How to apply customized constraint parameter to obtain shallower IL design in Drainage and Sewage

Drain · https://mes100.com/docs/how-to-apply-customized-constraint-parameter-to-obtain-shallower-il-design-in-drainage-and-sewage/

When designing drainage, users may sometimes be dealing with a fixed Invert Level at the end of the drain network (when connecting to existing drain) and may have trouble in passing the analysis due to the drain depth checking set in the project parameter.

Or perhaps users prefer shallow drain Invert Level (IL) with wider drain dimension and this is when the ‘constraint parameter’ function can be used to help in achieving the desired design.

Objective;

1. How to use the constraint parameter
2. How to achieve shallow drain depth

How to set different maximum depth checking on per drain basis

Project file sample 1 here

Steps involved;

1. Model drainage and analyze
2. Analysis failed due to ‘Depth more than maximum’

Network 1	Network 2
Represents the current situation where the Invert Level at end Node 5 is fixed And after analyzed, analysis failed due to ‘Drain Depth more than maximum. Exceed Max Depth Level’ at Drain Mark 4 (Node 4 - Node 5) This is because Maximum depth at ‘general parameter’ is set to 4.8m)	*ditto condition as Network 1 But used customized constraint parameter to solve the issue Applied different maximum depth checking for Drain Mark 8 (Node 9 - Node 10) Maximum depth at ‘constraint parameter’ is set to 8m. This means that for Drain Mark 8, the maximum depth is allowed up to 8m, different from the rest which is only 4.8m)

Refer to the project file attached, at network 2, for Drain Mark 8, there is no more remarks on ‘Drain more than maximum. Exceed Max Depth Level’



Drain Mark	Up Sump	Down Sump	evel m)	Drain End Invert Level (m)	Drain Drop at Begining (m)	Drain Start Invert Level (m)	Sump Depth at Start (m)	Sump Depth at End (m)	Depth Below Invert (m)	Total Sump Depth, TD (m)	Cascading Drain	Remarks
5	6	7	11.000	7.900	0.000	8.200	1.800	3.100	0.000	3.100	-	OK
6	7	8	11.500	7.525	0.000	7.900	3.100	3.975	0.000	3.975	-	OK
7	8	9	12.000	7.250	0.000	7.525	3.975	4.750	0.000	4.750	-	OK
8	9	10	13.000	6.500	0.000	7.250	4.750	6.500	0.000	6.500	-	OK
-	-	1	10.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	OK
1	1	2	11.000	7.900	0.000	8.200	1.800	3.100	0.000	3.100	-	OK
2	2	3	11.500	7.525	0.000	7.900	3.100	3.975	0.000	3.975	-	OK
3	3	4	12.000	7.250	0.000	7.525	3.975	4.750	0.000	4.750	-	OK
4	4	5	13.000	6.500	0.000	7.250	4.750	6.500	0.000	6.500	-	Depth more than Exceed Max Dept

This is because when apply customized constraint parameter for Drain Mark 8 (Node 9 - Node 10), the checking for the maximum depth will follow the newly set value in the constraint parameter and does not check against the general parameter (project parameter)

Therefore, the constraint parameter will be helpful in implementing certain condition for each drain (note: constraint parameter is per drain basis and will act alone without interfering the general parameter)

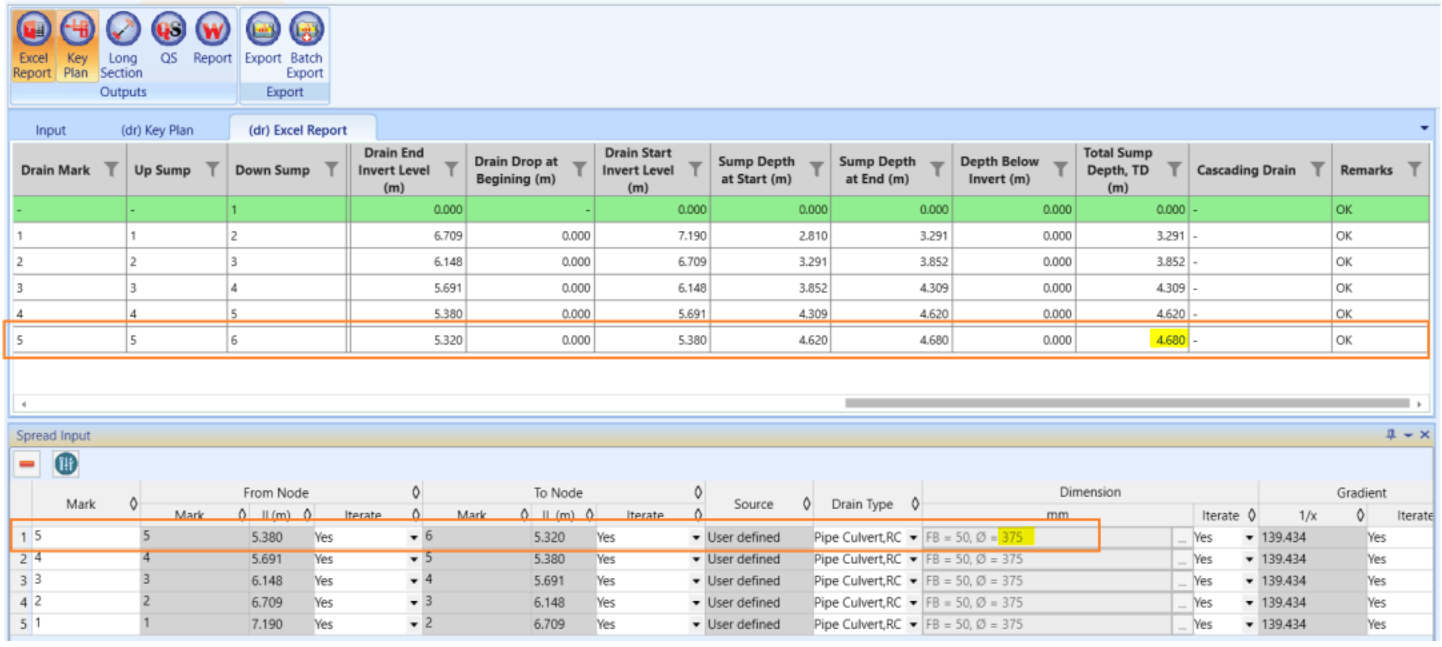
How can customized constraint parameter be used to achieve the designer of shallower IL

However, in some cases, another issue is that users may want to have shallow IL and anticipate software to propose wider drain dimensions to accommodate the peak flow accordingly.

Hence, to tackle this issue, user may set shallow IL at the ‘constraint parameter’

Drain situation **before** constraint parameter	Drain situation **after** constraint parameter
Project file Sample 2 (before) here	**Project file Sample 2 (after) here**
The current situation where the IL proposed by MiTS is deeper than required IL as the analysis follows the ‘maximum depth’ set at the general parameter at. Drain Mark 4 (Node 4 - Node 5)	Suggest to set shallower IL at the constraint parameter at Drain Mark 8 (Node 9 - Node 10)

Before apply constraint parameter (*maximum depth at general parameter is set to 6m*)

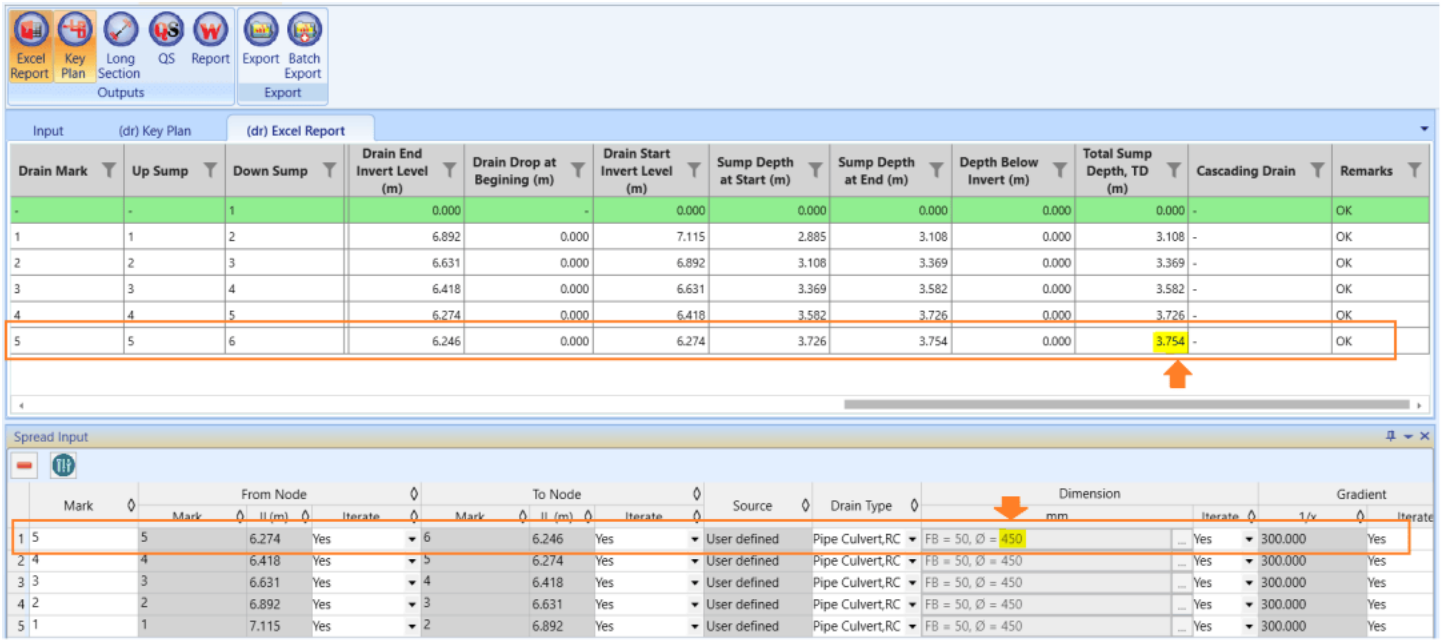


Drain Mark	Up Sump	Down Sump	Drain End Invert Level (m)	Drain Drop at Begining (m)	Drain Start Invert Level (m)	Sump Depth at Start (m)	Sump Depth at End (m)	Depth Below Invert (m)	Total Sump Depth, TD (m)	Cascading Drain	Remarks
-	-	1	0.000	-	0.000	0.000	0.000	0.000	0.000	-	OK
1	1	2	6.709	0.000	7.190	2.810	3.291	0.000	3.291	-	OK
2	2	3	6.148	0.000	6.709	3.291	3.852	0.000	3.852	-	OK
3	3	4	5.691	0.000	6.148	3.852	4.309	0.000	4.309	-	OK
4	4	5	5.380	0.000	5.691	4.309	4.620	0.000	4.620	-	OK
5	5	6	5.320	0.000	5.380	4.620	4.680	0.000	4.680	-	OK

	Mark	From Node Mark	From Node IL (m)	From Node Iterate	To Node Mark	To Node IL (m)	To Node Iterate	Source	Drain Type	Dimension mm	Dimension Iterate	Gradient 1/x	Gradient Iterate
1	5	5	5.380	Yes	6	5.320	Yes	User defined	Pipe Culvert,RC	FB = 50, Ø = 375	Yes	139.434	Yes
2	4	4	5.691	Yes	5	5.380	Yes	User defined	Pipe Culvert,RC	FB = 50, Ø = 375	Yes	139.434	Yes
3	3	3	6.148	Yes	4	5.691	Yes	User defined	Pipe Culvert,RC	FB = 50, Ø = 375	Yes	139.434	Yes
4	2	2	6.709	Yes	3	6.148	Yes	User defined	Pipe Culvert,RC	FB = 50, Ø = 375	Yes	139.434	Yes
5	1	1	7.190	Yes	2	6.709	Yes	User defined	Pipe Culvert,RC	FB = 50, Ø = 375	Yes	139.434	Yes

After apply constraint parameter

(maximum depth at constraint parameter is set to 4m)



Conclusion

Therefore, it can be concluded that the customized constraint parameter comes in handy when a shallow drain IL is required and software will propose wider drain dimension.

Related



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I'm the Benevolent Dictator for Life for MiTS Software cum Editor of this website. Read more here.

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