Class 1: New Stormwater Tools & the Design and Construction Process

Maria Neeland PE, CFM
Mary Halley PE
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Introduction to the Ordinance & Handbook

https://www.topeka.org/utilities/stormwater-development-management/
Important Terms

Best Management Practice (BMP)

A structural facility used to manage stormwater runoff from a property after construction

NOT sediment & erosion control BMPs

Bioretention BMP on Jackson Street in Topeka

Extended Dry Detention BMP
Important Terms

Stormwater **Quality** BMP

A BMP that “treats” runoff to protect streams and properties from pollutants in stormwater

*Bioretention BMP on private property in Topeka*

*Bioretention BMP on Jackson Street in Topeka*
Important Terms

Stormwater Quantity BMP
A BMP that manages runoff to protect onsite & downstream properties from flooding.
Goals for Topeka’s code revisions

- Comply with Topeka’s Municipal Stormwater Permit and EPA audit findings
  - Stormwater quality treatment
  - Municipal design plan review, construction, and maintenance processes

- “Modernize” and improve by aligning stormwater quality & quantity rules

- Use our improved understanding of Topeka streams for smarter regulation

- Use compliance & engineering methods that are locally relevant, effective, familiar, and flexible
Topeka’s Stormwater “Tools”

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TMC Chapter 13.15</td>
<td>Drainage system design (inlets pipes, culverts, channels, etc.)</td>
<td>Supports the requirements of TMC Chapter 13.35</td>
</tr>
<tr>
<td>TMC Chapter 13.30</td>
<td>Refers to the Stormwater BMP Design Handbook for design of stormwater quantity BMPs (detention and retention facilities)</td>
<td>Stormwater quality BMP design</td>
</tr>
<tr>
<td>TMC Chapter 13.35</td>
<td>Refers to the Stormwater BMP Design Handbook for plan preparation and submittal requirements</td>
<td>Stormwater quantity BMP design (detention and retention facilities)</td>
</tr>
<tr>
<td>TMC Chapter 13.40</td>
<td>Requirements and guidance for erosion prevention and sediment control practices</td>
<td>Stormwater management plan (i.e., drainage report) requirements</td>
</tr>
<tr>
<td>TMC Chapter 17.10</td>
<td></td>
<td>Stormwater BMP Record Drawing requirements</td>
</tr>
<tr>
<td>TMC Chapter 17.30</td>
<td></td>
<td>Property Owner’s Guide to Stormwater BMP Maintenance</td>
</tr>
</tbody>
</table>

- Supports the requirements of TMC Chapter 13.40
- Requirements and guidance for stormwater quality and quantity BMP protection, inspection, and maintenance
- Performance standards for stormwater quality and quantity BMP inspections
- Stormwater quality and quantity BMP inspection checklists

Table 1-2 in Handbook, Chapter 1, Section 1.4
Design Rules Working Together

The “Stormwater DESIGN & CONSTRUCTION Ordinance” (TMC Chap. 13.35)

- **Clarified** rules for stormwater *quality* BMP design and construction
- **Added** rules for stormwater *quantity* BMP design and construction
- **Added** rules for stormwater plan preparation and submittal

**For BMP design, the ordinance refers to:**

<table>
<thead>
<tr>
<th>Design Criteria &amp; Drafting Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage system design (i.e., inlets, pipes, channels, culverts)</td>
</tr>
<tr>
<td>Detention/Retention basin design</td>
</tr>
<tr>
<td>Design plan preparation and submittal requirements</td>
</tr>
<tr>
<td>Erosion and sediment control practices</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stormwater BMP Design Handbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design standards for stormwater quality BMPs</td>
</tr>
<tr>
<td>Design standards for detention &amp; retention basins, now watershed-based</td>
</tr>
<tr>
<td>Design plan preparation and submittal requirements</td>
</tr>
</tbody>
</table>
CODE REVISIONS:

- Update and clarify stormwater **quality and quantity** requirements
- Insert stormwater design plan checklist
- Insert new construction termination rules
  - Stormwater BMP Record Drawing
  - Final Inspection

DOES NOT INCLUDE:

- Calculation methods
- BMP design requirements
- Helpful checklists and support tools

**In the new Stormwater Design Handbook**

New to Topeka

Establishes **core requirements** for stormwater BMP design & const.
Stormwater BMP Design Handbook

Chapters
1. Introduction
2. Design Process & Plans
3. SW Quality Design
4. SW Quantity Design
5. LID Techniques

Appendices
A. Acronyms & Definitions
B. Required Forms
C. BMP Record Drawing checklist
D. BMP Certification Statement
E. BMP Design Procedure Forms
Chapter 1 - Introduction

- Negative impacts of runoff & benefits of management
- Handbook overview & relationship w/ City Code
- Handbook objectives & alignment w/ City Plans
- How to use the Handbook
- Companion resources
- City Utilities Contact Info

Table 1-3: Summary of Code Requirements and Supporting Information Provided in the Handbook

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TMC Chapter 13.35 - Stormwater Management</strong></td>
<td></td>
</tr>
<tr>
<td>• Code applicability and waivers</td>
<td>• Provides technical information for stormwater quantity performance criteria and justification to support waiver for criteria by the director</td>
</tr>
<tr>
<td>• Requirement to comply with stormwater quality performance criteria</td>
<td>• Provides ample guidance for implementation of LID techniques, especially those identified in the MARC/APWA BMP Manual</td>
</tr>
<tr>
<td></td>
<td>• Refers to MARC/APWA BMP Manual for compliance calculations and stormwater quality BMP design specifications</td>
</tr>
<tr>
<td>• Requirement to comply with stormwater quantity performance criteria</td>
<td>• Provides policies and guidance for compliance and design of stormwater quantity (detention/retention) BMPs</td>
</tr>
</tbody>
</table>
Chapter 2 – Design Process & Plans

- Key stakeholders & concepts
  - Developers & Designers
  - City of Topeka
  - Future Property Owner

- Design Process Flowcharts
  - Pre-Design Planning (Hydrologic Characterization)
  - Design Standards Applicability
  - Design, Construction, & Construction Termination
  - Post-Construction Inspection & Maintenance

- Plan Requirements
  - Stormwater Management Plan (SWMP)
  - Stormwater BMP Record Drawing

- Stormwater BMP Record Drawing Inspection
Handbook Chapter 2

Example BMP Location Map

Example BMP Planting Plan
Chapter 3 – Stormwater Quality Design

- Performance Standard and General Policies
  - Refers to MARC Manual

- Guidance on Green Infrastructure BMPs

- Policies for Infiltration (GI) BMPs
  - Feasibility criteria
  - Infiltration criteria
  - Underdrain criteria
  - Infiltration test requirements

- Policies for Vegetated BMPs
  - Native vs. Non-Native Species
  - Policies and Resources

- Policies for Manufactured Treatment Devices

- Guidance on BMP Selection, Location, & Protection

- Aligning Stormwater Quality & Quantity Designs

- Introduction to Green Street Design
Table 3-1. Stormwater Quality BMP Value Ratings (adapted from MARC/APWA BMP Manual, 2012)

<table>
<thead>
<tr>
<th>Cover Type or BMP</th>
<th>Median Expected Effluent EMC TSS (mg/L)</th>
<th>Value Ratings</th>
<th>Overall Value Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Water Quality Value</td>
<td>Volume Reduction</td>
</tr>
<tr>
<td>Native Vegetation Preserved/Established</td>
<td>N/A</td>
<td>5.25</td>
<td>2</td>
</tr>
<tr>
<td>Rain Garden</td>
<td>&lt; 10</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Infiltration Basin</td>
<td>&lt; 10</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Infiltration Trench</td>
<td>&lt; 10</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Bioretention</td>
<td>&lt; 10</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Pervious Concrete</td>
<td>10 - 20</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Porous Asphalt</td>
<td>10 - 20</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Modular Concrete Block</td>
<td>10 - 20</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Extended Detention Wetland</td>
<td>&lt; 10</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Surface Sand Filter</td>
<td>&lt; 10</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Underground Sand Filter</td>
<td>&lt; 10</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Pocket Sand Filter</td>
<td>&lt; 10</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Perimeter Sand Filter</td>
<td>&lt; 10</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Extended Wet Detention Basin</td>
<td>10 - 20</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Vegetated Filter Strip</td>
<td>10 - 20</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Extended Dry Det. Basin (Native Veg.)</td>
<td>20 - 50</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Extended Dry Det. Basin (Non-Native Veg.)</td>
<td>20 - 50</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Native Vegetation Swale</td>
<td>10 - 20</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Non-Native Grass Vegetation Swale</td>
<td>10 - 20</td>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td>Other Systems (Manufactured Treatment Devices)</td>
<td>10 - 100</td>
<td>1 – 3</td>
<td>0</td>
</tr>
<tr>
<td>- Proprietary Media Filtration Devices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Hydrodynamic Devices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Baffle Boxes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Catch Basin Inserts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approved on a case-by-case basis.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See Section 3.6 for design requirements.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Roofs</td>
<td>No VR; Post-construction CN credit; See MARC/APWA Manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisterns</td>
<td>No VR; Post-construction CN credit; See Appendix F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 3-2. Example of Appropriate Spacing and Depth for Soil Infiltration Tests
## Handbook Chapter 3

### Stormwater Quality BMP Value Rating

<table>
<thead>
<tr>
<th>Land Use of Project or Areas Within a Project</th>
<th>Commercial</th>
<th>Industrial</th>
<th>Parking Lots</th>
<th>Roadways Shoulder &amp; Medians</th>
<th>Parks &amp; Open Space</th>
<th>Residential SFR Indiv. Lots</th>
<th>SFR Common Lots</th>
<th>Multi-Family Res.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Veg. Preserved/Established</td>
<td>9.25</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Rain Garden</td>
<td>9.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Infiltration Basin</td>
<td>9.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Infiltration Trench</td>
<td>9.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Bioretention</td>
<td>8.5</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Pervious Concrete</td>
<td>7.5</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Porous Asphalt</td>
<td>7.5</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Mod. Concrete Block</td>
<td>7.5</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>ED Wetland</td>
<td>7.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Surface Sand Filter</td>
<td>6.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Underground Sand Filter</td>
<td>6.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Pocket Sand Filter</td>
<td>6.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Perimeter Sand Filter</td>
<td>6.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Ext. Wet Detention</td>
<td>5.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Vegetated Filter Strip</td>
<td>5.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Native Vegetation Swale</td>
<td>4.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Vegetation Swale (Turf)</td>
<td>1.5</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>ED Detention Basin (Native Veg.)</td>
<td>4.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>ED Detention Basin (Turf)</td>
<td>2.0</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Prop. Media Filter</td>
<td>*</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Hydrodynamic Device</td>
<td>*</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Baffle Boxes</td>
<td>*</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Catch Basin Inserts</td>
<td>*</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Green Roof</td>
<td>*</td>
<td>●</td>
<td>●</td>
<td>Ｘ</td>
<td>Ｘ</td>
<td>●</td>
<td>●</td>
<td>Ｘ</td>
</tr>
<tr>
<td>Cistern</td>
<td>*</td>
<td>○</td>
<td>●</td>
<td>Ｘ</td>
<td>Ｘ</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
</tbody>
</table>

- ● = Usually very well suited for application on this land use. Check design specifications.
- ○ = May be suitable for application on this land use, if project or hydrologic conditions allow. Check design specifications.
- ○ = Usually not for application on this land use but may be appropriate in limited situations. Check design specifications.
- Ｘ = Not suitable for land use.
- * = See Value Rating information on City website.
# Handbook Chapter 3

## Table 3-4. Stormwater Quality BMP Selection Based on Physical Constraints, Costs and Other Criteria (for BMPs used for TMDL 13.35 compliance. Table footnotes are on the next page.)

<table>
<thead>
<tr>
<th>BMP Type</th>
<th>Value Rating</th>
<th>Stormwater Quantity Impact</th>
<th>Physical Constraints</th>
<th>Cost Considerations</th>
<th>Other Policies of Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Native Vegetation Preserved or Established</strong></td>
<td>9.25</td>
<td>Yes No</td>
<td>NA</td>
<td>No restriction</td>
<td>Green infrastructure BMP • Vegetated BMP (see Sections 2.6.1 &amp; 3.4.3) 20%</td>
</tr>
<tr>
<td><strong>Rain Garden</strong></td>
<td>9.0</td>
<td>Yes Minimal</td>
<td>&lt; 1 acre</td>
<td>A or B required</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Infiltration Basin</strong></td>
<td>9.0</td>
<td>Yes Yes</td>
<td>5 acres</td>
<td>A or B required if not using an underdrain</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Infiltration Trench</strong></td>
<td>9.0</td>
<td>Yes Yes</td>
<td>&lt; 5 acres</td>
<td>A or B required if not using an underdrain</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Biofiltration</strong></td>
<td>8.5</td>
<td>Yes Yes</td>
<td>&lt; 4 acres</td>
<td>No restriction, underdrain always required</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Pervious Concrete, Porous Asphalt, Mix. Concrete Block</strong></td>
<td>7.0</td>
<td>Undrained required</td>
<td>Immensurate area draining to BMP &lt; 2/3 the total drainage area</td>
<td>Low Med High</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Extended Detention Wetland</strong></td>
<td>7</td>
<td>No Yes</td>
<td>2 to 1,000 acres</td>
<td>Budget analysis</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Sand Filter: Surface, Undrained Pocket, &amp; Perimeter</strong></td>
<td>3-5</td>
<td>No Yes</td>
<td>Varies (see design specifications)</td>
<td>No restriction, underdrain always required</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Vegetated Filter Strip</strong></td>
<td>5</td>
<td>Yes No</td>
<td>As large as needed</td>
<td>No restriction</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Vegetation Swale</strong></td>
<td>4 (native)</td>
<td>Yes No</td>
<td>&lt; 5 acres</td>
<td>No restriction</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Extended Dry Detention</strong></td>
<td>4</td>
<td>No Yes</td>
<td>2 to 1,000 acres</td>
<td>Budget analysis</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Proprietary Media Filtration Device</strong></td>
<td>3-5</td>
<td>No No</td>
<td>Manufacturer's specs</td>
<td>No restriction</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Hydrodynamic Device</strong></td>
<td>3-5</td>
<td>No No</td>
<td>Manufacturer's specs</td>
<td>No restriction</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Catch Basin Insert</strong></td>
<td>3-5</td>
<td>No No</td>
<td>Manufacturer's specs</td>
<td>No restriction</td>
<td>Low Med High</td>
</tr>
<tr>
<td><strong>Green Roof</strong></td>
<td>Roof area has CN&lt;75</td>
<td>Yes No</td>
<td>NA</td>
<td>NA</td>
<td>High Med High</td>
</tr>
<tr>
<td><strong>Cistern/Rainwater Harvesting</strong></td>
<td>1-10</td>
<td>Yes No</td>
<td>Volumetric</td>
<td>NA</td>
<td>Low Med High</td>
</tr>
</tbody>
</table>

---

*Note: Landscape credit available for BMP is shown in parentheses.*
Chapter 4 – Stormwater Quantity Design

» Performance Standards (Watershed Based)

» Detention/Retention Design Specifications (APWA-based)
  • General policies
  • BMP specific policies
  • Computations requirements & methods
Handbook Chapter 4

Left: Tall grass buffer help to create a “naturalized” stormwater pond that deters waterfowl residence. Source: Lake County, IL. Right: A “no mow” sign stands in a tall grass stormwater BMP buffer in Merrillville IN. Source: Municipal Sewer & Water Magazine.
Chapter 5 – Low Impact Development

- Background
- Incentives
- Planning & Design Process and Concepts
- Planning & Design Techniques

Table 5-1. LID Categories and Techniques

<table>
<thead>
<tr>
<th>Early Coordination, Collaboration, and Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ Work with a multi-disciplinary design team</td>
</tr>
<tr>
<td>✦ Pre-design hydrologic characterization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conservation of Natural Features &amp; Resources</th>
<th>“Build with the Land” Design Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ Preserve undisturbed natural areas</td>
<td>✦ Redevelopment</td>
</tr>
<tr>
<td>✦ Preserve/Restore stream buffers</td>
<td>✦ Fit the design to the terrain</td>
</tr>
<tr>
<td>✦ Avoid developing in floodplains</td>
<td>✦ Reduce limits of clearing and grading</td>
</tr>
<tr>
<td>✦ Avoid developing on steep slopes</td>
<td>✦ Locate development in less sensitive areas</td>
</tr>
<tr>
<td>✦ Minimize siting on porous or erodible soils</td>
<td>✦ Utilize open space development</td>
</tr>
<tr>
<td>✦ Soil management – preservation</td>
<td>✦ Consider creative development design</td>
</tr>
<tr>
<td>✦ Soil management – restoration</td>
<td></td>
</tr>
<tr>
<td>✦ Restoration of native vegetation</td>
<td></td>
</tr>
</tbody>
</table>
Appendices

A. Acronyms and Definitions
B. Stormwater BMP Record Drawing Checklist
C. LID Technique Form and GI-BMP Feasibility Form
D. Stormwater BMP Design Procedure Forms
E. Cistern BMP Design Specifications
Where to find the Handbook

City of Topeka Official Website > Utilities > Stormwater Development & Management

Stormwater Development & Management

Courtesy Reviews
The Utilities Department offers courtesy reviews of Stormwater Management Plan/Drainage Reports. Please prepare the Stormwater Management Plan/Drainage Report using the Stormwater Quality and Quantity Checklist and submit it to Zach Stueve at zstueve@topeka.org

Stormwater Design Resources
- City of Topeka Design Criteria
- Post-Construction Stormwater Quality Policy
- Stormwater Management Plan Checklist (PDF)
- Value Rating for StormTech Chamber System
- Catch Basin Insert BMP Technical Memo
- Topeka Stormwater Stakeholder Meeting Presentation
- Topeka Stormwater BMP Design Handbook
- Topeka Stormwater BMP Design Handbook Appendices
- Topeka Stormwater Runoff Waiver Request

Stormwater BMP Maintenance
- Topeka Stormwater BMP Maintenance Manual
- Rain Garden Inspection Form
- Infiltration Basin Inspection Form
- Infiltration Trench Inspection Form
- Bioretention Area Inspection Form
BMP Maintenance Manual

1: Introduction and Stormwater BMPs 101
2: BMP Operational and Success Criteria
3: BMP Inspection
4: BMP Maintenance
5: Individual BMP Inspection Checklists
6: Helpful Resources

Target Audience: Property Owners

✓ Uncomplicated ✓ Visual
✓ Educational ✓ Themed
Property Owner’s Guide to Stormwater BMP Maintenance

5.10 Extended Dry Detention Basics

Extended dry detention basins are Best Management Practices (BMPs) that collect and store stormwater. The basins remove pollution and control flooding. An extended dry detention basin will manage about 1-inch of stormwater and drain completely about 48 hours after a storm. Extended dry detention basins will be located in stormwater management easements (SMEs), and will be easy to find on your property’s Stormwater BMP Record Drawing, basic parts (see the figure below):

1. Inlet structures let water flow into the BMP.
2. Pretreatment areas remove trash, debris, and dirt from stormwater flowing in. This helps to prevent clogging of the main treatment area.
3. The main treatment area is where stormwater is collected, so the water can be cleaned and drain at a controlled speed.
4. Emergency overflows let water escape and flow around the BMP during intense or long storms, without flooding the surrounding area.
5. The outlet structure lets the cleaner water exit the BMP.

Benefits of Extended Dry Detention:
- Easy and inexpensive to use
- Great at capturing pollutants
- Reduce erosion
- Can be used as an area for recreation or open space

What are my responsibilities?

Ongoing protection, inspection, and maintenance is important to the function of your BMP. Here are a few things to keep in mind:
- BMPs found on your Stormwater BMP Record Drawing must be inspected and cared for by you, the property owner. The requirements for inspection and maintenance presented in this document are supported by the Topeka Municipal Code 13.35.
- You can choose to hire others (like a landscape company) to perform inspection and maintenance activities, but you are ultimately responsible for inspection and maintenance.
- The City of Topeka keeps track of your inspection and maintenance reports and may perform City-led inspections when they see fit. If you don’t inspect and maintain your BMP, this violates the City’s Stormwater Ordinance and can result in fines or penalties, and requirements to fix your BMP.

Version: January 2021
City of Topeka KS
Page S.19-1

Property Owner’s Guide to Stormwater BMP Maintenance

Your detention basin will last longer and you’ll save money if you protect the plants and soil, keep your property clean, and do regular inspections and maintenance. The image below shows the four Success Factors needed to make sure you have an attractive, working detention basin. Remember that a DOCUMENTED INSPECTION MUST BE DONE EVERY OTHER YEAR, NO LATER THAN 10/31, using the Extended Detention Basin Inspection Form included with this guidance sheet.

Vegetation

Activity
- Check for proper drainage and remove any debris that may be blocking or damaging the basin.
- Make sure the basin is maintained and cleared of any obstructions.

Schedule
- Seasonally

Protection

Activity
- Check the top of the basin for drainage issues, such as debris or obstructions. Repair immediately.
- Inspect the basin for any cracks or damages.

Schedule
- Monthly

Cleanliness

Activity
- Mow grass 2-4 inches high and remove trash and debris regularly.
- Keep your property clean.
- Do regular inspections and maintenance, often. Make repairs as soon as you notice problems.
- To prevent damage, tell landscapers and contractors working on the property about the location and purpose of the BMP.

Schedule
- Monthly

Do

- Don’t use too much salt and sand around the detention basin in the winter.
- Don’t use too much fertilizer, herbicides, or pesticides. Contact a local nursery or landscape company if your plants aren’t doing well.
- Don’t let heavy equipment in the detention basin or use it as storage, even for landscape items (leaves, snow, soil, mulch, etc.).
- Don’t let pollutants (trash, pet waste, pesticides, oils, etc.) wash into the basin.
The Stormwater Design Process & Plan Review Checklist
Keys to a Successful Stormwater BMP

- Early Planning
- Thoughtful Design
- Sound Construction
- Effective Maintenance

Stage 1: Planning & Design
Stage 2: Grading & Construction
Stage 3: Long-Term Management
Chapter 2
Section 2.3.2

Topeka Stormwater BMP Design Handbook

Performance Standard Applicability

Chapter 2
Section 2.3.2

Topeka Stormwater BMP Design Handbook
Chapter 2
Section 2.3.2

Topeka Stormwater BMP Design Handbook

Performance Standard
Applicability

Apply LID techniques to establish site layout (buildings, roads, parking, etc.)
Chapter 2
Section 2.3.2

Topeka Stormwater BMP Design Handbook

Performance Standard Applicability

See Section 4.2. Is site located in a watershed or area identified as “No Control”

Yes

Stormwater Quantity Treatment NOT required

No

Can the system discharge to an offsite BMP that can fully provide peak flow or volume control?

Yes

Stormwater Quantity Treatment NOT required

No

Stormwater Quantity Treatment Required

See Handbook Chapter 4
Prepare SWMP according to Chapter 2.
Go to Figure 2-3.
Apply LID techniques to establish site layout (buildings, roads, parking, etc.).

Does the site contain concentrated flows or stream buffers?

Does the site propose to change the drainage patterns or discharge points?

Stormwater Quantity Treatment Required
See Handbook Chapter 4
Prepare SWMP according to Chapter 2. Go to Figure 2-3.
SWMP Requirements

➢ **SWMPs must:**
  • Be prepared per the Handbook and the Topeka Design Criteria
  • Comply with all local, state and federal permit requirements, plans and programs
  • Use Topeka Stormwater Management Plan Checklist
  • Be signed and sealed by a Professional Engineer

➢ **We recommend:**
  • Consult a registered Landscape Architect, horticulturalist, or plant ecologist for BMP Planting Plan design
Key Elements of a SWMP

Topeka Stormwater Management Plan Checklist

Existing Conditions Information

• **Narratives:**
  • Land use, topography, and hydrologic characteristics

• **List:** each impervious area added since 2011

• **Map:**
  • Drainage features
  • Interior drainage area boundaries
  • Surface flow paths
  • Discharge points/outfalls
  • Floodplains, levees, and critical areas
  • Easements
  • Pervious and impervious areas

• **Identify and calculate:**
  • Peak flows at each discharge point (for all required storm events)
Proposed Conditions Information

- **Narratives:**
  - Land use of disturbed areas
  - Topographic and hydrologic characteristics
  - Describe impervious areas to be added or replaced
  - Identification of any land use “hot spots”

- **Site Plans and Grading Plans must include:**
  - Minimum 2-foot contours of proposed grading
  - Easements:
    - Stormwater Management
    - Access
    - All others
  - Location and boundaries of LID Areas
  - Profiles for all pipeline crossings
Proposed Conditions Information

- **Map the proposed:**
  - Drainage features
  - Interior drainage area boundaries
  - Surface flow paths
  - Discharge points/outfalls
  - Floodplains, levees, and critical areas
  - Easements
  - Pervious and impervious areas

- **Identify and calculate:**
  - Peak flows intercepted by stormwater BMPs
  - Proposed conditions peak flows at each discharge point (for all required storm events)
  - Peak flows leaving site from each driveway
Effective Mapping

- **Clearly** labeled
- Arrows showing flow paths
- Colors or shading help distinguish drainage areas, impervious vs. pervious areas, etc.
On-Site Conveyance System Information

• **Map:** All components of stormwater conveyance system:
  - Swales, ditches, and channels
  - Gutters, inlets, and drains
  - Catch basins
  - Pipes and culverts
  - Headwalls, wing walls, and end walls
  - Aprons and armoring

• **Calculations:** Storm conveyance system design

The on-site stormwater system must be designed for the **10-year storm** with provisions for safe overflow of the **100-year storm**.
Overland Flow Path Information

- **Map:**
  - Overland flow pathways for flows above the required design storms

- **Calculations must show:**
  - Proposed design manages overflows in a manner that does not cause or increase negative impacts to other properties or infrastructure
Stormwater Quantity Summary

- **Describe** the approach to be used to meet the stormwater quantity requirements
- **Summarize** the difference in pre-developed and post-developed peak flow rates
- **Identify** upstream and downstream impacts
Key Elements of a SWMP

Stormwater Quality Information

- **Describe** how the design meets stormwater quality requirements

Use the MARC Manual of Best Management Practices for Stormwater Quality
Key Elements of a SWMP

Topeka Stormwater Management Plan Checklist

Stormwater Quality Information

- **Map:**
  - Stormwater quality BMP locations/boundaries
  - BMP drainage areas
  - BMP plan and profile views
  - BMP Planting Plan (each vegetated BMP)

- **Provide:**
  - Level of Service/Value Rating Worksheets (MARC Manual)
  - Mitigation Plan Worksheets (MARC Manual)
  - Infiltration Design Information
  - Water Quality Volume Calculations
  - BMP Design Procedure Forms
  - Documentation that the BMP meets the design requirements defined in the MARC Manual.
Stormwater Quality Information

Example Mitigation Plan Worksheet

<table>
<thead>
<tr>
<th>Project: BMP Manual Example No. 1</th>
<th>By: SAS</th>
<th>Date: 11/20/07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location: Bur Oak, Missouri</td>
<td>Checked:</td>
<td>Date:</td>
</tr>
<tr>
<td>Sheet 2 of 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Required LS (from Table 1 or 1A or Worksheet 1 or 1A, as appropriate):

   Note: Various BMPs may alter CN of proposed development, and LS. Recalculate if applicable.

2. Proposed BMP Option Package No. 3

<table>
<thead>
<tr>
<th>Cover/BMP Description</th>
<th>Treatment Area</th>
<th>VR from Table 5 or 6</th>
<th>Product of VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preserved native vegetation</td>
<td>14.00</td>
<td>9.75</td>
<td>139.50</td>
</tr>
<tr>
<td>Streets</td>
<td>15.50</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>House/roads</td>
<td>16.50</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Native grass lawn</td>
<td>44.45</td>
<td>9.75</td>
<td>430.00</td>
</tr>
</tbody>
</table>

| Total | 95.50 |
| Total | 550.65 |
| Weighted VR | 5.89 |

(Note: Maintain native lawns through covenants?)

Example BMP Planting Plans
Requests for Waiver from Post-Construction Water Quality Requirements

Submit to the Utilities Director

Include:

a) Description of proposed project
b) Explanation of existing conditions
c) Existing condition land cover – label impervious and pervious
d) Proposed land cover & site plan – label impervious and pervious
e) Pre- and Post-condition runoff calcs for 10- and 100-year events
f) Verification that existing drainage patterns WILL NOT change
g) Verification of 10-year discharge from driveways
Key Elements of a SWMP

Easement Information

- **Identify:**
  - Existing Drainage or Stormwater Management Easements
  - Will they remain or be vacated?

- **Describe:**
  - Proposed easements
  - Potential easement conflicts

Easement language is in the Subdivision Checklist

Forms for Easements Granted by Instrument are here: [https://www.topeka.org/engineering/easement-forms/](https://www.topeka.org/engineering/easement-forms/)
Stream Buffer Information

• **Identify and label:**
  • All streams on the site or adjacent to the site that require a stream buffer easement
  • All stream buffer easement extents (inner and outer limits)

• Submit waiver requests **for development within a stream buffer** to the Utilities Director.
Floodplain Information

• **Identify and label:**
  • FEMA Special Flood Hazard Areas
  • Channelized drainage areas
  • Designated floodplains on a City of Topeka work map, such as the levee ponding areas
  • Drainage Easement Extents

• **Drainage Easements** shall cover the **entire** 100-year WSEL extent
BMP Inspection & Maintenance Plan

- **Map:**
  - Property boundary
  - Building and pavement footprints
  - General description of pervious land cover areas
    - Woods, turf, landscaped bed, etc.

- Copy of BMP-specific inspection & maintenance guidance from Topeka BMP Maintenance Manual

- Explanation of Maintenance Verification for existing BMPs that will remain

- Acknowledgement of BMP Responsibility (signed)

- For proprietary BMPs
  - Vendor name & contact info
  - Manufacturer name & contact info
  - BMP make, model, & date of manufacture
  - Manufacturer’s maintenance guidance
  - List of parts that must be removed/replaced for normal operation
Key Elements of a SWMP

Other Notable Items

- **Levee Review required** when any portion of project lies within 500 ft from centerline of levee (“levee critical zone”)

- **KDOT approval required** for changes to drainage entering KDOT right-of-way

- **Drainage agreement between property owners required** for point source discharges onto a neighboring property

- **Public Improvement Project required** for alterations or installation of a public drainage structure in the public right-of-way or public easement
The Construction Termination Process

https://www.topeka.org/utilities/stormwater-development-management/
Life Stages of Stormwater BMPs

- Stage 1: Planning & Design
- Stage 2: Grading & Construction
- Stage 3: Long-Term Management
Importance of Const. Termination

- “Officially” transitions BMPs from const. to maint. stage
  - TMC Chapter 13.35 “ends” and Chapter 14.40 “begins”
- Establishes a record of each BMP at end of construction
- Assures correct BMP construction and proper function to Developer, City, & Future Property Owner

Evaluates:

- Construction compliance with approved SWMP
- “Proper” BMP construction
- BMP locations and types
- BMP function at construction termination
  - Functional and undamaged
  - Clean *(no construction sediment or debris, well-maintained)*
  - Protected *(no open, dirty, or unstable areas in drainage area)*
  - Plant coverage and health *(vegetated BMPs only)*
1. Submit Stormwater BMP Record Drawing for approval
2. “Final” Inspection (maybe)
Chapter 2, Section 2.5

✓ Major Elements
  • Stormwater BMP Location Map
  • Stormwater BMP Certification Statement
  • As-Built Plans
  • BMP Planting Plans
Topeka Stormwater BMP Design Handbook

Appendix B

Full list of record drawing requirements

2. CERTIFICATIONS, LEGAL DOCUMENTS, AND AGREEMENTS
   a. Signed original Engineers and Landscape Architect Certification Statement (see Appendix B)
   b. If applicable, signed original of any other legal agreements or certificates pertaining to the stormwater BMPs or stormwater conveyance system (e.g., agreement with downstream property owner for use of office BMPs on drainage easements, etc.)
   c. Copy of recorded plat with accurate description of constructed stormwater BMPs, their stormwater management elements, and all other elements. Plats must include statement: "Stormwater BMPs shall be maintained in accordance with TWA Criteria 23.48."

3. AS-BUILT PLAN
   A. General Information
      a. Name and contact information of developer
      b. Name and contact information of person preparing the Stormwater BMP Record Drawing
      c. Name and contact information of responsible Kansas professional engineer or landscape architect
      d. Comment area and project number of the applicable development
   B. Topographical Maps
      a. Title block with project name, status, and contact person (all projects)
      b. Scale and signatures for the certifying Kansas Professional Engineer or Landscape Architect and the certifying Kansas Registered Landscape Architects (all projects)
      c. Survey bench marks or other reference points (all projects)
      d. North arrow, bar scale, and coordinates (all projects)
      e. Topographical map clearly indicating the property boundaries, cross-drains, and grade level changes with names, footing and pavement footprints of the applicable development, roadways, stormwater BMP locations, storm sewer lines, and all other elements and boundaries (all projects)
      f. Stormwater and grading map indicating any constructed grading of the property using maximum 75’ contour, drainage basin boundaries, waterbodies, stormwater BMPs, storm sewer lines, and all other elements and boundaries (all projects)
      g. Stormwater, street buffer, and backwater map indicating drainage basin boundaries, waterbodies, stormwater BMPs, pavement and other footprints, and general types of pervious and impervious areas (e.g., roads, rainwater harvesting systems, grass, grassing areas, managed buff), and subdivided area, etc.)

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BMP Location Map

- Prepared for the Owner and Maintainer
- Non-technical
- Easy to understand
- Labeled
As-Built Plan

Chapter 2 & Appendix B

Topeka Stormwater BMP Design Handbook

Major Requirements

• General Info (developer, designer, location, etc)
• Topo & Hydrology Maps
• Detailed Stormwater BMP Information
• BMP Planting Plans
• Hotspot Maps/Info
• Conveyance System Maps/Info
As-Built Plan

- **BMP Info for each BMP**
  - Plan view of each BMP w/ all components labeled
  - Drainage area
  - Cross-section view
  - Type, condition, dimensions, depth, materials, etc.
  - Design calculations
  - Additional detail for proprietary BMPs

- **Planting Plan for each vegetated BMP**
  - Labeled map with plan legend of BMP as-planted
  - For each plant species
    - Type (genus/species)
    - Location, spacing, expected spread
    - Installation schedule/reqmts
    - Growing conditions
    - Care requirements
    - Warranty info
BMP Planting Plans

BMP #5 - NATIVE VEGETATION PRESERVED OR ESTABLISHED

- CURB PULLED BACK TO PROVIDE SPACE FOR VEGETATION INSTEAD OF EXCESS PARKING
- PROTECT THESE TWO EXISTING TREES
- PLACE RIPRAP TO STOP BANK EROSION NEAR EXISTING TREE

PLANT SCHEDULE

<table>
<thead>
<tr>
<th>TREES / SHRUBS</th>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>NATIVE</th>
<th>QUANTITY</th>
<th>COLOR</th>
<th>SPACING</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Betula nigra</td>
<td>River Birch</td>
<td>YES</td>
<td>1 (EXIST)</td>
<td>CREAM</td>
<td>20 FT OC</td>
<td>30-40 FT</td>
</tr>
<tr>
<td>B</td>
<td>Tilia americana</td>
<td>American Linden</td>
<td>YES</td>
<td>1 (EXIST)</td>
<td>CREAM</td>
<td>30 FT OC</td>
<td>50-60 FT</td>
</tr>
<tr>
<td>C</td>
<td>Cercis canadensis</td>
<td>Redbud</td>
<td>YES</td>
<td>3</td>
<td>PINK</td>
<td>15 FT OC</td>
<td>10-20 FT</td>
</tr>
<tr>
<td>D</td>
<td>Cephalanthus occidentalis</td>
<td>Buttonbush</td>
<td>YES</td>
<td>6</td>
<td>WHITE</td>
<td>15 FT OC</td>
<td>5 - 10 FT</td>
</tr>
</tbody>
</table>

GRASSES / SEDGES

<table>
<thead>
<tr>
<th>IDEN</th>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>NATIVE</th>
<th>QUANTITY</th>
<th>COLOR</th>
<th>SPACING</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Carex vulpinoidea</td>
<td>Fox Sedge</td>
<td>YES</td>
<td>250</td>
<td>TAN</td>
<td>15 FT OC</td>
<td>2-3 FT</td>
</tr>
<tr>
<td>F</td>
<td>Scirpus atrovirens</td>
<td>Great Green Bulrush</td>
<td>YES</td>
<td>50</td>
<td>GREEN</td>
<td>15 FT OC</td>
<td>2-3 FT</td>
</tr>
</tbody>
</table>

NOTES:
1. PLANTING SHALL TAKE PLACE IN THE SPRING (APRIL 10 - JUNE 10) OR IN THE FALL (SEPTEMBER 21 - DECEMBER 21) WHEN VEGETATION IS PREVAILING. THE PLANTING PERIODS, TIMES, AND CONDITIONS SHOULD BE STATED IN WRITING OR IN A WRITTEN AGREEMENT. THE GROWTH PERIOD FOR ALL PLANTS IN BMP #5 IS PROVIDE BY INSERTING THE NAME OF THE GROWTH PERIOD AND COVERING 2 YEARS FROM PURCHASE DATE OR (MONTH, DAY, YEAR). BE SURE TO OBTAIN ANY WARRANTY INFORMATION NEEDED TO ACTIVATE THE WARRANTY (e.g., PURCHASE RECEIPT, PLANT INSTALLATION CONTRACTOR'S STAMP, ETC.).
BMP Planting Plans

PLANT SCHEDULE

<table>
<thead>
<tr>
<th>IDEN.</th>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>NATIVE</th>
<th>QUANTITY</th>
<th>COLOR</th>
<th>SPACING</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Baptisia australis</td>
<td>Blue false indigo</td>
<td>YES</td>
<td>50</td>
<td>PURPLE</td>
<td>12&quot; OC</td>
<td>2'-4 FT</td>
</tr>
<tr>
<td>B</td>
<td>Penstemon digitalis</td>
<td>Foxglove beardtongue</td>
<td>YES</td>
<td>20</td>
<td>WHITE</td>
<td>12&quot; OC</td>
<td>2'-3 FT</td>
</tr>
<tr>
<td>C</td>
<td>Sporobolus heterolepis</td>
<td>Prairie dropseed</td>
<td>YES</td>
<td>40</td>
<td>GREEN</td>
<td>18&quot; OC</td>
<td>1'-3 FT</td>
</tr>
<tr>
<td>D</td>
<td>Asclepias incarnata</td>
<td>Swamp milkweed</td>
<td>YES</td>
<td>20</td>
<td>PINK/PURPLE</td>
<td>18&quot; OC</td>
<td>3'-5 FT</td>
</tr>
<tr>
<td>E</td>
<td>Carex vulpinoidea</td>
<td>Fox sedge</td>
<td>YES</td>
<td>142</td>
<td>TAN</td>
<td>12&quot; OC</td>
<td>2'-3 FT</td>
</tr>
<tr>
<td>F</td>
<td>Rudbeckia fulgida speciosa</td>
<td>Shout black-eyed susan</td>
<td>YES</td>
<td>34</td>
<td>TAN</td>
<td>12&quot; OC</td>
<td>2'-3 FT</td>
</tr>
<tr>
<td>G</td>
<td>Gentiana andrewsi</td>
<td>Bottle gentian</td>
<td>YES</td>
<td>262</td>
<td>BLUE</td>
<td>8&quot; OC</td>
<td>1'-2 FT</td>
</tr>
</tbody>
</table>

NOTES:
1. PLANTING SHALL TAKE PLACE IN THE SPRING (APRIL 1 TO JUNE 1) OR IN THE FALL (SEP 1 TO OCT 1). REMOVE UNWANTED VEGETATION PRIOR TO PLANTING.
2. APPLICANTS ARE ENCOURAGED TO OBTAIN PLANT WARRANTIES (TYPICALLY THROUGH 2 GROWING SEASONS). THE WARRANTY PERIOD, TERMS, AND CONDITIONS SHOULD BE STATED IN WRITING (E.G. "THE WARRANTY PERIOD FOR ALL PLANTS IN BMP 92 IS PROVIDED BY [INSERT NAME OF WARRANTY] AND COVERS TWO YEARS FROM PURCHASE DATE OF "MONTH, DAY, YEAR"). BE SURE TO PRESERVE ANY WARRANTY INFORMATION NECESSARY TO ACTIVATE THE WARRANTY (E.G., PURCHASE RECEIPTS, PLANT INSTALLATION CONTACTOR, WARRANTY STATEMENT, ETC.).