# **Contents**

**Abstract-Chinese**[……….. I](#_Toc37753451)

**Abstract-English**[........ II](#_Toc37753452)

**Contents**[…….…… IV](#_Toc37753453)

[**Chapter 1 Introduction** ……….. 1](#_Toc37753456)

[**1.1 Background of the study** 1](#_Toc37753457)

[1.1.1 Complexity of urban drainage systems 1](#_Toc37753458)

[1.1.2 Urban fine management puts forward new requirements for the design of urban drainage system 4](#_Toc37753459)

[1.1.3 Limitations and deficiencies of traditional planning methods 6](#_Toc37753460)

[**1.2**  **Questions raised**.……..………… …………………………….……… ….. 7](#_Toc37753461)

[**1.3 The purpose, content and significance of the study** 8](#_Toc37753462)

[1.3.1 Purpose of the study 8](#_Toc37753463)

[1.3.2 Research content 8](#_Toc37753464)

[1.3.3 Research significance 8](#_Toc37753465)

[**1.4**  **Paper structure** 9](#_Toc37753466)

[**Chapter 2 A review of the literature** 11](#_Toc37753467)

[**2.1** **An overview of the research progress of urban drainage system planning and design content** 11](#_Toc37753468)

[2.1.1 Simple build of the "net" 11](#_Toc37753469)

[2.1.2 Traditional planning for the "Net-a-Factory" 12](#_Toc37753470)

[2.1.3 Space design for "Faces and Nets and Plants" 15](#_Toc37753471)

[**2.2 An overview of the application of urban drainage system design methods and models** 18](#_Toc37753472)

[2.2.1 Traditional planning methods and models for "Net-a-Plant" 18](#_Toc37753473)

[2.2.2 Space design for "Faces and Nets and Plants" 23](#_Toc37753474)

[**2.3 A summary of the practice of considering uncertainty in the design of urban drainage systems** 27](#_Toc37753475)

[2.3.1 Uncertainties affecting the design of urban drainage systems and their classification 27](#_Toc37753476)

2.3.2 Urban drainage system design practices that take into account uncertainties 28

[**2.4 Summary of this chapter** 38](#_Toc37753478)

[**Chapter 3 A study on the optimal design method of sewerage urban drainage system under uncertain condition** 40](#_Toc37753479)

[**3.1 Method framework** 40](#_Toc37753480)

[**3.2 Problem identification** 41](#_Toc37753481)

[**3.3 Data collection and uncertainty quantitative forecasting** 46](#_Toc37753482)

[3.3.1 Data collection generates baseline design conditions 46](#_Toc37753483)

[3.3.2 Uncertainty Quantitative Forecasts generate a collection of evaluation scenarios 47](#_Toc37753484)

[**3.4 Multi-objective optimization under baseline conditions** 53](#_Toc37753485)

[3.4.1 Rainwater system design 53](#_Toc37753486)

[3.4.2 Sewage system design 57](#_Toc37753487)

[**3.5 System performance evaluation under uncertain conditions** 59](#_Toc37753488)

[3.5.1 Rainwater system performance assessment 60](#_Toc37753489)

[3.5.2 Sewage system performance assessment 61](#_Toc37753490)

[**3.6 Scheme preferably with optimal collection recommended** 62](#_Toc37753491)

[**3.7 Summary of this chapter** 63](#_Toc37753492)

[**Chapter 4 An optimized design model for urban drainage systems with uncertainty parameters** 64](#_Toc37753493)

[**4.1 Overall framework** 64](#_Toc37753494)

[**4.2 Basic assumptions** 65](#_Toc37753495)

[4.2.1 Urban lots and design units 65](#_Toc37753496)

[4.2.2 Principles for the selection of facility space locations 67](#_Toc37753497)

[4.2.3 The capacity of runoff storage facilities and their spatial distribution 68](#_Toc37753498)

[4.2.4 Other basic assumptions 69](#_Toc37753499)

[**4.3 Model input** 69](#_Toc37753500)

[4.3.1 Design unit attribute data 69](#_Toc37753501)

[4.3.2 Drainage and recycled water data 70](#_Toc37753502)

[4.3.3 Spatial information data 72](#_Toc37753503)

[4.3.4 Facility reference data 73](#_Toc37753504)

[4.3.5 Cost attribute data 74](#_Toc37753505)

[4.3.6 Simulated rainfall data 77](#_Toc37753506)

[4.3.7 Production flow fitting parameter data 77](#_Toc37753507)

[4.3.8 List of rainwater and sewage system input data 78](#_Toc37753508)

[**4.4 Model building** 79](#_Toc37753509)

[4.4.1 Rainwater system model construction 79](#_Toc37753510)

[4.4.2 Sewage system model construction 85](#_Toc37753511)

[**4.5 Algorithm design** 91](#_Toc37753512)

[4.5.1 Overall design ideas 91](#_Toc37753513)

[4.5.2 Rainwater system algorithm design 91](#_Toc37753514)

[4.5.3 Sewage system algorithm design 99](#_Toc37753515)

[4.5.4 Algorithm performance 105](#_Toc37753516)

[**4.6 Model output** 107](#_Toc37753517)

[**4.7 Summary of this chapter** 108](#_Toc37753518)

[**Chapter 5 Case Study: Design of drainage system in the northern part of Kunming City** 109](#_Toc37753519)

[**5.1 Overview of the northern part of Kunming City** 109](#_Toc37753520)

[**5.2 Studying regional generalization and data collection** 110](#_Toc37753521)

[5.2.1 Study of regional generalization 110](#_Toc37753522)

[5.2.2 Basic data collection and quantitative forecasting of uncertain conditions 111](#_Toc37753523)

[**5.3 Design input information** 115](#_Toc37753524)

[5.3.1 Benchmark Design Conditions 115](#_Toc37753525)

[5.3.2 Uncertainty assessment scenario set 120](#_Toc37753526)

[**5.4 System design output under reference conditions** 120](#_Toc37753527)

[5.4.1 Rainwater system design 120](#_Toc37753528)

[5.4.2 Sewage system design 124](#_Toc37753529)

[**5.5 System performance evaluation under uncertain conditions** 128](#_Toc37753530)

[5.5.1 Rainwater system performance assessment 128](#_Toc37753531)

[5.5.2 Sewage system performance assessment 130](#_Toc37753532)

[**5.6 Recommended scenario collection** 134](#_Toc37753533)

[5.6.1 Recommendations for rainwater systems 134](#_Toc37753534)

[5.6.2 Recommendations for sewage systems 135](#_Toc37753535)

[**5.7 Compared with the performance of the current system in the northern part of the city** 137](#_Toc37753536)

[**5.8 Summary of this chapter** 139](#_Toc37753537)

[**Chapter 6 Identification and Analysis of the Design Law of Urban Drainage System under Uncertain Conditions** 141](#_Toc37753538)

[**6.1 Rainwater system** 141](#_Toc37753539)

[6.1.1 Effect of system dispersion/concentration on the performance of the stormwater system 141](#_Toc37753540)

[6.1.2 Coordination between pipeline design reproducation period and runoff space storage 143](#_Toc37753541)

[**6.2 Sewage system** 148](#_Toc37753542)

[6.2.1 Effect of changes in design input conditions on optimal solution sets of sewage systems 148](#_Toc37753543)

[6.2.2 Impact of DWF design principles on sewage system performance assessment results 151](#_Toc37753544)

[**6.3 Summary of this chapter** 153](#_Toc37753545)

[**Chapter 7 Conclusions and Recommendations** 155](#_Toc37753546)

[**7.1 Conclusion**…… 155](#_Toc37753547)

[**7.2 Recommendations**…… 158](#_Toc37753548)

**References** [……. 159](#_Toc37753549)

[**Appendix A List of program documents for design model of rainwater system and sewage system** 173](#_Toc37753550)

[**Appendix B List of spatial and time scale-down model structures and main procedures** 179](#_Toc37753551)

**Acknowledgements** […….… 184](#_Toc37753552)

Relevant Academic Achievements Completed During the Academic Period  [186](#_Toc37753554)

说明

此处引用的目录例子，只作为书写格式的示范，并不代表论文研究内容的示范。

论文目录要求：

（1）中英文各一份；

（2）至少要示明“章和节”的标题、页码；

（3）章的标题的字号：四号Arial加重；

（4）节的标题的字号：小四Arial加重；

（5）目的标题的字号：小四Times New Roman。

望周知。

阅后删除此框及内容。