DESIGN CRITERIA FOR
STORM DRAINAGE FACILITIES

A. GENERAL. All development plans submitted for approval to the City of Liberty must be accompanied by an adequate storm drainage system analysis and design performed by a licensed professional engineer in the State of Missouri in accordance with the criteria described in the Kansas City Metro Chapter APWA Division V – Section 5600 "Storm Drainage Systems & Facilities" as amended by the City. Exceptions and additions to KC APWA Section 5600 are detailed in the following Section.

B. KC-APWA SECTION 5600 – CITY OF LIBERTY ADDITIONS/EXCEPTIONS.

GLOBAL STATEMENTS

- Any regulations, equations or departments referenced to "Kansas" are not applicable.
- Wherever the term "City/County" is used, replace with "City of Liberty" or simply "City"
- Wherever design manual is in conflict with the City Code, standards or policies, the City's Code, standards or policies shall rule.

EXCEPTIONS/ADDITIONS

- Section 5601.2 - Replace definition of City: "The City of Liberty."

- Section 5601.2 - Replace definition of Swale: "A shallow channel intended to convey stormwater."

- Section 5601.5.A.1 - Add: "d. Storm drainage along the side lot lines of residential property for pipe sizes less than 48" in diameter shall be in conduit to a point seventy-five (75) feet beyond the front yard setback. Extension of the system shall then be continued from this point the full length of the side lot line or to the nearest natural drainage way of a larger tributary stream with a stable ditch section. Pipes 48"in diameter or greater shall terminate at or beyond the right-of-way unless approved by the Director."

- Section 5601.8.A.2.a. – Replace "openings in a building" with "lowest floor". Delete "Where 10% storm flows are less than 8 cfs, freeboard may be reduced to 6 inches."

- Section 5601.8.A.2.b. –Delete "Where 10% storm flows are less than 8 cfs, freeboard may be reduced to 6 inches."

- Section 5601.8.D.1 – Delete all.

- Section 5604.1.B – Revise: The minimum dimensions are per the City of Liberty Standard Drawings and apply to steep-faced curbs (CG-1).

Opening length, inside	4.0 ft (min)
Width, perpendicular to curb line, inside	3.0 ft (min)
Setback curb line to face	1.0 ft (min)

Opening, clear height	10 in. (min)
Gutter transition length	
(a) Both sides in sump and upstream side on slopes	10.0 ft (min)
(b) Downstream on slopes	5.0 ft (min)

- Section 5604.2 Replace: "Gutter Flow: Inlets shall be located to limit the width of flow in street gutters at the time of peak discharge for the design storm specified in 5601.8.B to provide a minimum 10 foot wide travel lane for emergency vehicles. Spread may exceed these limits within 50 feet of a sump inlet.

- Section 5605.3.B.2 – Delete.

- Section 5605.5.A.5 through Section 5605.5.A.7 – Delete.

- Section 5605.5.B through Section 5605.5.D – Delete.

- Section 5605.5.F – Delete "Riffle Spacing/Bank-full width…..5 to 7"

- Section 5605.5.G – Replace section with "Channel Condition: A qualitative analysis of the general condition of the natural stream prior to development shall be provided. In summary, this should indicate the stability of the stream and stream banks and possibly address any special considerations to protect the stream during construction."

- Section 5605.10 – Replace section with "Floodplain Fills: Although filling of floodplains is discouraged, Chapter 30 of the City Code shall dictate the conditions for filling of floodplains."

- Section 5606.1 – Add "A wider easement may be required if the depth of cover exceeds four (4) feet."

- Section 5607.2 – Replace "..will be publicly maintained." with "..convey water as part of the public drainage system or overflow for the public drainage system."

- Section 5607.2.A – Remove "Generally, easements shall be required for swales that collect stormwater runoff from more than two acres or as required by the City/County."

- Section 5607.5 – Remove "grouted rip rap"

- Section 5608.2.A – Insert: "or easement lines" after "property lines" in the first sentence.

- Section 5608.2 – Replace last paragraph with: "Detention facility easements are required on all detention facilities. If the detention facility is to be maintained by the City, land equal to the minimum area required for easements may be dedicated by recorded deed to the City."

- Section 5608.3 – Add: "Maintenance of detention facilities may include: 1. Removal of debris from basin surface to minimize outlet clogging and improve aesthetics; 2. Removal of sediment buildup; 3. Repair and revegetation of eroded areas. 4. Performance of structural repairs to inlet and outlets. 5. Routinely mowing to limit unwanted vegetation."

- Section 5608.4.A.4 – Add: "Areas above the normal high water elevations of the detention facility should be sloped toward the basin to allow drainage and to prevent standing water. Careful finish grading is required to avoid creation of upland surface depressions that may retain runoff."

- Section 5608.4.E.7 – Add "A low flow orifice capable of releasing the channel protection volume over 24 hours must be provided."

- Section 5608.4.E.8 – Add "Seepage control or anti-seep collars should be provided for all outlet pipes."

- Section 5608.4.F.1 – Add: "The emergency spillway shall be designed such that the top of the dam is not breached in the 1% storm."

- Section 5608.4.G – Delete this subsection.

- Section 5608.4.H – Delete "and drain works" and then Add "and low flow channels within the basins" after "..conveyance system entrances to basins,"

- Section 5608.4.I – Add: "Inflow: Inflow channels may be stabilized with flared riprap aprons, turf reinforcement mats, or other methods to prevent erosion at the expected velocities."

- Section 5608.5.B.2 – Replace "sodded" with "vegetated".

- Section 5608.5.B.3 – Delete "…and at least 25% of the perimeter shall have a slope of 5 to 1 or flatter."

- Section 5608.5.C – Add "Additionally, "green" roof technology that utilizes plant material to provide storage, treatment and evapotranspiration of the stormwater can be utilized to achieve quantity control requirements as well as water quality objectives. The green roof industry has a resource portal at www.greenroofs.com."

- Section 5608.5.D – Remove and replace with "Parking lots paved with traditional impervious pavements may be designed to provide temporary detention storage of stormwater on a portion of their surfaces. Generally, such detention areas shall be in the more remote portions of such parking lots. Depths of storage shall be limited to a maximum depth of six inches, and such areas shall be located so that access to and from parking areas is not impaired.

  Parking lots paved with pervious pavements or that are designed with innovative turf reinforcement techniques may be designed to provide temporary detention storage of stormwater below their surface in the pore spaces of granular media. The designer

should consider the infiltration rate of the soil beneath the media. Soil infiltration, underdrains or a combination of the two should provide discharge of at least 80 percent of the detention storage volume within 24 hours."

- Section 5608.5.E – Add "microdetention, bioretention, bioswales, cisterns" before the "etc." Then after that sentence add "Design underground detention facilities with adequate access for maintenance (cleaning and sediment removal). Provide such facilities with positive gravity outlets. Design venting sufficient to prevent accumulation of toxic or explosive gases."

- Section 5609.3 – Add "It may be acceptable to combine elements of the above types of sheets in lieu of separate sheets."

- Section 5609.4 – Replace "22" with "24".

- Section 5609.5 – Revise to [Plan: 1"=50' and Profile: Vertical: 1" = 10'; Horizontal: 1" = 50'].

- Section 5609.6.F – Remove "as well as signature block for the owner/developer."

- Section 5609.7.B – Remove "bar" and Add "where possible" to the end of the second sentence.

- Section 5609.8.A – Remove "bar" and Add "where possible" to the end of the second sentence.

- Section 5609.8.N – Delete "..and invert elevations." (duplicate)

- Section 5609.9 – Replace this section with "A typical cross-section shall be provided showing bottom width, side slopes, and lining information. Additional cross-section details may be required at structures and intersecting drainage systems or as necessary to provide detail beyond that shown on any grading plan. Cross-sections may also be required for overflow drainage paths that are designated to convey overland flows in excess of the underground system capacity."

- Section 5609.10.A - Remove "bar" and Add "where possible" to the end of the second sentence.

- Section 5609.14 – Replace section with "Grading Plan Sheets: Grading plan sheets shall be included as necessary to show sufficient detail in how overall drainage is being handled on the site (including areas outside of street rights-of-way). This shall include, but is not limited to, addressing how sheet flow is handled as it enters and exits the site and how overflow drainage is handled. More detail will be required for site plans where final building layouts are known."

C. MINIMUM STANDARDS OF DESIGN. Storm water runoff shall be carried by enclosed systems or open channels on the basis of criteria established in this section, or otherwise managed utilizing stormwater Best Management Practices (BMPs) as designed per criteria set forth in the most recent version of the MARC/APWA Manual for Best Management Practices for Stormwater Quality, and subject to the final determination and approval of the City Engineer.

Best Management Practices for Stormwater Quality: The Kansas City Mid-America Regional Council (MARC) and the Kansas City Metro Chapter of the American Public Works Association (APWA) have developed the Manual for Best Management Practices for Stormwater Quality as a guide for applying stormwater Best Management Practices (BMPs) to land development within the Kansas City Metropolitan Area and the MARC planning region. The manual addresses the need to control the volume and quality of stormwater discharges from developed sites, both of which are crucial requirements for protecting human life and property, maintaining overall water quality, and for creating more environmentally sensitive site designs.

BMP designs shall conform to the criteria as set forth in the most recent version of the MARC/APWA Manual for Best Management Practices for Stormwater Quality.

Storm Detention Facilities Easements: Easements for storm detention facilities shall be the area providing storage for the peak design storm, plus additional width on all sides deemed necessary by the City to allow access for maintenance equipment.