Appendix E-4

City of Loveland
Requirements for Public Improvements - Construction Plans

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Project Name: ______________________________________

All applications for final subdivision plans must include final construction plans for public improvements. The standards for these plans are set forth in Section 16.20.090 of the Municipal Code, these Standards and as further noted in this appendix.

The two “check list” columns to the left of the construction plan requirements below are provided for the convenience of both staff and the Developer's Engineer. The columns are organized as follows:

(1) The first column, “Applicant Validation,” is provided as a check list for the applicant to ensure that all required items are addressed within the construction plan set.

(2) Upon submittal, city staff will check off items in the second column to ensure that all the required items are included within the construction plan set.

<table>
<thead>
<tr>
<th>Applicant Validation</th>
<th>N/A</th>
<th>Included</th>
<th>Staff Check</th>
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</table>

I. Title Sheet

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<tbody>
<tr>
<td></td>
<td>A. Preamble title of &quot;Public Improvements Construction Plans&quot;.</td>
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<td></td>
<td>B. The legal name of the addition or subdivision (the marketing name may be used on the plans, but must be subordinate to the subdivision name).</td>
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<td></td>
<td>C. Signature review blocks for City and other applicable entities, i.e., ditch company, C.D.O.T., County, etc. (See Appendix E-3)</td>
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<td></td>
<td>D. Index to all sheets in the plan set.</td>
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<td></td>
<td>E. The character type and position of benchmark (including elevation) must reference the “City of Loveland 1995 Level Net Survey.</td>
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<td></td>
<td>F. Vicinity map, scale and north arrow. The vicinity map must be updated to show all approved projects in the area. 1&quot; = _____</td>
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<td></td>
<td>G. General Construction Notes, Street Construction Notes, &amp; Water/Sewer and Storm Drainage Notes (see attached Appendix E-1).</td>
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<td>H. Stamp and signature of licensed Civil Engineer (on final approved sets of plans) in accordance with current State Statutes and Board Rules.</td>
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</tbody>
</table>
I. Overall Utility Layout Plan sheet(s)

A. Streets

1. R.O.W. and easements.

2. Cross-Pans.

3. Curb and gutter (lines depicting lip and flowline).

4. Walk, (attached or detached).

5. Medians, (line depicting both flowlines), if an outfall gutter then show lip and flowline.

6. Signs (speed, stop, warning) general location.

7. Other roadway signs or devices associated with phasing or dead end streets.

B. Provide 3” P.V.C. schedule 40, 36” deep with pull boxes at intersections that will be signalized now or in the future.

C. Include Phasing of development and construction of all Public Improvements. Minimum development phasing shall be 10 lots; All public improvements within each phase shall stand alone. Phase lines shall be shown by heavy dark lines, all phases shall be identified by number or letter.

D. Water Distribution System Valves, hydrants, bends, airvacs, blowoffs, lowering, crossings, sizes of all mains and services. See Water/Wastewater Development Standards for further requirements.

E. Sanitary Sewer System MH, C.O.’s, services, subdrains (where applicable), crossings and sizes of all mains and services. See Water/Wastewater Development Standards for further requirements.

F. Storm Drain System

1. MH, junction structures

2. Inlets / catch basins

3. Storm sewer pipes

4. Detention Pond Outlet Structures

5. Waterways
II. Grading, Drainage & Sediment/Erosion Control Plan & Report

A. A Grading, Drainage and Sediment/Erosion Control Report done in accordance with the City of Loveland Storm Drainage Criteria Manual.

B. Existing and proposed contours in a minimum of two foot intervals.
   1. Show contours extending a minimum of 50’ off-site, and tying into existing contours.
   2. Finish grade elevations for streets, lot corners, and finish floor grades or alternately top of foundation of buildings shown for all lots.

C. This statement: The top of foundation elevations shown are the minimum elevations required for protection from the 100 year storm. The lowest opening elevations shown are at least one foot above the 100 year storm elevation of adjacent streets, channels, ditches, swales, or other drainage facilities. Minimum finished floor elevations above 100-year water surface in streets, channels, ditches, swales, or other drainage facilities, as illustrated by a master grading plan are to be shown.

D. Plans to have positive drainage to streets (showing drainage arrows across lots) or to an approved discharge facility.

E. All drainage improvements are to be designed to include all necessary improvement details on the detail sheet.

F. Cross-check front lot elevations with plan & profile sheets for continuity. Also check for elevations and datum match where streets will meet an adjoining subdivision, especially when the adjoining street is designed but not built.

G. Show phase lines. If phasing is proposed after the construction plans are signed, the consultant must revise the plans to show the phase lines.

H. Criteria:
   1. Minimum of 1.5% profile grade on grass and a maximum side slope of 4:1. If special circumstances warrant a steeper cross slope, it will be evaluated on a case-by-case basis.
   2. If rear lot drainage distance is greater than 300’ and provides less than 2% profile...
grade, a concrete trickle channel or an under drain must be provided.

3. Drainage outlets and ending pans typically should have some type of erosion protection indicated. Example: If rip-rap is to be used, details should include size of rock D-50 and dimensions of placement, length, width, depth.

I. Inlets/catch basins, fire hydrants and utility poles are not to be constructed where they would conflict with handicap ramps, or be a hazard to traffic. Maintain a 2’ minimum clearance from flowline.

J. A final drainage report must be accepted by the storm water utility.

K. Include Phasing of construction & development if phasing is desired.

IV. Street Plan & Profile

A. Minimum local street widths is per Table 4.1 and 4.2 (unless project is a PUD or a waiver or variance is approved).

B. Profile grades:

1. See Table 4.2 for maximum grades. Minimum grade allowed is 0.5%.

2. Street grades within 100’ of an approaching intersection shall be a maximum grade of 4%.

3. Maximum grade through the intersection is 3%.

a. 10’ min. length for each segment prior to a grade break. 2% max. algebraic difference between segments for Collectors and Arterials. 4% max. grade break on local streets. This is to provide a smooth ride through the intersection.

b. Provide flow line grades for intersections with cross-pans. Check the grades for correctness. Make sure they drain.

c. Provide the percent grade for all curb returns at intersections.

C. Vertical curve is required when the algebraic difference in grades is >1.0% except flowline grades in sumps.
1. Check actual grades and length for accuracy and correctness.

2. All K-values shall be noted on the profile view; minimum K-values shall be in accordance with design speed. Minimum K=45 for crest vertical curve unless circumstances warrant less than 45 ($K = L/\Delta g$, Difference in grades).

3. All proposed streets to match with existing streets and adjacent topography/projects. Show the existing streets profile and topography grade and where the proposed will match it. Existing street and topography grades are to be shown for an adequate distance beyond the proposed improvements to facilitate a smooth transition.

4. Check stationing of plan and profile for errors in design and/or discrepancies between the two. Keep the street names the same. (Don’t change names of streets at intersections.)

D. Tapers:

1. When shifting an entire directional stream of traffic the taper length ($L$) = WS for design speeds of $>45$ mph; and $L = WS^2/60$ for design speeds of $<40$ mph; and for turning bay tapers $L = WS/3$. ($L$=length of transitional taper section in feet, W=width of lateral lane shift in feet, S=design speed in m.p.h.)

E. Access ramps shall be constructed at all corners of street intersections, including one ramp opposite from corners of tee intersections. It is recommended by the Handicap Advisory Committee that access ramps be installed midblock when blocks exceed 600 feet in length street.

F. Inlets/catch basins, fire hydrants, utility poles and electric appurtenances are not to be constructed where they would conflict with handicap ramps.

G. Provide 3” P.V.C. schedule 40, 36” deep with pull boxes at intersections that will be signalized now or in the future. Includes 90° sweeps.

H. Show all raised medians and include all details for construction. Show interior median treatment and design. (i.e., trees, sprinklers, pavement, rock, splash pan, etc). Trees shall not block signing. See Standard Drawing 4-9.
I. Gutter cross pans are not to be designed to cross arterial or major collector streets. Gutter pans widths are as follows:

<table>
<thead>
<tr>
<th>Width</th>
<th>Intersection Type</th>
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<tbody>
<tr>
<td>6'</td>
<td>Local-Local</td>
</tr>
<tr>
<td>8'</td>
<td>Local-Collector</td>
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<tr>
<td>8'</td>
<td>Collector-Collector</td>
</tr>
<tr>
<td>10'</td>
<td>Local-Arterial</td>
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<tr>
<td>10'</td>
<td>Arterial-Collector</td>
</tr>
<tr>
<td>12'</td>
<td>midblock on local street</td>
</tr>
<tr>
<td>30'</td>
<td>midblock on collector street</td>
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J. Gutter pans or concrete edge protection may be constructed in place of curb and gutter within industrial zoned areas.

1. Minimum 4’ compacted fill to be placed between back edge of concrete edge protection or gutter and top of slope of roadside ditch.

K. Minimum curb radii at intersections will be as follows (measured to flow line):

<table>
<thead>
<tr>
<th></th>
<th>Local</th>
<th>Collector</th>
<th>Arterial</th>
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</thead>
<tbody>
<tr>
<td>Local</td>
<td>15’</td>
<td>20’</td>
<td>30’</td>
</tr>
<tr>
<td>Collector</td>
<td>20’</td>
<td>25’</td>
<td>30’</td>
</tr>
<tr>
<td>Arterial</td>
<td>30’</td>
<td>30’</td>
<td>35’</td>
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Note: As per state highway regulations, a minimum of a 50’ flow line radius is required when an arterial street intersects a state highway, unless otherwise approved through traffic engineering.

L. Verify written easements are received for any required easements not dedicated on the final plat. Check the easements for accuracy and check that all roadway improvement (i.e., curb and gutter, walk, etc.) are located within dedicated public ROW or pedestrian easements when applicable.

M. Identify the numeric phasing designation and the physical limits of each construction phase.

1. Type III barricades or 3-rail fence with “End of Road” sign, and any related pre-warning signs at all deadends of roads and sidewalks. For detail see Part IV, 4.6.b.

2. Secondary access provided for dead ends of length ≥ 400’ shall be all weather surface, 20’ wide, 6” minimum thickness of Class 5 or 6 ABC or recycled HBP.

3. 50’ outside radius all weather turn around at deadend roadways longer than 150’.
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<tr>
<th>Applicant Validation</th>
<th>N/A</th>
<th>Included</th>
<th>Staff Check</th>
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<td>P.</td>
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<tr>
<td>V.</td>
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<tr>
<td>A.</td>
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<tr>
<td>1.</td>
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<td>2.</td>
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<td>3.</td>
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</table>
of either may result in slopes which overrun the R.O.W. In this case, a construction easement will be required.

Applicant Validation  N/A  Included  Staff Check

4. Information to be shown on each cross section.
   a) Curb and gutter, existing and proposed.
   b) Roadway surface, existing and proposed.
   c) Sidewalk, existing and proposed.
   d) Pavement, base and subgrade thickness, existing and proposed.
   e) Cross grades, existing and proposed.
   f) R.O.W., existing and proposed.
   g) Easements, existing and proposed.
   h) Sideslopes, existing and proposed.

VI. Striping Plan

A. SIGNING & STRIPING PLANS ARE REQUIRED on all streets classified minor collector and greater. Major Collector and Arterial street signing and striping plans shall have a minimum scale of 1"=30’ and shall be per M.U.T.C.D. and the City Standards.

1. Bike lanes w/symbols and dimensions (7’ min. adjacent to curb and gutter, 5’ min. adjacent to travel lanes w/o curb and gutter.)

2. Travel lanes w/dimensions for all tapers, angle points, turning bays, medians, symbols, etc.

3. Location of all existing and proposed signs (i.e., no parking/bike lane, stop, speed, warning, etc.)

4. R.O.W., easements. (All traffic control devices must be located within right-of-way or easements.)

5. All street improvements (i.e., curb and gutter, walk, asphalt, etc.) w/dimensions.
Applicant Validation
N/A Included Staff Check

6. Layout data/geometrics to all angle points, end points, symbol locations, and sign locations.

7. Add note to signing and striping sheet: “The layout of all signing and striping using 3-M temporary tape at a minimum of 50’ spacing shall be approved by the City Street Inspector prior to the installation”.

8. Preformed thermo-plastic for arrows, cross walks, bike symbols, etc.

VII. Sanitary Sewer Plan and Profile

A. Include Phasing of construction and development if phasing is desired. See Water/Wastewater Development Standards for further requirements.

VIII. Storm Sewer Plan and Profile

A. Check to make sure water tight joints are used on all storm drainage pipes underneath roads.

B. Include Phasing of construction and development if phasing is desired.

C. The profiles must include the hydraulic grade lines of the storm event that the storm sewer is being designed for.

D. Check to make sure there is a profile for each storm sewer and culvert being proposed.

IX. Utility Details

A. All improvements that have not been standardized are required to be fully designed and shown in the Plans, including the following items:

1. Curb inlets and outlets (to have grates for sidewalks).

2. Irrigation boxes.

3. Drainage structure inlets and outlets.

4. Bridges.

5. Drainage pans.

6. Retaining structures.

B. All standardized improvements shall be depicted by the appropriate City Standard Detail Drawing.
X. Typical Pavement Cross-Sections & Street Improvement Details

A. Pavement sections are to be designed using a soil investigation report as a basis for design, or by using the City’s default values as found in Part IV, Table 4.3.

1. This design will include:

   a. Methods of stabilizing the subgrade. The most common method is to scarify to a minimum depth of six inches and re-compact to a uniform minimum of 95% relative density as determined by AASHTO T-99.

   b. Thickness of the aggregate base course. Compacted to 95% in accordance with T-180.

   c. Thickness of asphalt pavement.

2. “Default pavement design” may be chosen vs. a full pavement design based on a soils report. The default pavement design is based on the following coefficients.

   a. Aggregate Base Course (A.B.C.) strength coef. = 0.11 per inch, unless R Value tests are submitted which show R values > 78.

   b. Pavement Grading “C” & “G” Hot Bituminous pavement strength coefficient = 0.44 per inch.

   c. The minimum sums of the coefficients for the default pavement design are listed below:

<table>
<thead>
<tr>
<th>Pavement Thickness</th>
<th>Street Clarification</th>
<th>WSN</th>
<th>(full depth HBP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.22</td>
<td>Local</td>
<td>2.22</td>
<td>5.5”</td>
</tr>
<tr>
<td>2.97</td>
<td>Minor Collector</td>
<td>2.97</td>
<td>7.0”</td>
</tr>
<tr>
<td>3.48</td>
<td>Major Collector</td>
<td>3.48</td>
<td>8”</td>
</tr>
<tr>
<td>4.08</td>
<td>2-lane Arterial</td>
<td>4.08</td>
<td>9.5”</td>
</tr>
<tr>
<td>4.51</td>
<td>4-lane Arterial</td>
<td>4.51</td>
<td>10.5”</td>
</tr>
<tr>
<td>4.77</td>
<td>6-lane Arterial</td>
<td>4.77</td>
<td>11”</td>
</tr>
</tbody>
</table>

   d. Show the min/max lift thickness for Grading “SX” HBP =1.5” and 2.5” respectively.
e. Show the min/max lift thickness for Grading “S” HBP =2” and 3” respectively.

f. Show the min/max lift thickness for Grading “SG” HBP =3” and 5” respectively.

g. Minimum allowable pavement thickness shall be as shown in Table 10-1.

B. Soils/Subsurface investigation report to recommend methods of stabilizing the subgrade when ground water is within 3’ of the pavement section. Details of the methods of construction of the roads, in high ground water areas, shall be shown and described in the appropriate typical cross-section.

C. Standard Details

1. Access ramp.

2. Gutter pan.

3. Curb and gutter (vertical or driveover).

4. Sidewalk (detached or attached).

5. Elevated sidewalk crossings at driveway (detached walk only).

6. Monolithic curb and gutter/walk (driveover or vertical).

7. Commercial drive approach (flared or radius).

8. Residential drive approach (flared or radius).

9. Curb chase.


11. Industrial edge protection.

D. Non Standard Details – construction detail (i.e., speed hump, traffic circles, etc.)

E. Street Construction Notes (See appendix I-B)
XI. Signing and Striping Details

A. Signing (include MUTCD designations):

1. Standard Details

a. 4” diameter cutout/PVC sleeve in concrete.

b. Sign post and stub.

c. Street name sign and block numbers.

d. Type III barricade with closure sign (road or sidewalk).

e. No parking sign spacing.

f. Speed limits.

g. With school zones. Routing plans for X-walks, stop signs, school flashers, etc.

h. No signs in sidewalks.

i. Install behind attached walk.

B. Striping:

1. Size and details for all pavement markings. (Latex paint for lane lines, and preformed thermoplastic for all symbols and bars).

2. Details

   a. Arrow, only, arrow

   b. Diamond, bike, arrow

   c. Intersection detail (crosswalk, stop bar)

   d. Crosswalk. (Denver Style)

XII. Landscape Plan

A. Include the following in the Landscape Plan:

1. Show all public median treatments (i.e., plants, groundcover, subdrains, etc.)
2. Show all proposed public tree lawn treatments.

3. Show all existing mature vegetation.

4. Annotate intersection sight distance triangles and horizontal curve stopping sight distance triangles on all proposed streets. Private easements may be needed which restrict installation of certain landscape material.

5. All proposed and existing water, wastewater, storm drainage facilities, including laterals, services, meter pits, hydrants, blowoffs, airvacs, etc. Clearances of 10’ to any tree and 5’ to any shrub must be maintained for all proposed and existing facilities.