

## Terre Kleen™ Performance, Design and Installation Specifications: Terre Kleen 27

Terre Kleen™ is a stacked inclined plate Hydrodynamic Separator housed inside a precast structure. Terre Kleen™ removes pollutants by separating sediment, metals and nutrients attached to sediment, and floatables such as oils, grease, trash and debris from stormwater.

1. capture & retain **100%** of floating trash & debris at all flows
2. capture & retain **95%** of non emulsified oil, grease and Total Petroleum Hydrocarbons (TPH) at all flows; through use of “oil sorbents”
3. capture & permanently remove **80%** of weighted TSS contained in net annual sediment; (**Net Annual Removal Efficiency**) (**see Chart**)
4. capture & retain **50%** of metals (lead, zinc, copper, cadmium) attached to sediment
5. capture & retain **50%** particulate phosphorus attached to captured sediment
6. capture & retain **25%** nitrogen through capture of vegetation
7. all flows shall enter the Terre Kleen TK 27, no flows shall by-pass the unit
8. not less than 172 ft<sup>2</sup> of horizontally projected sedimentation cell area in the grit sedimentation chamber shall be provided (**see Chart**)
9. no loss of captured pollutants during any precipitation event or tidal influences
10. Maximum treatment flow capacity and Peak flow capacity (**see Chart**)
11. HS 25 traffic and earth loadings and buoyancy prevention construction
12. Minimum volume of captured pollutant sump area is 168 Ft<sup>3</sup> all of which is below the treatment flow path, preventing re-suspension of captured pollutants
13. Minimum gross oil storage volume is 331 gallons
14. 30 inch manhole access for maintenance from grade by vacuum truck; not less than 15 inch continuous access opening to bottom of sump area
15. Water/air pressurized sludge dispersion manifold at bottom of grit sump area, causing pollutants located under inclined plate area to drain to vacuum suction hose
16. Manufacturer shall submit shop drawings and such other information requested by Engineer to verify Performance and Design Specifications
17. Warranty: 4 years from date of substantial completion for labor and material; in the event that the material supplied is not free from substantial defects; equipment shall be used only in the particular application for which it was specifically manufactured

### Product Substitution Procedure

1. No stormwater treatment BMP shall be approved as an equivalent substitution unless the Engineer shall receive and approve drawings and specifications stamped and sealed by a professional engineer registered in the state wherein the project is located showing the following:
  - a. project specific sizing calculations, with 3<sup>rd</sup> party performance verification, clearly showing that the unit meets or exceeds the Performance and Design Specifications of the Terre Kleen™.
  - b. project-specific hydraulic calculations, with 3<sup>rd</sup> party performance verification, showing the Hydraulic Grade Line (HGL) plotted through the structure for the design flow
  - c. product shall have no external by-pass of all flows before entering unit

## Maintenance Procedures

1. Quarterly inspection during 1<sup>st</sup> year is recommended to record pollutant accumulation.
2. Cleaning is recommended when the sediment reaches 16 inches in depth in both sediment sump areas.
3. No confined space entry required; Terre Kleen™ design allows access, from grade, to both chambers by vacuum hose for removal of 100% of all captured pollutants.
4. Air and water pressurized sludge dispersion manifold, under inclined plates
5. Removed material must be handled and disposed according to all regulations

## Terre Kleen Installation Specifications

1. Terre Kleen™ inclined plate assembly shall arrive at the job site fully assembled inside precast concrete structure. Precast structure may arrive in sections due to weight and transportation issues. Each precast structure shall contain lifting points with Uni-lifts, manufacturer shall provide lifting equipment required between the uni-lift and the lifting straps / crane hook, which shall be the property of manufacturer. Contractor shall provide equipment with sufficient lifting capacity to unload and set the Terre Kleen™.
2. Contractor shall excavate, dewater and shore in accordance with project specifications, as provided by Engineer and OSHA regulations.
3. Sub-grade shall be established as shown on the Drawings. Underlying soil and sub-grade material shall have design loading of not less than 2000 PSF. Precast components shall be placed on the compacted base (95% Proctor Density), elevation confirmed, level and aligned to ensure that the entire unit will be properly positioned when fully installed.
4. Contractor shall place “CONSEAL” or equivalent water tight mastic material between each precast component.
5. Precast structure containing the Terre Kleen™ component shall be aligned horizontally and vertically plumb. Contractor must confirm that the entire Terre Kleen™ shall be level *during and* after completion of backfill of the structure.
6. Manhole frame/cover and inlets frame/grate, if required shall be installed as shown on the drawings and grade adjusted to match final grade elevations by Contractor.
7. Connect and seal storm drain inlet and outlet pipes to Terre Kleen™ unit using non-shrink grout-fill material in accordance with project specifications.
8. BACKFILL SPECIFICATIONS :It is recommended that the stone sub-base be extended a minimum of one foot (1 ft) beyond the exterior face of the precast and compacted to 95% Proctor Density to sub-grade. Upon completion of the precast installation the backfill material shall be placed and compacted achieving a minimum compaction of 90% Proctor Density, or as specified by the Engineer, when tested by ASTM A1557. Backfill material may be a “minimal compaction effort” material. Native material may be used if the material provides an allowable bearing pressure of 2000 PSF and compacts to 90% Proctor Density per ASTM A1557, if approved by the Engineer. In areas of vehicular use, the upper two feet (2 ft) of backfill shall be aggregate base, compacted to 95% Proctor Density (ASTM A1557).
9. Contractor shall remove all foreign material and debris, including all sediment, oils, grease and construction materials and debris from the inlet pipe, outlet pipe and Terre Kleen™ upon completion of installation.



### Terre Kleen Performance Chart

#### Pollutant Removal

- TSS**                    **80% Net Weighted Annual Removal: Column 4 ( PSD 38-640 micron with d50 = 150 micron)  
Column 5 (NJDEP Certification)**
- Metals**                **50% (lead, zinc, copper, cadmium); attached to TSS**
- TP**                      **50% ( see: “Distribution of Phosphorus in Particulate Matter Transported in Urban Rainfall-Runoff”  
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Louisiana State University, 3418 CEBA Building, Baton Rouge, LA 70803)**
- Nitrogen**            **25% Based on 100% capture of vegetation in primary chamber of Terre Kleen**
- Oil**                      **95% Based on 100% capture of non emulsified oil in primary chamber of Terre Kleen**
- Grease**                **95% Based on 100% capture of non emulsified grease in primary chamber of Terre Kleen**
- Trash**                 **100% Based on 100% capture of trash in primary chamber of Terre Kleen**

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>
	Terre Kleen	Structure Footprint (ft <sup>2</sup> )	Settling Area (ft <sup>2</sup> )	MTFR (cfs)	NJDEP MTFR (cfs)	Head Loss (in)	Peak Flow (cfs)	Peak Flow Headloss (in)	Max Pipe (inches)	Sediment Storage (cf)	Oil/Grease Storage (gal)	Trash Storage (cf)	Min. grade to Pipe Invert	Pipe Invert to bottom
<b>02</b>		<b>24</b>	<b>13.0</b>	<b>2.1</b>	<b>0.52</b>	<b>0.04</b>	<b>4.0</b>	<b>2.25</b>	<b>18</b>	<b>88</b>	<b>133</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>05</b>		<b>48</b>	<b>32.4</b>	<b>5.3</b>	<b>1.28</b>	<b>0.23</b>	<b>9.0</b>	<b>11.40</b>	<b>18</b>	<b>88</b>	<b>133</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>09</b>		<b>31.5</b>	<b>57.0</b>	<b>9.4</b>	<b>2.29</b>	<b>12.44</b>	<b>15.0</b>	<b>31.70</b>	<b>24</b>	<b>90</b>	<b>175</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>18</b>		<b>45.5</b>	<b>115</b>	<b>18.9</b>	<b>4.61</b>	<b>15.48</b>	<b>28.0</b>	<b>34.00</b>	<b>36</b>	<b>129</b>	<b>253</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>27</b>		<b>59.5</b>	<b>172</b>	<b>28.3</b>	<b>6.90</b>	<b>17.33</b>	<b>42.0</b>	<b>38.20</b>	<b>42</b>	<b>168</b>	<b>331</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>36</b>		<b>75.25</b>	<b>230</b>	<b>37.9</b>	<b>9.22</b>	<b>18.79</b>	<b>56.0</b>	<b>41.00</b>	<b>52</b>	<b>208</b>	<b>409</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>45</b>		<b>87.5</b>	<b>288</b>	<b>47.4</b>	<b>11.55</b>	<b>19.76</b>	<b>70.0</b>	<b>43.00</b>	<b>60</b>	<b>248</b>	<b>487</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>54</b>		<b>101.5</b>	<b>346</b>	<b>57.0</b>	<b>13.88</b>	<b>22.97</b>	<b>77.0</b>	<b>42.00</b>	<b>72</b>	<b>287</b>	<b>565</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>
<b>63</b>		<b>115.5</b>	<b>403</b>	<b>66.4</b>	<b>16.19</b>	<b>23.46</b>	<b>89.0</b>	<b>42.00</b>	<b>72</b>	<b>327</b>	<b>643</b>	<b>123</b>	<b>3.27 ft</b>	<b>6.25 ft</b>