

CHAPTER 11**DRAINAGE**

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ARTICLE I. SCOPE AND DEFINITIONS**15-11-1. Scope.****15-11-1.1. Short title.**

This ordinance may be referred to as the “Hot Springs Drainage Specification Ordinance.”

15-11-1.2. Adoption.

In order to provide for the health, safety, and general welfare of the public, the City of Hot Springs Board of Directors does hereby adopt the drainage specifications contained hereinafter.

15-11-1.3. Approval required.

No storm drainage facility, whether an enclosed structure, pipe, open channel, ditch, or stream, shall be constructed, altered, extended, or reconstructed within a subdivision, planned development, or a developed area, within a public right-of-way, whether public ownership or easement, or discharging into, upon, or under a public right-of-way within the planning jurisdiction of the City of Hot Springs, Arkansas, without first obtaining written approval of the City of Hot Springs, and all such construction shall meet or exceed the requirements of these drainage specifications.

15-11-1.4. Related standards.

These drainage specifications shall be used in association with the adopted ordinances and regulations pertaining to; (1) subdivisions; (2) planning and zoning; (3) streets; and (4) the Flood Prevention Code. Where two or more of these regulations conflict, or where two or more sections of these drainage specifications conflict, the more restrictive specification shall govern.

15-11-2. Definitions.

(a) The following words, terms, phrases, abbreviations, or acronyms, when used in these drainage specifications, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning.

Cross reference- §16-4-1, Subdivision Code.

AASHTO: American Association of State Highway and Transportation Officials.

AHTD: Arkansas State Highway and Transportation Department.

AHTD Standards or AHTD Specifications: The latest edition of the “Standard Specifications For Highway Construction” as published by the Arkansas State Highway and Transportation Department.

Applicant: The developer.

Approval by City, Submitted For Approval or Similar Terms: Shall refer solely to the action of the city in reviewing a drainage work construction plan submitted by a developer for the purpose of determining whether the proposal conforms with the minimum requirements of these specifications. Such review and approval shall not be construed to indicate that the city has engineered the project, has independently examined or reviewed the engineering design of the project, that the city has thoroughly inspected construction, that purchasers, users, or affected properties should rely on the city’s action as indicating the project is designed or constructed, nor to indicate any other level of review, inspection or supervision in excess or in addition to review of the project to determine that it meets the minimum requirements of these drainage specifications. All acts of approval shall be accomplished only by employees of the city expressly authorized by the board of directors or city manager to accomplish such tasks of approval. Further, in approving the proposed projects as meeting the minimum requirements of these specifications, the city shall rely on the statements and representations made in the developer’s engineering report, plans and specifications.

Agricultural: Any operation for the production of goods by way of land use including crop land, forage production, animal husbandry, dairy and floriculture.

ASTM: American Society for Testing and Materials.

Base Flood: The flood that would result from a 100-year storm event, i.e., the 100-year flood or the once-in-100-year flood.

Board of Adjustments and Appeals: Any references to a board of adjustments and appeals shall mean such appeals board as may now or hereafter exist and be designated by the board of directors to serve in that capacity for the purposes of this code. (Ord. No. 5534, §1, 2-5-07)

Board or Board of Directors: The duly elected governing body of the City of Hot Springs, Arkansas.

Bond, Maintenance: A bond posted by the developer to the city to cover the cost of maintenance, repair, or replacement of a storm-water management, drainage, and/or erosion control project.

Bond, Performance and Payment: A bond posted by the developer of a storm-water management, drainage, and/or erosion control project to guarantee completion of the proposed work, and to guarantee payment of all charges for labor, material, equipment, and all other items and services used or utilized in the project.

Building: Any structure built for the support, shelter or enclosure of persons, animals, materials, or equipment, and having a permanent foundation.

Channel: A course of perceptible extent which periodically or continuously contains moving water and which has a definite bed and banks.

City: The words “the city” or “this city” shall be construed as if the words “of Hot Springs” follow it and shall extend to and include its several officers, agents and employees.

City Engineer: The employee of the city designated by the city manager as the city engineer or acting in the capacity of a city engineer (e.g., public works director).

Commercial Establishment: A unit whose function is to sell goods and/or services at wholesale or retail, where goods are not stored outside buildings, and offices of construction firms where neither materials nor equipment are stored, manufactured, or assembled on site. Establishments which would otherwise be considered within this definition but which have limited or incidental outside storage or assembly may be included in this definition.

Commission: The planning commission of the city of Hot Springs, Arkansas, as established by ordinance of the Hot Springs board of directors.

Conduit: Any open or closed device for conveying flowing water.

County: Garland County, Arkansas.

County Judge: The chief executive officer of Garland County, Arkansas.

Detention: The temporary storage of runoff flows under predetermined and controlled conditions to reduce peak discharge flow rates, and accompanied by controlled release of the runoff waters.

Detention Basin: Any manmade area which serves as a means of controlling and temporarily storing storm-water runoff, and which drains completely between storm events.

Detention Pond: Any manmade structure which serves as a means of controlling and temporarily storing storm-water runoff, and in which a fixed minimum water level is maintained between storm events, except for the lowering due to losses of water due to evaporation or infiltration.

Developer: Any person, firm, corporation, utility, or other entity planning, constructing, altering, reconstructing, or extending any drainage work within the planning jurisdiction of the city of Hot Springs, Arkansas.

Development: Any change of land use or improvement on any parcel of land.

Development, New or Proposed: Any improvements to property which will or may result in a subdivision of property into two or more tracts for sale, lease, or rental, and any development which would require the extension of existing streets or development of new streets.

Differential runoff: The increase or decrease in volume of and/or rate of flow of storm water runoff discharged from a parcel of land or drainage area after a proposed development is completed when compared with the volume and/or rate prior to the development.

Drainage area: The watershed area contributing surface water to a storm water management system.

Drainage facility: Any ditch, channel, swale, pipe, creek, river, culvert, gutter, basin, box, head wall or other structure which does or is designed for conveying or directing the flow of storm water runoff.

Drainage work: Any work of designing, planning, or construction of any item of site grading, installation, or construction of any device or structure to convey or direct the flow of storm water runoff within the planning jurisdiction of the City of Hot Springs Planning Commission.

Easement: Authorization by a property owner for use by another party for all or any part of the owners property for a specific use and purpose.

Engineer: A professional engineer registered to practice in the State of Arkansas.

Engineer, project: The engineer retained by the developer to design a specific storm-water management system.

Erosion: The wearing away of land by the action of wind, water or gravity.

Extraterritorial area: The area between the city limits and the outer boundary of the city planning area as adopted by the Hot Springs board of directors.

Extraterritorial limits: The outer boundary of the city planning area as adopted by the Hot Springs board of directors.

FEMA: The Federal Emergency Management Agency of the U. S. Housing and Urban Development Department.

Flood plain: The land area which is likely to be flooded under a given set of conditions.

Flood plain elevation: The top elevation of the water surface that may result from a storm event under a given set of conditions.

Floodway: The channel of a river or other water course and the adjacent land area through or over which storm water will flow under a given set of conditions.

Frequency: The reciprocal of the exceedance probability.

Impervious surface: A surface on or above the ground surface which is highly resistant to the infiltration of water, specifically including asphalt, concrete, roofs and compacted clays.

Industrial establishment: A unit where a product is manufactured, fabricated, finished, or assembled on site, specifically including but not limited to: printing presses, construction firms where materials or equipment are stored outside, and wholesalers where products are stored outside buildings. Establishments which would otherwise be considered within this definition but which have limited or incidental commercial use may be included in this definition.

Land alteration: The process of grading, clearing, filling, excavating, quarrying, construction or similar activities.

Off-Site: Any premises not located within the bounds of the improvement project.

One-hundred year storm: A rainfall event of a specified duration having a one percent chance of occurrence in any given year.

Planning area: The area within the city limits of the city of Hot Springs plus the extraterritorial area of the City of Hot Springs Planning Commission.

Plat: The legally recorded surveyor's drawing of a parcel of land which subdivides the parcel into two or more tracts.

Runoff coefficient: The amount given in percent terms of the total precipitation on a given area less that amount that is evaporated, entrapped or infiltrated into the soil. The percentage of the total precipitation that can be expected to be discharged from the site on the surface of the ground.

Storm water management system: The various parts and the sum of all the parts of a project which directs the flow of storm water runoff within and from a given site.

Storm water runoff: The water that results from precipitation which is not absorbed by the soil, evaporated into the atmosphere, or entrapped by ground surface depressions or vegetation, which flows over the surface of the ground and is discharged to the ground surface at a given point.

Swale: A shallow waterway less than two feet deep and having side slopes of not steeper than three horizontal to one vertical.

Time of concentration: The time required for runoff to flow from the most remote point in a watershed to a given discharge point.

Watercourse: Any stream, creek, brook, branch, pipe, depression, reservoir, lake, pond or drainage way in or into which storm water runoff flows.

Watershed: The total area of land from which runoff is discharged at a given point.

(b) All definitions regarding streets, and street classifications shall be as given in the Hot Springs Street Specifications Ordinance.

ARTICLE II. GENERAL REQUIREMENTS

15-11-3. Request for approval.

(a) Prior to beginning construction of any drainage work within the jurisdiction of these drainage specifications, the developer shall submit a request for review and approval to the planning department. The planning department shall submit a copy to the city engineer for his consideration. All such requests shall be approved by the city engineer in accordance with the provisions of this ordinance.

(b) In addition to the above, a request for approval for any and all proposed drainage work projects, located within the extraterritorial area shall be submitted to the county judge by the developer.

(c) Three (3) copies of each request shall be submitted and shall include the following documents:

- (1) Letter requesting approval.
- (2) Plans and specifications for the proposed drainage work.
- (3) Vicinity map or other complete description of the location of the proposed drainage work, sufficient to clearly describe the location in such a manner as to enable the site to be easily located on city and/or county maps and in the field.
- (4) Additional information that the city engineer may consider appropriate to the review of the project, including flood information, downstream and/or upstream drainage structures, existing utility locations, soils information, etc.
- (5) Identification of the ownership of the proposed project area and adjacent areas.

(d) The city engineer shall review all complete requests for approval and approve, deny, or approve with conditions in writing any such request for approval of drainage work.

(e) The city engineer shall notify the developer, planning commission and/or the county judge as required herein, in writing, within thirty (30) consecutive calendar days after his office receives such complete request for approval. Such approval shall be a statement that the city engineer finds that the proposed drainage work project, as presented in the submitted documents, meets the minimum requirements of these drainage specifications. This approval shall be referred to as approval of the plans and specifications.

(f) A permit for construction must be issued by the city engineer prior to commencing construction for any drainage work project. Such written notification shall clearly state the city engineer's approval, denial or approval with conditions.

(g) Any incomplete request shall be returned to the developer and such notification shall include a list of items which would be needed to complete the request.

(h) If no written response is made by the city engineer within the thirty (30) consecutive calendar day period after having received a complete request for approval, the plans and specifications shall be considered approved. No such approval shall absolve the developer from the other requirements of these drainage specifications.

(i) Written approval from the city engineer for a drainage work project in an existing development shall constitute acceptance of the plans and specifications as meeting the technical requirements of these specifications and related regulations and ordinances. Construction of the project can begin only after the developer has submitted to the city a performance and payment bond and a maintenance bond, each in the amount of one hundred percent of the estimated construction cost of the project. The performance and payment bond shall guarantee the completion of the construction work as proposed and that all costs of the project are paid. The maintenance bond shall guarantee, for one year after acceptance of the completed construction by the city engineer, the repair or replacement of all or any portion of the project which may prove inferior due to materials or workmanship.

(j) After receiving the required bonds, the city engineer shall issue a permit to the developer to construct the proposed drainage work.

(k) The city engineer's approval, denial, or approval with conditions of the plans and specifications for drainage work in proposed new developments, shall be submitted to the planning commission for further consideration. The planning commission shall have sole authority and responsibility for final approval of proposed drainage work in proposed new developments.

(l) If the proposed project is located within the extraterritorial area, the city engineer's approval, denial or approval with conditions shall be submitted to the county judge.

(m) The request for approval for drainage work within street rights-of-way shall be submitted as a part of the street work project and no separate request will be required. In such combined request, all technical requirements of these drainage specifications shall be met in the drainage work elements of the project.

15-11-4. Requirements to provide storm water management systems in new developments.

(a) All new developments of any kind, shall be required to provide, at the expense of the developer, a storm water and erosion control management system within the development in accordance with these drainage specifications and in accordance with other regulations and ordinances of the city governing drainage work.

(b) Off-site drainage facilities leading away from such developments may also be required to be constructed or otherwise upgraded, at the expense of the developer, to meet the intent of these specifications.

(c) The developer shall dedicate by easement shown on the recorded development plat or by separate recorded drainage easement for all drainage facilities. Such easement shall be not less than twenty (20) feet in width and shall be dedicated to the public for drainage use. Such easements shall be provided for each and every section of all drainage facilities which drain any upstream watershed of five acres or more and are not otherwise located within public rights-of-way.

15-11-5. City participation in drainage work cost.

(a) The city may participate in the construction cost of drainage work within the city limits either adjacent to a development or on a drainage facility leading away from a development if the need for such improvement is not totally caused by the development in question. The appropriateness of any such cost sharing between the developer and the city shall be determined by the planning commission on the recommendation of the city engineer. The city engineer shall base his recommendation on the prorata share of the need for the work as a result of the development versus the need for the work as a result of other factors.

(b) In no case shall the city participate in the cost of drainage work which is located totally within the bounds of the development or which drains only the properties within the development.

(c) A formal hydrological study may be required in connection with a proposed cost share project, if in the opinion of the city engineer and/or planning director, it is required to properly determine cost shares between the developer and the city. The cost of such study shall be paid by the developer.

(d) City participation in any cost sharing project shall be dependence on the availability of funds as appropriated by the board of directors.

15-11-6. Rights-of-way.

Right-of-way width for drainage facilities shall be a minimum of 15' wide and include the width of the pipe, channel, creek, ditch, etc., from top of slope on one side to the top of slope on the opposite side plus a horizontal distance of five feet outside the top of slope on each side. Easements for rights-of-way shall provide for operation, maintenance, repair, cleaning, reconstruction, reshaping and improvement for the purpose of maintaining proper drainage, and shall include access across adjacent properties for operating, maintaining, cleaning, reconstruction, reshaping and improving such drainage facility.

15-11-7. Submission documents.

(a) The letter of request shall be addressed to the planning director or county judge, as required herein. It shall clearly state the purpose of the request, the conditions that created the need for the improvements, and the probable impact of the proposed project on the neighborhood. It shall include the name of the developer and the name of the person who will serve as the developer's representative regarding the project, his address and his telephone number .

(b) The plans shall be submitted on 24" by 36" or smaller drawing sheets. All sheets in any one drainage work project shall be of the same size, shall be bound into one set and shall be on one of the standard sheet sizes, i.e., "A" (8.5" x 11"), "B" (11" x 17"), "C" (18" x 24") or "D" (24" x 36"). Plan drawings shall have a scale of one inch equals one hundred feet or larger. Construction details shall have a scale of one quarter inch equals one foot or larger.

- (1) All plans and specifications for any drainage work project with a probable construction cost of \$25,000 or more shall have been prepared by and bear the seal of a professional engineer registered to practice in the state of Arkansas.
- (2) The city engineer may, when conditions warrant, require that the developer retain the services of a professional engineer to prepare the plans and specifications for a drainage work project of smaller size.
- (3) When required by the city engineer, an engineer's report shall also be submitted. The engineer's report shall be prepared by a qualified engineer retained by the developer and shall include the design calculations, soils investigations, watershed areas, rainfall intensities, flow calculations, and other information used to design the proposed storm water management and erosion control system.
- (4) The plans shall include the following:
 - a. Layout plans of the proposed project at a scale of 1" = 100' or larger. The layout plans shall include the following:
 1. Layout of all elements of the entire drainage work project.
 2. Size, shape, length and location of all pipe, swales, channels and other drainage facilities.
 3. Flow-line elevations at ends, junctions, basins and bends.
 4. Slopes in percent grade for all segments over one hundred feet in length.
 5. Existing and proposed easements.
 6. Existing and proposed contours of proposed development area, based on USGS mean sea level datum.
 7. Existing structures, utility lines, water and sewer lines.
 8. Location and description of reference benchmark.
 9. Watershed outline and watershed areas for each drainage segment.
 - b. Profiles shall be provided for drainage facility sections of 200 feet or greater in length and shall include the following:
 1. A horizontal scale of one inch equals one hundred feet or larger.
 2. A vertical scale of one inch equals ten feet or larger.

3. All elevations shall be shown relative to USGS mean sea level datum.
 4. Natural ground elevations.
 5. Proposed finish grade elevations.
 6. Proposed flow line elevations.
 7. Length and grade of each section.
 8. Location of each junction box, catch basin, curb inlet and all other structures proposed to be installed.
 9. Invert of existing grade at discharge point.
 10. Invert and location of any and all intersecting drainage facilities.
- c. Typical cross sections of all swales, ditches and channels including the following:
1. Width at bottom.
 2. Side slopes.
 3. Proposed surface treatment.
 4. Minimum and maximum depth.
- d. Typical trench detail for drainage pipe installation.
- e. Plan and cross section details for construction of junction boxes, catch basins, curb inlets, valley gutters, retention basins, detention basins, and all other structures necessary for the complete construction of the proposed drainage work.
- (5) Technical specifications shall be placed on the drawings or presented on typed and bound 8.5" by 11" bond paper and shall include the following:
- a. Materials specifications.
 - b. Methods of construction.
 - c. Quality control requirements.
 - d. Sampling and testing procedure.
- (6) The names of the existing owners of the properties within and adjacent to the project boundaries shall be included on the layout plan or on a separate drawing which can be related directly to the layout plan.
- (7) Plans, specifications, and all data submitted in conjunction with the plans and specifications shall constitute a complete design. Any item not specifically included in these documents shall not be considered reviewed nor approved by the city engineer's approval based on these documents.

15-11-8. Responsibilities of the developer.

(a) The developer shall be responsible for installation of the proposed drainage work including all design and construction, and for all cost associated therewith except in situations where cost sharing may be appropriate and is approved by the city.

(b) All formal agreements entered into by the city will be with the developer regardless of the developer's form of organization.

(c) The developer shall provide all engineering services required for planning, design, investigation, inspection, testing, and related activities necessary for drainage work, and shall be responsible for drainage work in accordance with the design approved by the city as satisfying the minimum requirements of these specifications.

(d) When drainage work is located within an existing development, within the city limits, the developer shall provide a performance and payment bond and a maintenance bond to the city. Each bond shall be in the amount of one hundred percent of the estimated construction cost. The bonds shall be provided in one of the following forms.

- (1) A bond issued by a bonding company licensed to do business in the state of Arkansas. The bond shall be in the form approved by the city attorney. A certificate of the power of attorney for the individual executing such bonds shall also be submitted.
- (2) Assignment of bond or bonds from a licensed contractor to the developer for construction of the project in the amounts and in the form specified above. Such bond or bonds shall be assigned to the city by the developer or the city of Hot Springs named on the bond or bonds along with the developer.
- (3) A cash deposit or a cashier's check, in the full amount, made to the city of Hot Springs.
- (4) An irrevocable letter of credit in the full amount. If a letter of credit is utilized, the letter shall be from a bank insured under the Federal Depositors Insurance Corporation, and the city shall have the right of approval for the terms of such letter of credit.
- (5) An escrow account established with a bank which is insured by the Federal Depositors Insurance Corporation. Such escrow account shall be set up for the specific purpose of guaranteeing the performance and payment and/or maintenance of the project, and shall be in the amount of one hundred percent of the estimated project cost.
- (6) The developer may provide a certificate of deposit, treasury bond or other negotiable government security, in the full amount. The instrument will be returned to the developer upon final acceptance of the project by the city.

(e) The performance and payment bond shall remain in effect throughout the construction period and shall not be canceled or otherwise diminished prior to final acceptance of the project by the city.

(f) The maintenance bond shall remain in effect throughout the warranty period and shall not be canceled or otherwise diminished prior to the end of the one year maintenance period.

(g) Where letters of credit or escrow accounts are used in lieu of bonds, the total amount shall not be drawn down or diminished in any way during the construction or maintenance period as applicable.

(h) Where proposed drainage work is located in new developments, the developer may provide the performance and payment bonds as specified above, or he may construct the facilities after approval of the plans and specifications, complete the construction, and then request final approval of the drainage work prior to filing the record plat of the development. In either case, the one year maintenance bond shall be provided by the developer to the city before final acceptance by the city can be granted.

(i) The developer shall provide to the city, a set of reproducible record (as built) drawings after construction is complete, but prior to final acceptance by the city of the drainage work project. Such record drawings shall be submitted at the same scales and with the same requirements as required in the original submitted plans, and shall show the various elements as they were constructed.

(j) The developer shall afford city personnel the right of access to the project site during the plan review and construction phases of the project. The developer shall schedule all activities to provide the city with adequate notice and review time.

(k) The developer shall be responsible for the preparation and submission of all documents required in these drainage specifications, including submission documents, bonds, and as-built drawings.

(l) The developer shall obtain and submit to the city the approval of the county judge for any drainage work project located within the extraterritorial area.

(m) The developer shall notify the city of the date construction is to commence at least five days prior to such date.

(n) The developer shall notify the city when construction is complete and arrange for a pre-final inspection. He shall also notify the city when any punch list items are complete and arrange for any necessary final inspection.

(o) In the case of an emergency, the developer shall proceed to construct the needed repairs to alleviate the emergency condition and shall notify the city engineer of such emergency as soon as practical, and not later than the end of the first working day after such emergency is discovered. For the purpose of these specifications, an emergency condition may

be considered to exist when: (1) an existing condition presents an immediate hazard to the health and safety of the public, (2) existing conditions could result in the immediate flooding of any building used for human habitation or for storage of materials or equipment, and/or (3) existing conditions, if left immediately uncorrected, would result in additional future expenditures of \$2,000 or more.

(p) The developer shall be responsible for acquiring all permits necessary for construction of the drainage facilities including, but not limited to, permits to work on state highway rights-of-way, railroad rights-of-way, wet lands permits, and state and federal storm water permits.

15-11-9. Engineering services.

(a) The design data, plans, specifications, and related information shall bear the name, signature and seal of the project engineer. The registration seal and signature of the project engineer shall be placed on each sheet of the plans and on each additional document submitted for approval.

(b) Soils investigations, materials testing, and quality control testing shall be performed by a laboratory approved by the city engineer. All reports submitted to the city shall bear the name of the project engineer.

15-11-10. Estimates.

Where estimates of construction costs are required to form the basis for bonding amounts or required for any other reason in these specifications, the developer shall have such estimates prepared and submitted to the city engineer. The city engineer shall review such estimates and approve or reject such estimates. If a disagreement as to the estimated cost should occur, the developer may present his justifications to the city engineer for consideration. The city engineer's decision regarding such estimates, after thorough consideration, shall be final.

15-11-11. City's responsibility.

(a) After receiving an incomplete request for approval, the planning department shall notify the developer, in writing, giving notice of the incomplete request and listing the reasons for such incomplete determination as determined by the city engineer.

(b) After receiving a complete request for approval, the city engineer shall conduct a thorough review of the submitted documents and the conditions in the proposed project area and render a decision as to whether or not the proposed project meets the minimum requirements of these specifications.

(c) The city engineer may reject the plans and specifications for failure to meet the minimum requirements, approve the project as meeting the requirements, or approve the project with conditions. Such approval with conditions shall clearly state the changes necessary to bring the project into compliance.

(d) Approval with conditions, shall constitute an approval of the plans and specifications only if the developer incorporates the stated changes in the construction of the project.

(e) After the city engineer has received the required performance and maintenance bonds, the city engineer shall examine the bonds and, if he finds them in order, issue to the developer, within ten (10) business days, a permit to construct the drainage work project.

(f) Approval of the plans and specifications or a permit to construct shall remain in effect for a period of one (1) year from the date of issuance. After that time, a new request for approval and all required documents may be submitted for a new approval. Such resubmitted documents shall be reviewed in accordance with the ordinances and regulations in effect at the time of the new submission.

(g) The city shall observe at various stages of the construction. The city reserves the right to observe the construction at all times.

(h) When the developer notifies the city that the construction is complete, and after the developer has submitted the required maintenance bonds and record drawings, the city engineer shall conduct a pre-final inspection of the constructed project. The city engineer may accept the project as constructed, in writing, as conforming to the approved plans and specifications, or he prepare a punch list of incomplete and unacceptable items.

(i) After the developer has corrected the items on any punch list, he shall notify the city engineer.

(j) The city engineer shall conduct a final inspection of the project and, if he determines that the construction conforms to the approved plans and specifications, issue, in writing, a final acceptance of the project. If, upon inspection, the city engineer finds that the project still does not meet the requirements, a second punch list shall be prepared and submitted to the developer. This process shall continue until the constructed project conforms to the approved plans and specifications and all approved changes thereto.

(k) Where the drainage work project is located in the extraterritorial area, the final acceptance of the city engineer shall be submitted to the county judge.

(l) Upon notification of emergency repairs or construction, the city engineer shall, as soon as practical, inspect such emergency drainage work. Emergency drainage work shall meet the minimum technical requirements of these specifications and require the same procedure for final acceptance as required for any other drainage work project. The city engineer may reject such emergency drainage as not meeting the minimum requirements of these specifications. In this case, the developer shall repair or reconstruct such work in such a manner to bring such drainage work into compliance with these specifications.

ARTICLE III. MINIMUM DESIGN CRITERIA

15-11-12. General design requirements.

(a) The rational method shall be used as the standard method for design of storm water management systems.

(b) At points where the upstream watershed is over 300 acres, or where lakes are included, other methods, such as the soil conservation service TR-55 hydro graph method may be required by the city engineer.

(c) The rational method is based on the formula $Q=CIA$ for estimating runoff from rainfall where:

Q = The rate of flow in cubic feet per second

I = The rainfall intensity in inches per hour

C = The runoff coefficient

A = The area of the upstream watershed in acres

(d) The rainfall intensity shall be based on the time of concentration, the design storm frequency, and the historical records of rainfall as given in "Technical Paper No. 40, Rainfall Frequency Atlas of the United States" as published by the Weather Bureau, U.S. Department of Commerce.

(e) The time of concentration shall include the total time of overland flow, channel flow, and any delays due to lakes, basins or other water bodies. Types of surfaces, hydraulic gradient, and probable future development shall be utilized to arrive at the design time of concentration.

(f) The runoff coefficient shall be based on the reasonable expectation of the ultimate development of the upstream watershed, and the various surfaces of the watershed shall be composited together to arrive at the coefficient for the contributing watershed. The values given in the following tables shall be used as a guide in calculating the runoff coefficient:

RUNOFF COEFFICIENTS			
Area Description	Runoff Coefficient		
	Minimum	Recommended*	Maximum
City Business - Downtown	0.7	0.9	0.95
City Business - Other	0.65	0.75	0.95
City Residential - Single Family	0.3	0.4	0.5
City Residential - Multi-units Detached	0.4	0.5	0.6
City Residential - Multi-units Attached	0.6	0.65	0.75
Suburban - Single Family 1 acre or more units	0.25	0.35	0.4
Suburban - Single Family less than one acre	0.3	0.4	0.5
Industrial	0.5	0.7	0.8
Parks and Cemeteries	0.1	0.25	0.3
Playgrounds	0.2	0.3	0.35
Unimproved	0.1	0.2	0.3

* Recommended values given may be used for ground slopes from three to five percent. Values shall be adjusted for steeper or flatter slopes within the ranges given.

RUNOFF COEFFICIENTS			
Surface Type	Runoff Coefficient		
	Minimum	Recommended*	Maximum
Asphalt Pavement	0.7	0.9	0.95
Concrete Pavement	0.7	0.9	0.95
Gravel	0.25	0.5	0.7
Roofs	0.7	0.9	0.95
Sandy Soils - Bare Vegetation	0.15	0.4	0.55
Sandy Soils - Light Vegetation	0.1	0.3	0.5
Sandy Soils - Dense Vegetation	0.05	0.2	0.3
Loam Soils - Bare Vegetation	0.2	0.4	0.6
Loam Soils - Light Vegetation	0.1	0.3	0.5
Loam Soils - Dense Vegetation	0.05	0.2	0.35
Clay or Silt Soils - Bare Vegetation	0.3	0.5	0.75
Clay or Silt Soils - Light Vegetation	0.2	0.4	0.7
Clay or Silt Soils - Dense Vegetation	0.15	0.3	0.5
Exposed Rock Soils	0.65	0.75	0.9

*Recommended values may be used for surfaces with slopes of three to five percent. Values shall be adjusted for steeper or flatter slopes within the ranges shown.

(g) Storm water management systems shall be designed such that the finished floor of all buildings shall be at least one foot above the once in one hundred year flood elevation.

(h) Storm water management systems shall be designed to prevent flooding of land any more than one time in the number of years given in the following table.

MINIMUM DESIGN FREQUENCY STORM	
Area Description	Storm Frequency (yrs) *
Local Street	5
Minor Collector Street	25
Major Collector Street	25
Arterial Street	50
Highway	50
Railroad	100
Residential Land	10
Commercial Land	25
Industrial Land	25
Parks and Playgrounds	1

* Flooding across any street which may result in a water depth of eight inches or more shall be designed for the once-in-one-hundred-year storm frequency.

(i) All proposed lots or building sites in new developments, which lie within the one- hundred-year flood plain, shall have a minimum finished floor elevation given on the final record plat of such development. Such minimum finished floor elevation shall be at least one foot above the water elevation of the base flood.

(j) All storm water management systems shall be adequate to contain the runoff from the design storm from the project area to an existing waterway of adequate size to carry the runoff flows.

(k) All conduits, channels or other concentrated storm water conveyance shall be intercepted before crossing the curb (or curb-line). Discharges of such concentrated flows shall not be discharged over the curb nor into the gutter or any other portion of the street pavement or shoulder.

(l) No building or other enclosed structure shall be placed within ten feet of any drainage facility.

15-11-13. Flow in conveyance structures.

(a) The flow capacity of drainage structures shall be determined by the manning formula and entrance control.

(b) The coefficient of friction or roughness coefficient to be used shall be as given in the following table.

COEFFICIENT OF FRICTION	
Material	Coefficient of Friction
Bed rock	0.03
Brick in cement mortar	0.013
Clay pipe	0.013
Corrugated Plastic - Smooth Lined	0.013
Corrugated Metal	0.023
Corrugated Metal with paved invert	0.021
Earthen channels -Clean, straight, and smooth	0.02
Earthen channels natural with no weeds	0.03
Earthen channels with weeds or other vegetation	0.04
Portland Cement Concrete	0.013
Rip Rap	0.04
Smooth Plastic	0.01
Steel Pipe	0.015

15-11-14. Curbs and gutters.

(a) Street curbs and gutters shall be an integral part of the storm water management system. To the maximum extent possible, drainage systems, street layout and grades, lotting patterns, and the location of curbs, gutters, curb inlets, catch basins, storm sewers and swales shall be concurrently designed.

(b) Curbs and gutters shall be designed to convey the runoff from the design storm without flooding the street centerline or overflowing the top of the curb.

(c) Gutter drainage shall be intercepted by curb inlets, catch basins or other approved facility and placed into storm sewers or channels. Such curb inlets, etc., shall be placed at intervals of not greater than eight hundred feet.

(d) No runoff based on the design storm shall be allowed to flow across the centerline of any street except where valley gutters are specifically authorized.

(e) Valley gutters may be used across intersections of local residential and local industrial streets at points where the total gutter flow distance, including the distance across the valley gutter, does not exceed the total length of eight hundred feet.

(f) In high pedestrian areas, curb inlets shall be placed to prevent excessive amounts of runoff water in the pedestrian crosswalk based on the ten-year storm.

(g) The construction details for curbs and gutters and valley gutters shall be as given in Appendix "A" to these specifications.

Editor's note-Appendix A to the Hot Springs Drainage Specifications Ordinance is on file in the Office of the City Clerk.

15-11-15. Storm sewers.

(a) Storm sewers may be underground circular, elliptical, or arch pipe or underground rectangular cast in place or pre cast concrete sections.

(b) The minimum storm sewer pipe shall be 15 inches in diameter or an equivalent arch pipe.

(c) Storm sewers shall be provided with a means of access at all horizontal bends and at vertical grade breaks of three percent or more. Access may be provided by means of curb inlets with manhole access, catch basins with removable grates, by junction boxes with manhole access or by standard sewer manholes.

(d) Curb inlets, catch basins, junction boxes and manholes shall be constructed with the details shown in Appendix "A."

Editor's note-Appendix A to the Hot Springs Drainage Specifications Ordinance is on file in the Office of the City Clerk.

(e) All storm sewers shall be designed so as to maintain a minimum velocity of 2.5 feet per second and a maximum velocity of 15 feet per second when flowing full.

(f) Provisions shall be made at the discharge points of storm sewers to prevent erosion of the receiving stream and the surrounding area.

(g) The minimum cover over storm sewers shall be one foot between the top of the sewer and the finish grade.

15-11-16. Open channels.

(a) Open channel storm-water conveyance structures may consist of swales, constructed channels or natural or improved creeks and streams.

(b) Unpaved grass lined channels may be used where the design storm velocities do not exceed six feet per second. All unpaved channels shall be seeded, plugged or sodded immediately after their construction and adequate measures taken to prevent erosion.

(c) Side slopes of unpaved open channels shall have a minimum of three horizontal to one vertical. Side slopes for open channels for any area that may be mowed by lawn mowers, including residential, commercial and industrial areas shall have a minimum of four horizontal to one vertical.

(d) Special protection such as head walls or rip-rap will be required at all points in otherwise unpaved channels such as bends, junctions, inlets and outlets where erosion may occur.

(e) All open channels having a velocity of more than six feet per second shall be paved with an erosion control material. Such material may be concrete, brick, rock or other lining material approved by the city engineer.

(f) Paved open channels may utilize steeper side slopes with the following provisions:

(1) Reinforced concrete lined channels may use vertical slopes. Reinforced concrete channels with side slopes of less than three horizontal to one vertical and a depth of nine inches or more shall be provided with safety devices, such as hand rails, to prevent accidental falls into the channel.

(2) Brick and rock (rip rap) lined open channels shall have minimum side slopes of one horizontal to one vertical.

(g) Concrete lined open channels shall have a minimum of four inches thick concrete and have a minimum of ten gauge wire reinforcing at six inches on center.

(h) Brick lined open channels shall have standard thickness brick with full mortared joints.

(i) Rock lined open channels shall be of rip rap meeting AHTD specifications and shall be installed over a minimum of six MIL thickness of continuous polyethylene fabric.

ARTICLE IV. DRAINAGE FACILITY MATERIALS

15-11-17. Pipe culverts and storm drainage pipe.

Materials for pipe culverts and storm drainage pipe shall be reinforced concrete, closed profile plastic pipe or corrugated plastic pipe meeting the following specifications and limitations:

- (a) Reinforced concrete pipe shall be Class III or higher with bell and spigot joints and conform to the requirements of the latest editions of the following standards.
- (1) AASHTO M170 or ASTM C76 - Circular pipe, minimum wall thickness "B."
 - (2) AASHTO M206 or ASTM C506 - Arch shaped pipe.
 - (3) AASHTO M85 or ASTM C14 - Horizontal elliptical pipe (major axis horizontal).
 - (4) AASHTO M207 or ASTM C507 - Vertical elliptical pipe (major axis vertical).
 - (5) AASHTO M280 - Testing.

The class of pipe and date manufactured shall be marked on each joint of pipe section. Pipe shall be at least ten (10) days old before it is delivered to the project site. Joints shall be sealed with compression type pre-formed rubber gaskets or bitumen/butyl rubber plastic gaskets.

- (b) Corrugated plastic pipe shall be smooth interior corrugated high density polyethylene. The manufacturer and furnishing of corrugated plastic pipe shall conform to latest edition: AASHTO M294 Type "S" for sizes 15 inches to 36 inches, MPG - 95 Type D or S for sizes 42 inches to 48 inches, and MPX-97 for sizes 54 inches and 60 inches. Couplings and fittings supplied and recommended by the pipe manufacturer shall be used. Factory installed bell and spigot joints with O-ring gaskets meeting ASTM F477 are preferred.
- (c) Closed profile plastic pipe shall be closed profile polyvinyl chloride (PVC) pipe. The manufacturer and furnishing of pipe and fittings shall conform to ASTM F794 and uni-bell UNI-B-9. Pipe shall be installed in accordance with the pipe manufacturer's guidelines.
- (d) Corrugated plastic pipe shall be terminated with head walls, catch basins, junction boxes, curb inlets or other structures in order that the ends of the pipe may be protected from damage.
- (e) Jointing of pipe culverts shall be in accordance with Section 606 of the AHTD standards.

15-11-18. Miscellaneous materials.

- (a) Portland cement concrete for paved liners and other structures shall have a 28-day compressive strength of 3000 pounds per square inch.
- (b) Rip-rap shall meet the requirements of the AHTD specifications.

ARTICLE V. VARIANCES & PENALTY**15-11-19. Variances.**

(a) The rules and regulations set forth in these regulations are the standard requirements of the city. Where the applicant alleges that extraordinary hardships or practical difficulties may result from strict compliance with these regulations, or the purpose of these regulations may be served to a greater extent by an alternative proposal, the city engineer shall review such requests for variances and shall forward his recommendation to the board of adjustments and appeals for final action so that substantial justice may be done and the public interest secured. Such variances, however, shall not have the effect of nullifying the intent and purpose of these regulations. The following criteria shall be used to determine whether a variance shall be granted:

- (1) The conditions upon which the request for variance is based are unique to the property because of its particular physical surroundings, shape or topographical conditions.
- (2) The granting of the variance will not be detrimental to the public safety, health or welfare of, or injurious to, other property.

(b) No variance shall be granted except upon written petition by the developer when the request for approval is filed with the city. The petition shall state fully the grounds for the variance and all of the facts upon which the petition is made. In approving variances, the board of adjustments and appeals may, at its option, require special conditions to ensure construction in accordance with objectives, standards and requirements of this Ordinance. (Ord. No. 5534, §2, 2-5-07)

(Ord. No. 4834, § 1, 12-6-99)

Cross reference-Board of adjustments and appeals, §2-8-14.

15-11-20. Penalty.

The penalty for violation of this ordinance shall, upon conviction in the Hot Springs Municipal Court, or any other court of competent jurisdiction, be such fines and penalties as established by the general penalty clause for the Hot Springs Code of Ordinances as may now or hereafter be enacted by the Hot Springs Board of Directors. (Ord. No. 4960, § 19, 3-5-01)

Cross reference-Violation of building and development codes - disconnection of water service, §15-1-8.

15-11-21. Alternative material and methods.

Developers may propose alternative materials, methods, and designs in accordance with the U.S. Green Building Council, Leadership Energy and Environmental Design (LEED) voluntary rating system. Such proposals must include documented evidence from professional engineers, architects, or environmental planners demonstrating the effectiveness of the proposed alternative materials, methods, and designs in meeting the intent and purpose of these regulations. For purposes of this section a LEED consists of a long-term, integrated, systems approach to developing and achieving a healthy community by jointly addressing economic, environmental, and social issues. Any such proposals must be specifically approved by the Planning Commission and the City Engineer. (Ord. No. 5053, §1, 1-22-02)

ARTICLE VI. EXISTING DRAINAGE STRUCTURES

15-11-22. Closing open ditches in residential areas.

Property owners in pre-existing residential areas shall be permitted to closed open drainage ditches within the right-of-way of public streets along their property in accordance with the provisions of this section. The ditch section to be closed must include the total length from the upstream point of origin to connection with the nearest downstream closed system or other approved drainage facility. In this regard, the permit application must include a signed statement from all affected property owners indicating their agreement with the proposed project. All costs associated with the closing shall be paid by the property owners. Any ditch closed pursuant to this section shall also include the installation of curb and gutter. Any work undertaken pursuant to this section shall be permitted, designed, approved and accomplished in accordance with the applicable provisions of this ordinance regulating the design, materials and installation of drainage systems, including design and submission of project plans by a Professional Engineer. (Ord. No. 5186, §1, 5-5-03)