular in civil engineering industry. Apart from this there are some specialised software for pipe line design, treatment plants etc. that are meant for civil engineering related jobs namely analysis and design. Many computer applications are helping civil engineering research in the areas such as finite element analysis and computational fluid dynamics. However there is no substantial attempt made in the design and drawing of irrigation structures such as surplus weir, tank sluice with tower head, syphon aqueduct etc. The work upon which the paper is based is to give a complete design solution for surplus weir. The design includes both hydraulic and structural. The developed software is a desktop application that runs on windows operating system and is developed in VB.NET (Programming language). All the software and tools used in the development are essentially open source.

IndexTerms: VB.Net, Surplus Weir and .Net Frame work

INTRODUCTION

Irrigation Structures For purposes of convenience and identification, Irrigation projects divided into three categories.

1. Major and Multipurpose Project, irrigating vast tract of land
2. Medium Irrigation Projects
3. Minor Irrigation Projects

The demarcation between items are one and two is purely based on financial outlays for the projects. While multipurpose projects could serve irrigation, Navigation, flood control, etc. Medium irrigation projects are purely for development of irrigation, and sometimes for drinking water supply also.

Minor irrigation consists of irrigation from

- a). Tanks
- b). Lift Irrigation
- c). Diversion Schemes on small streams.

Irrigation Tanks:

Irrigation tanks is generally a small storage reservoir form across a stream in a valley. Sometimes these tanks could be having independent catchments, drawing their supplies from the runoff from catchment areas. These tank fully depended rainfall in their catchments. In addition, some tanks may have a supply channel from a neighbouring stream, which has a dependable flow.

The irrigation tanks essentially consist of the following.

- a) An earthen bund across the valley creating a storage
- b) A surplus weir to dispose off flood discharge
- c) Sluice to feed the channels
- d) channels from the sluice to feed the ayacut

The current work focus on design of surplus weir.

SURPLUS WEIR

It is pukka structure constructed to dispose of excess water from an irrigation tank. It is a safety device in the tank. The surplus work of a tank is usually either a weir or flus escape. The length of such a weir or an escape must be such that the quantity of water estimated as the maximum flood discharge likely to enter from the catchment into the tank, can be disposed of with a depth of water over the weir equal to the difference between the maximum water level and full tank level. The effective storage capacity is limited by the F.T.L. but the area submerged by the tank water spread, height of the tank bund, etc., are all dependent on the M.W.L.

Generally it is better to limit the difference between the M.W.L. and F.T.L. to as small a height as possible. This difference is called the “Head over the Surplus Weir” With which the flood water can be disposed of for small tanks head limited to between 50 and 75 centimetres.

NEED FOR SOFTWARE

The medium irrigation structures such as surplus weir are quite common in any state. Development of irrigation structures is the major lookout of state governments. Reasons apart no irrigation department is having well established software for the design of such structures. The current software fills this gap by developing a application software for the design of surplus weir using open source platform namely .Net community edition.

SOFTWARE DETAILS

VB.Net is a Programming language. It is desktop application that runs to windows operating system and developed in VB.Net. which belongs to .NET framework. This application is developed on .Net community edition. It has full access to all libraries in the .Net frame Work.. The .Net Frame work applications are multiplatform applications.

SOFTWARE CAPABILITIES

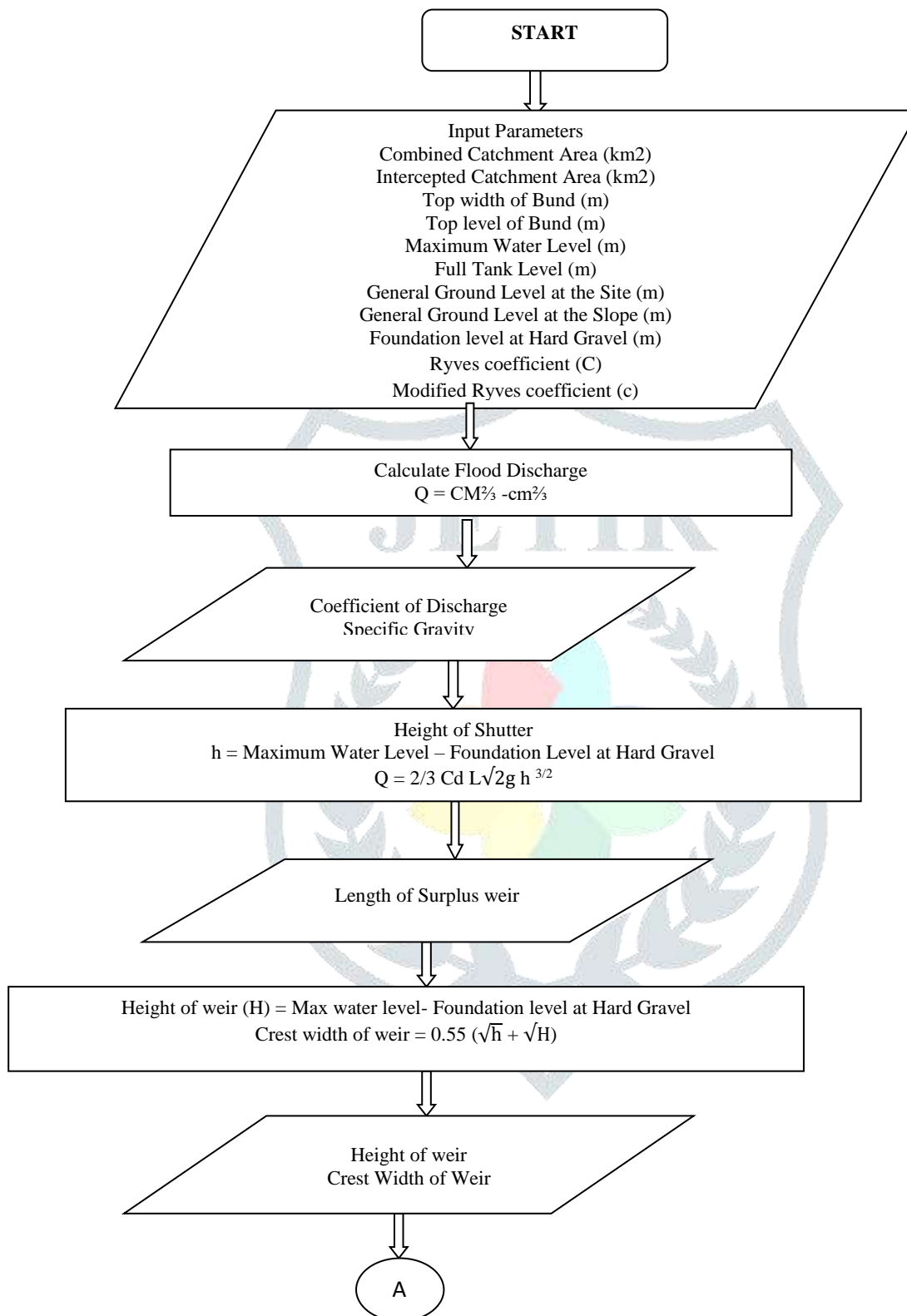
The all software tools used in the development are essentially open sources. The software gives a both hydraulic and structural design of a surplus weir.

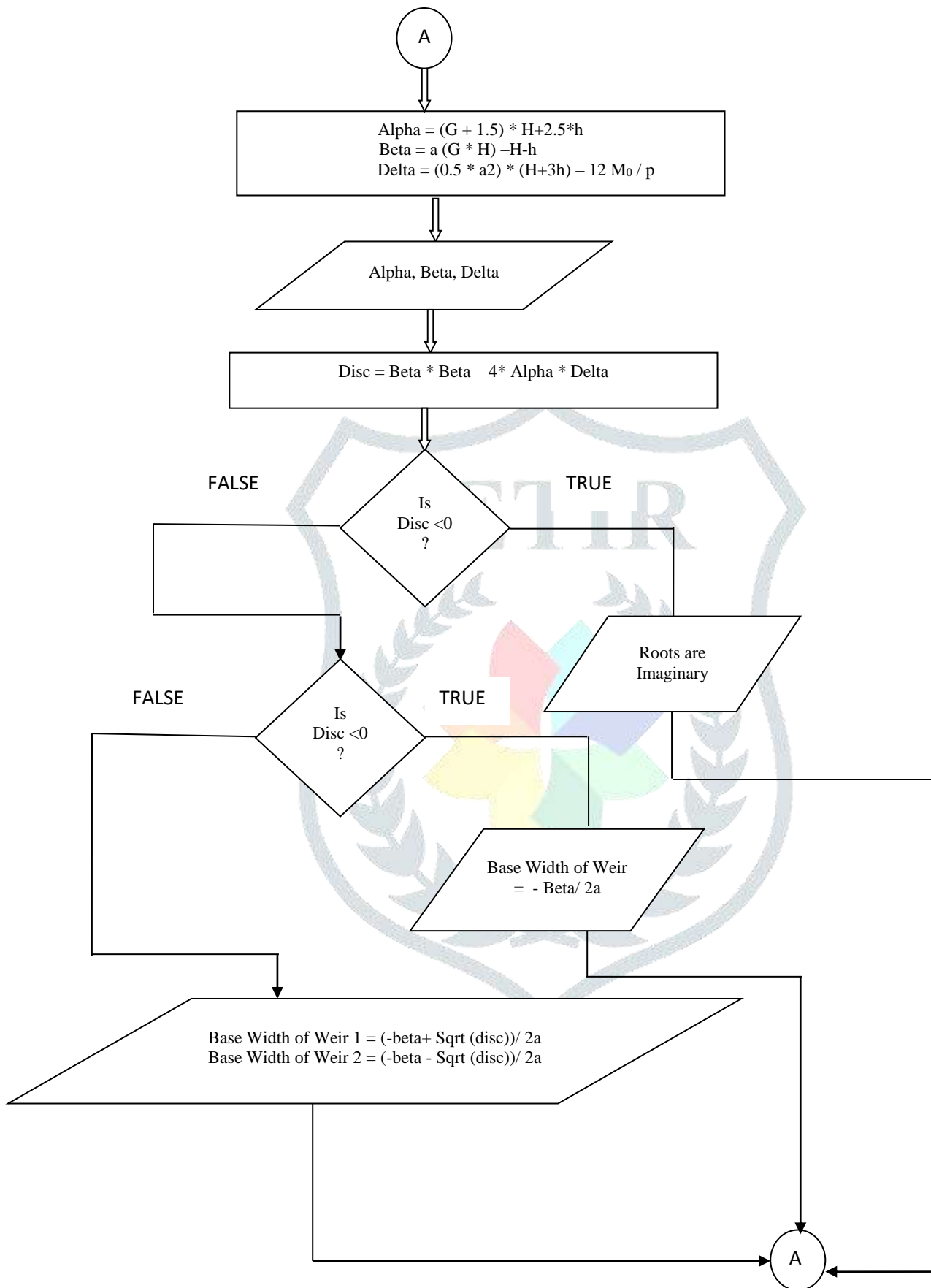
ESSENTIALS OF SOFTWARE DESIGN

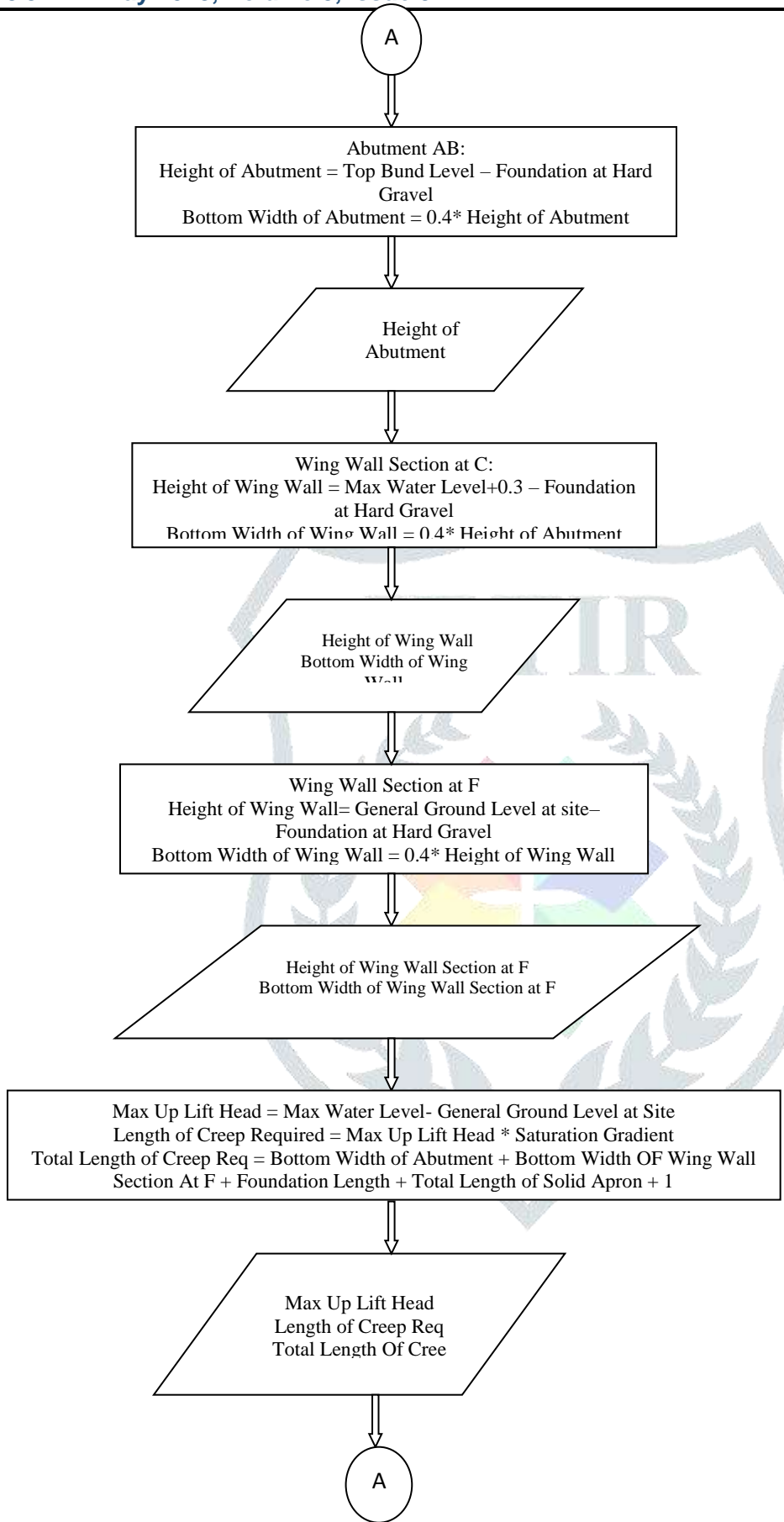
The Design data the surplus work of a tank forming part of chain of tanks to collected combined catchment area, Intercepted catchment area, Full tank level, Max water level, General ground level at the proposed site work, General ground level at the slopes of level, Top level of bund and foundation at hard gravel. Complete design steps for the design of surplus weir is depicted in the form of a flow chart shown in Fig.1

SOFTWARE FUNCTIONAL FLOW

After invoking the executable file by clicking on the icon, a window as shown in Fig.2 gets displayed. The user is expected to enter vital data required for design of surplus weir in the text box and finally click on “Submit” button to navigate to output screen. Fig.3 shows the valid data entered by the user. After entering the data the user can click on the “Submit” button to get the complete design as shown in Fig.4. The software got the ability to export the data in the form of a world file (.doc or .docx) as well by clicking on “Export Design” button in output screen.







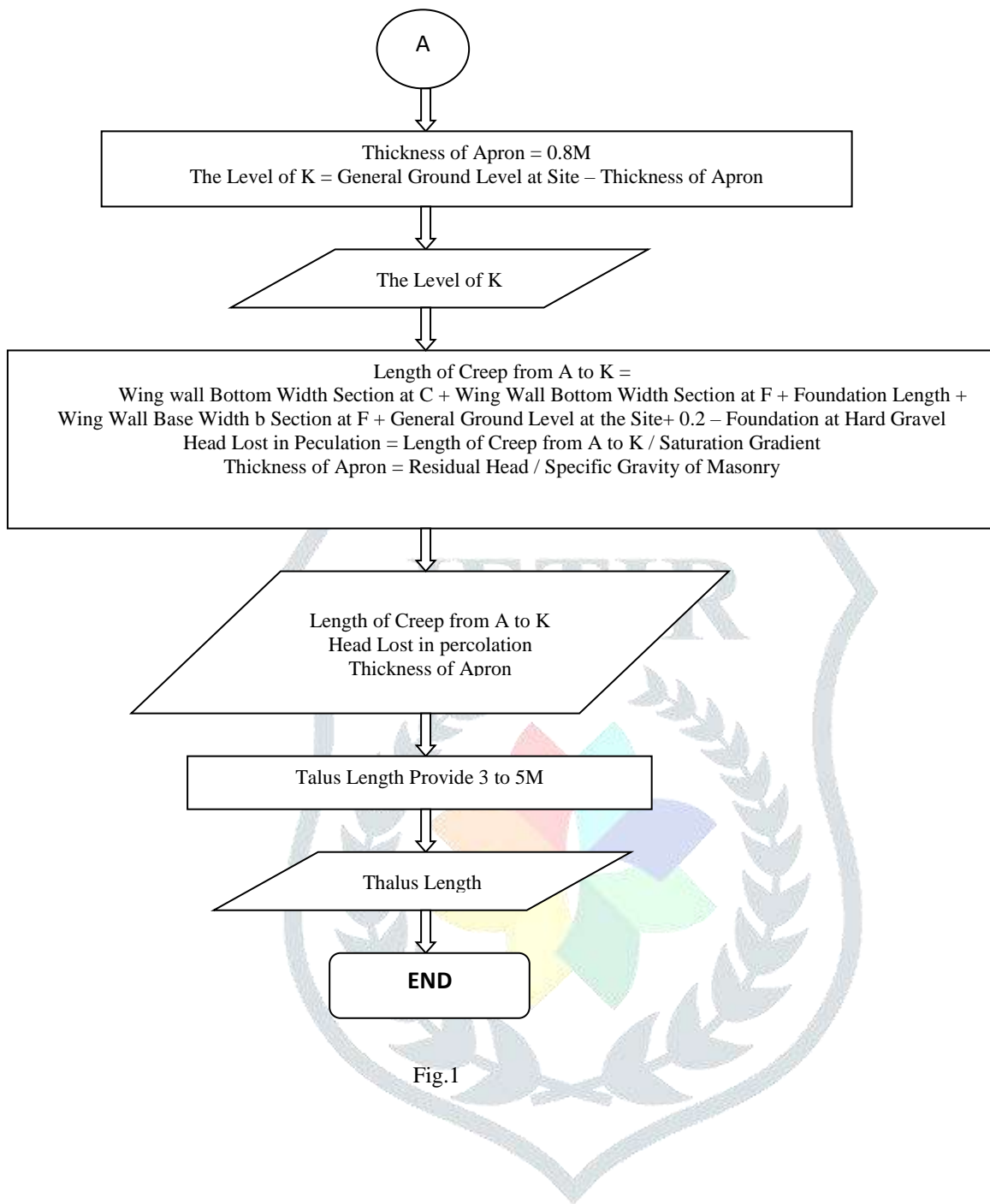
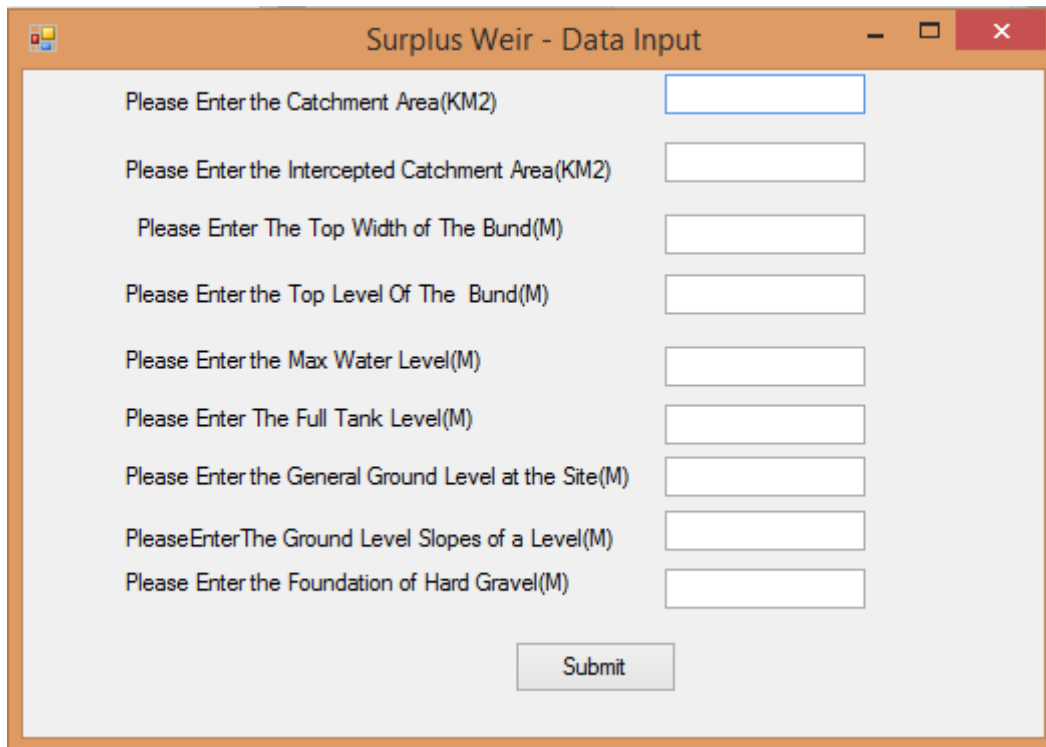
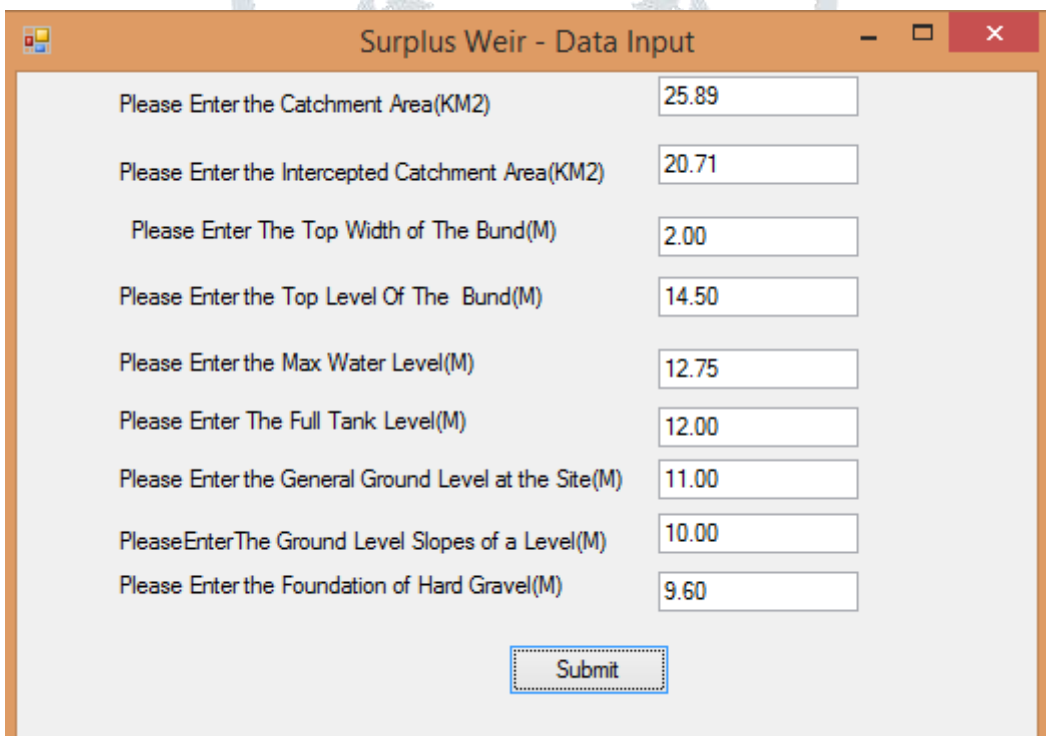


Fig.1



The screenshot shows a web browser window with the title "Surplus Weir - Data Input". The window contains a form with nine input fields, each preceded by a label: "Please Enter the Catchment Area(KM2)", "Please Enter the Intercepted Catchment Area(KM2)", "Please Enter The Top Width of The Bund(M)", "Please Enter the Top Level Of The Bund(M)", "Please Enter the Max Water Level(M)", "Please Enter The Full Tank Level(M)", "Please Enter the General Ground Level at the Site(M)", "PleaseEnterThe Ground Level Slopes of a Level(M)", and "Please Enter the Foundation of Hard Gravel(M)". All input fields are currently empty. A "Submit" button is located at the bottom center of the form.

Fig.2



This screenshot shows the same "Surplus Weir - Data Input" form, but with numerical values entered into all the input fields. The values are: 25.89, 20.71, 2.00, 14.50, 12.75, 12.00, 11.00, 10.00, and 9.60. The "Submit" button is highlighted with a dashed border.

Label	Value
Please Enter the Catchment Area(KM2)	25.89
Please Enter the Intercepted Catchment Area(KM2)	20.71
Please Enter The Top Width of The Bund(M)	2.00
Please Enter the Top Level Of The Bund(M)	14.50
Please Enter the Max Water Level(M)	12.75
Please Enter The Full Tank Level(M)	12.00
Please Enter the General Ground Level at the Site(M)	11.00
PleaseEnterThe Ground Level Slopes of a Level(M)	10.00
Please Enter the Foundation of Hard Gravel(M)	9.60

Fig.3

Surplus weir-Data out put

Flood Discharge Entering To a Tank (M3)

Design of Weir		Abutment	
Length of Weir(M)	<input type="text" value="75"/>	Length of Abutment(M)	<input type="text" value="2"/>
Height Of Weir(M)	<input type="text" value="2.4"/>	Height Of Abutment(M)	<input type="text" value="4.9"/>
Crest Width Of Weir(M)	<input type="text" value="1.3"/>	Top Width Of Abutment(M)	<input type="text" value="0.5"/>
Base Width Of Weir(M)	<input type="text" value="2.4"/>	Bottom Width Of Abutment(M)	<input type="text" value="2"/>
Wing Wall(Section At C)		Wing Wall(Section At F)	
Height Of Wing Wall(M)	<input type="text" value="3.45"/>	Height Of WW Section At F(M)	<input type="text" value="1.4"/>
Bottom Width of Wing Wall(M)	<input type="text" value="0.6"/>	Bottom Width of WW Section At F(M)	<input type="text" value="0.6"/>
Top Width of Wing wall(M)	<input type="text" value="0.5"/>	Top Width of WW Section At F(M)	<input type="text" value="0.5"/>
Solid Apron			
Length of solid apron(M)		<input type="text" value="8"/>	
Thickness of Apron(M)		<input type="text" value="0.9"/>	
<input type="button" value="Export Design"/>		<input type="button" value="Goto Estimation"/>	

Fig.4

CONCLUSION

The current application software is developed on .Net community edition, VB.Net as programming language. It is a desktop application and runs on windows operating system. The software has a graphical user interface and is user friendly. By using this software, the user can get a complete hydraulic and structural design of surplus weir.

REFERENCES

1. Govt. of Andhra Pradesh Irrigation & CAD Department
2. Gandikota Lift Irrigation Scheme Package NO – L1 – 01, Kadapa (D)
3. Plan & Section of Surplus Weir on Thimmapuram Reservoir at Km. 2.400
4. Design of Irrigation Structures by R. S. N. Moorthy
5. Design & Drawing of Surplus Weir by Sathyanarayana Moorthy Challa
6. Thimmapuram Reservoir L1-01 Package Proposed Surplus Course U/s & D/s Grid Level at Chainage
7. Planning and Cross Section of Surplus Weir by N. Sreenivasulu
8. Indian Standard Hydraulic Design of High Ogee Overflow Spillways, ICS 27.40