MEMORANDUM

TO: Developers, Engineers, Surveyors and others preparing civil plan sets for City Approval in Aurora

THROUGH: Kevin Wegener, City Engineer

FROM: Bill McCormick, Associate City Engineer

DATE: November 27, 2017

SUBJECT: Roadway Design & Construction Specifications Erratum No. 1

This Memorandum is being sent to inform you an erratum is available for the above manual on the City’s website. The revisions include clarifications, revisions, additions regarding the Traffic Manager’s signature block placement on plans, inspection of concrete forms general note, street lighting plan requirements, sight triangle dimensional corrections within the text relative to an associated figure, allowable pavement types and associated edge drain requirements, contractor licensing for work within public rights-of-ways, final acceptance of public improvements process, as well as a few other minor revisions corrections. The changes do not affect the entire manual. Also, there have been revisions/corrections made to the street cross-section standard details, curb cut standard details, and Standard Detail S9.15.

The revisions may be downloaded from the City's web page, https://www.auroragov.org/cms/one.aspx?portalId=1881221&pageId=2024030. The changes are also attached to this memo.

These revisions are effective immediately.
The following are minor changes to the above *Roadway Design & Construction Specifications, October 2016*, (Roadway Manual)

- **Chapter 2.00, Section 2.03.5.02.1 and Table 2.03.5.1**: Clarified when and where the Traffic Manager’s signature is required.
- **Chapter 2.00, Section 2.03.6.10**: Modified concrete placement note to reflect form inspection is required by the Public Improvements Inspector prior to placing concrete.
- **Chapter 2.00, Section 2.03.6.17**: Modified note regarding public street or pedestrian lighting installation shall be installed by the developer and the installed lighting shall be owned and maintained by the City.
- **Chapter 2.00, Section 2.10.1**: Eliminated reference to the “Aurora Bicycle Facility Design Guidelines as this document is outdated and is not in conformance with the “Bicycle and Pedestrian Master Plan, dated February 17, 2012.
- **Chapter 4.00, Sections 4.04.2.10.1, 4.04.2.10.1.02, and 4.04.2.10.1.03**: Corrected dimensions to be in conformance with Figure 4.04.2.10.1.02.1’s dimensions.
- **Chapter 4.00, Section 4.04.2.10.2, **Sight triangle area**: Deleted the 30-foot sight triangle.
- **Chapter 4.00, Figure 4.04.2.10.1.02.1**: Corrected spelling within the figure.
- **Chapter 4.00, Section 4.07.7.01.2**: Added reference for parking stall depth.
- **Chapter 5.00, Section 5.01.2.01**: Clarified allowable pavement types within public right-of-way and modified the text to require edge drains for composite pavement sections, unless the geotechnical and pavement design report states the subgrade has the appropriate permeability to waive the edge drain requirement.
- **Chapter 5.00, Section 5.09.2.01**: Modified the text to be in conformance with the changes to Section 5.01.2.01.
- **Chapter 7.00, Section 7.02.1**: There is now only one contractor’s right-of-way license required for work within a public right-of-way instead of four different types of right-of-way licenses.
- **Chapter 7.00, Section 7.03.1**: Added dry utility work requires a permit.
- **Chapter 7.00, Section 7.03.3**: Clarified the fees to be paid are permit fees.
- **Chapter 7.00, Section 7.11.2**: Clarified the required “Release and Indemnification” documentation is for City capital and maintenance projects and such documentation to be forwarded to the City’s Project Manager.
- **Chapter 7.00, Section 7.12**: Added process/requirements for final inspections, needed warranty repairs, and the timing of issuing Final Acceptance of public improvements.
- **Chapter 23.00, Table 23.02.1**: Added Type 5 classification for permeable base to be used when edge drains are present, unless otherwise approved by the City Engineer.
- **Chapter 30.00, Section 30.05**: Changed requirements for discharging concrete from the truck mixer to be in line with ACI guidelines.
- **Chapter 32.00, Section 32.02.1, third paragraph**: Clarified test locations needed to be horizontally located.
- **Standard Details S1.1 through S1.5 and S1.7 through S1.19** have been modified to reflect the above text changes plus line work and dimensional corrections.
- **Standard Detail S7.7** has been added for retrofit projects. Due to this detail addition the page number for Details S7.1 through S7.6 required correction.
- **Standard Detail S9.15** added accessible parking signage information.
2.03.5 Civil Construction Plans and Detail Sheets  All civil construction plans and detail sheets shall conform to the following criteria and show the following information. Additional specific requirements are discussed later in these specifications.

2.03.5.01 Title Block  A title block is required on every report, plan sheet and cover sheet submitted. The subdivision name and filing number; site plan name and its City file number (if applicable); the type of improvement; name of Developer/Owner, name of contact, address (including zip code), telephone number of the Development/Owner contact, the name of the Consultant; name of contact, address (including zip code) and telephone number of contact; and sheet number (consecutive, beginning with the cover sheet) shall be included in the title block. If the plans or reports do not relate to a specific subdivision, the name of the street or channel, as well as the limits of the project, shall be clearly indicated. The title block shall be located in the extreme lower right-hand corner of each sheet. See Section 2.05 for title information needed on Pavement Design Reports.
2.03.5.02 Approval Block

2.03.5.02.1 An approval block is required on the cover sheet of the civil construction plans, the first page of every drainage report, the first page of every pavement design report, the first page of every inspection and maintenance plan document submitted for review and approval. The one exception to the above is when there are traffic signal plans included in the civil plans. Then, those sheets associated with the traffic signal(s) shall have an approval block in the lower right-hand corner of the plans with only the Traffic Manager as the signatory. The Traffic Manager signature shall not be included on the cover sheet. See Table 2.03.5.1 for the required signatures in the approval block relative to the type of plan sheets included in the civil construction plans. The height of the approval block shall be adjusted according to the number of signatures required.

### Table 2.03.5.1
Required Signatures

<table>
<thead>
<tr>
<th>TYPE PLAN</th>
<th>SIGNATURES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water distribution and water system report</td>
<td>City Engineer</td>
</tr>
<tr>
<td></td>
<td>Water Department</td>
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<tr>
<td></td>
<td>Fire Department</td>
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<tr>
<td>Sanitary sewer system and Sanitary sewer report</td>
<td>City Engineer</td>
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<tr>
<td></td>
<td>Water Department</td>
</tr>
<tr>
<td>Storm drainage system and drainage report</td>
<td>City Engineer</td>
</tr>
<tr>
<td></td>
<td>Water Department</td>
</tr>
<tr>
<td>Roadway and grading</td>
<td>City Engineer</td>
</tr>
<tr>
<td>Roadway modifying existing or new raised median construction within the public R.O.W.</td>
<td>City Engineer</td>
</tr>
<tr>
<td>Access proposed onto the public R.O.W. without an approved site plan</td>
<td>City Engineer</td>
</tr>
<tr>
<td>Erosion and sediment control plan and report</td>
<td>City Engineer</td>
</tr>
<tr>
<td></td>
<td>Water Department</td>
</tr>
<tr>
<td>Traffic construction control</td>
<td>City Engineer</td>
</tr>
<tr>
<td>Signing and striping plans</td>
<td>City Engineer</td>
</tr>
<tr>
<td>Pavement design report</td>
<td>City Engineer</td>
</tr>
<tr>
<td>All plans on a case-by-case basis</td>
<td>Parks, Recreation and Open Space</td>
</tr>
<tr>
<td>Traffic Signal Plans*</td>
<td>Traffic Manager</td>
</tr>
<tr>
<td>Street Light Plans</td>
<td>City Engineer</td>
</tr>
</tbody>
</table>

- The Traffic Manager’s signature is required only on traffic signal plans. Do not include this signature on the cover sheet.
2.03.07.2 **Projects shall be prepared using the NAVD 1988 vertical datum and the NAD 83 / 92 HARN horizontal control system (see Section 2.11).**

2.03.08 **Underground Utilities** The type, size, location, and the number of all underground utilities shall be shown. Field verified elevations and locations are required on all development plans for existing underground utilities which will potentially affect the proposed design or construction. It will be the responsibility of the Contractor to verify the existence and location of all existing underground utilities along his route of work prior to commencing any construction.

2.03.09 **Private Improvements**

2.03.09.1 Private improvements, such as roadways, sidewalks, driveways, utilities, etc., shall be clearly shown and labeled as such on each sheet of the development plans. See required notes in Section 2.03.6.

2.03.09.2 When a request is made for the City to assume maintenance of any private improvement, it shall be the responsibility of the person(s) making the request to prove the private improvement was in fact constructed in accordance with the current Roadway Design and Construction Specifications. The City will review these requests under normal review procedures. Private improvements built according to City specifications and standards may be accepted at the City's discretion. Private improvements not constructed in accordance with the applicable Design and Construction Standards and Specifications will not be accepted for maintenance by the City.

2.03.10 **Copyright Notes** Copyright notes shall not be placed on the signature sets or any reports submitted for approval. The City must be able to make copies of the approved plans and reports at any time without written authorization from the plan’s or report’s author.

2.03.6 **Required Notes** These notes shall appear on the cover sheet. If a cover sheet has not been used, they shall be put on every sheet of the submittal.

2.03.6.01 City of Aurora plan review is only for general conformance with City of Aurora design criteria and the City Code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations which shall be confirmed and correlated at the job site. The City of Aurora, through the
approval of this document, assumes no responsibility for the completeness and/or accuracy of this document.

2.03.6.02 All roadway construction shall conform to City of Aurora "Roadway Design & Construction Specifications," latest edition.

2.03.6.03 All water distribution, sanitary sewer, and storm drainage construction shall conform to City of Aurora "Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure," latest revision.

2.03.6.04 All materials and workmanship shall be subject to inspection by the City. The City reserves the right to accept or reject any materials and workmanship that does not conform to the City standards and specifications.

2.03.6.05 The Contractor shall notify the City Public Improvement Inspections Division, 303-739-7420, 24 hours prior to the beginning of construction.

2.03.6.06 Location of existing utilities shall be verified by the Contractor prior to actual construction. For information, contact Utility Notification Center of Colorado, 1-800-922-1987 or 811.

2.03.6.07 The Contractor shall have one signed copy of the plans (approved by the City of Aurora), one copy of the appropriate standards and specifications at the job site at all times, and a copy of any permits and extension agreements needed at the job site at all times.

2.03.6.08 It is the Consultant's responsibility to accurately show existing conditions, both on-site, and off-site, on the construction plans. Any modifications needed due to conflicts, omissions, or changed conditions either on-site or off-site, which arise in the field, will be entirely the Developer's responsibility. The cost to rectify any adverse situation to meet the City standards and specifications and the City Code shall be borne solely by the Developer.

2.03.6.09 The owner/developer must obtain the written permission of the adjacent property owner(s) prior to any off-site grading or construction.

2.03.6.10 Concrete shall not be placed until the forms have been inspected by Public Improvements Inspections.

2.03.6.11 Paving of public streets shall not start until a soil report and pavement design is approved by the City Engineer, proof rolling, and subgrade and trench
compaction tests taken by the developer’s geotech are approved by Public Improvements Inspections/Materials Lab.

2.03.6.12 Standard City of Aurora curb ramps shall be constructed at all curb returns, at all "T" intersections and at all curbside kiosks or clusters, unless otherwise modified by these plans.

2.03.6.13 All stationing is based on centerline of roadways unless otherwise noted.

2.03.6.14 All elevations are ________________________________ (indicate top of curb or flow line) unless otherwise noted.

2.03.6.15 The City of Aurora shall not be liable for the maintenance of ________________________________ (Insert name of specific private improvement(s).) These facilities may not meet City standards and shall remain in private maintenance by ________________________________ (insert name of entity to be responsible for the maintenance) in perpetuity. These private facilities include, if provided, the private underdrain system placed within the public right-of-way.

2.03.6.16 The contractor/developer is responsible for contacting CDOT to ensure all work on or adjacent to state highways or CDOT R.O.W. meets CDOT requirements.

2.03.6.17 The streetlight or pedestrian light installation within the public right-of-way shall be designed, funded, and constructed by the developer/owner. Ownership and maintenance of the street/pedestrian lights shall be the responsibility of the City of Aurora once they have been accepted. Street light and/or pedestrian lighting plans shall be prepared and submitted to the City for review and approval and shall become a part of the approved civil construction plans for the project. Certificate of occupancies will not be issued until the street and/or pedestrian lighting plans are approved, constructed, and initially accepted.

2.03.6.18 The Owner/Contractor must obtain a C.D.P.S. storm water discharge permit from the Colorado Department of Public Health and Environment, if required.

2.03.6.19 The Owner/Contractor is responsible for coordinating with the Army Corp of Engineers for wetland mitigation or work within the Waters of the U.S., if required. It is the responsibility of the Owner/Contractor to provide a copy of the Army Corp of Engineer’s requirements to the City of Aurora. If there are no requirements by the Army Corp of Engineers, then a written notification from the Army Corp of Engineers shall be submitted to the City of Aurora stating such. City approval of the construction plans is subject to the
Owner/Contractor obtaining a 404 permit, if applicable. A copy of this permit shall be submitted to the City of Aurora prior to any permits being issued.

2.03.6.20 All signage and striping shall be in accordance with the Manual of Uniform Traffic Control Devices, unless otherwise noted by the City of Aurora.

2.03.6.21 Private underdrain systems for groundwater discharges from foundation drains shall be owned and maintained by the HOA/Metro District *(select one)*.

2.03.7 Where applicable label adjacent subdivision names and their City of Aurora six digit Engineering Drawing Number (EDN).

2.03.8 Details The plans shall include adequate details of special structures not covered by City of Aurora Standard Details. Do **not** include City Standard Details in the plans, but reference them by detail number, only.

2.04 Storm Drainage Plans and Reports

In accordance with the requirements set forth in Chapter 2.00, the City of Aurora "Storm Drainage Design and Technical Criteria" manual, and "Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure," latest editions, the following information shall be shown on all storm drainage plans or included in all drainage reports submitted for approval.

2.04.1 Master Drainage Study A Master Drainage Study Plan and Report is required prior to approval of any planned community zoned district or site plan in excess of 80 acres or any phased commercial/industrial development in excess of 10 acres. The study shall be coordinated with all applicable drainage master plans and prepared according to the City of Aurora "Storm Drainage Design and Technical Criteria" manual.

2.04.2 Preliminary Drainage Plan and Report/Letter A Preliminary Drainage Plan and Report/Letter must be approved prior to approval of any subdivision plat or site plan. The Preliminary Drainage Plan and Report/Letter must be approved by the City Engineer and the Water Department prior to Planning Commission action. The Preliminary Drainage Plan and Report/Letter shall be prepared according to the City of Aurora "Storm Drainage Design and Technical Criteria" manual, latest edition.

2.04.3 Final Drainage Plan and Report/Letter The Final Drainage Plan and Report/Letter shall be a detailed study and analysis of the proposed development. It shall include detailed calculations for all runoff, as well as for all drainage structures, of facilities within the proposed development. The Final Drainage Plan and Report
must be approved by the City Engineer and the Water Department prior to the issuance of any building permits within the proposed development and prior to the subdivision plat approval. The Final Drainage Plan and Report/Letter must be submitted for review and approval with the construction plans for the entire development and will be reviewed concurrently with said construction plans. The report shall be typed on 8-1/2" x 11" format. If hard copies of reports are submitted for review and approval, they shall be bound with either three-ring binder or plastic comb binding. Reports bound with stitching, thermal bindings, glued bindings or perfect bindings will not be accepted. Plans and calculations comprising the Final Drainage Plan and Report/Letter shall be prepared in accordance with the City of Aurora "Storm Drainage Design and Technical Criteria" manual.

2.04.4 Title of Storm Drainage Plan and Report All drawings and reports shall include in the title the subdivision name, subdivision filing number, and the lot and block number where applicable.

2.04.5 Channel Plans and Profiles Where streams or channels are Urban Drainage and Flood Control District (UDFCD) maintenance eligible the following note shall be added to the general notes. “The UDFCD shall be contacted for a channel pre-construction meeting and to establish routine inspection for required elements of the channel, i.e., toe protection, grade control structures, etc.

2.05 Pavement Design Report Format

2.05.1 General The report shall be on 8 1/2" x 11" format. At a minimum the report shall contain the following information and in the order enumerated: a title page with the City approval block; a vicinity map; the geotechnical investigation portion of the report (see Section 5.04); the pavement design portion of the report (see Section 5.05). See the submittal checklist after Figure 2.05.2.07.1.

2.05.2 Title Page with City Approval Block The title page shall be on the very first page of the report. A sample of the title page is included in Figure 2.05.2.1. The following information shall be shown on the title page:

2.05.2.01 Title of the report: Geotechnical and Pavement Design Report.

2.05.2.02 Subdivision Name and Filing Number. Also, include the Lot and Block numbers if the report does not apply to the entire filing. If the report does not relate to a specific subdivision, the name of the proposed development shall be listed or the street and the limits of construction.
2.05.2.03 City of Aurora Engineering Drawing Number of approved civil plans, if available.

2.05.2.04 Name of Consultant, full address (including zip code), telephone number, fax number of the Consultant, name of contact person, and email address of the contact person.

2.05.2.05 Name of the owner, full address (including zip code), telephone number, fax number, name of contact person, and email address of the contact person.

2.05.2.06 A 2 inch to 2 ½ inch blank space for the City reviewing engineer’s comments.

2.05.2.07 A City approval block, in the dimensions shown on the Sample Title Page.
residential structure on a property removed from the floodplain by the issuance of a FEMA Letter of Map Revision Based on Fill (LOMR-F), unless such new structure or addition has the lowest floor (including basement or crawl space), electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities (including ductwork), are elevated to at least two feet above the BFE that is current or existed prior to the placement of fill, whichever is greater. Where a new addition to an existing residential structure is proposed, the NFIP requirements for substantial completion still apply.

2.08.3 Erosion Control/Overlot Grading In most cases the erosion control plan may be combined with the overlot grading plan. However, they may be submitted separately. If an erosion control and overlot grading plan is submitted separately from the rest of the civil construction package in order to obtain a storm water quality permit, only the erosion control plan is approved. The final grading plan is approved when the final drainage study is approved. Refer to the "Rules and Regulations Regarding Stormwater Discharges Associated with Construction Activities", latest edition, for storm water quality control plan, and erosion and sediment control plan requirements.

2.08.4 Over Excavation Where over excavation and backfill within building envelopes will be performed, the erosion control plans shall show the following:

2.08.4.01 The extent of the over excavation.

2.08.4.02 Temporary stockpile locations resulting from the over excavation.

2.08.4.03 The following notes shall be added:

2.08.4.03.01 The Contractor shall not leave any 1:1 slopes open for any extended period of time. Excavations shall be backfilled if construction is delayed more than three weeks.

2.08.4.03.02 A Colorado licensed Professional Engineer must be onsite to observe the excavation, evaluate slope stability, and determine when shoring and/or side sloping of the excavation is required.

2.08.4.03.03 Due to the depth of the over excavation, the excavated area must be surrounded with a six-foot high chain link fence. It must be securely closed during non-working hours to prevent unauthorized access.

2.09 Combining Plans

The plans described above may be combined, at the discretion of the consulting engineer, provided they are clear and adequately communicate the required information. The Public Works
Engineering Control Division plans review staff shall make the final determination for approval or disapproval for the clarity and adequacy. Combining water line and/or sanitary sewer line information with other plans will not be allowed (see Section 2.06.2.13).

### 2.10 Signing and Striping Plans

2.10.1 Signing and striping plans (interim and final, if necessary) shall be submitted for all streets, including those streets designed to accommodate striped bike lanes. See the Aurora Bicycle and Pedestrian Master Plan, dated February 17, 2012. Signing and striping plans shall include, but not be limited to, all appropriate and applicable regulatory, warning, and guide signs and striping materials in accordance with the current Manual on Uniform Traffic Control Devices (MUTCD) and City standards and specifications. Said plans shall also include street name signs on ALL public and private streets as appropriate and applicable.

2.10.2 For TOD and Urban Centers signing and striping plans shall be submitted showing the striping for the parking and other striping requirements such as the Fire Department’s truck set-up areas, bike lanes, etc.

2.10.2.01 Bike lanes shall extend through curb extensions at TOD and Urban Centers intersections up to the cross-walks, if provided, in accordance with MUTCD standards. The bike lane width shall be a minimum of five-feet, not including the gutter pan width.

2.10.3 Roundabout signing shall include proper regulatory control, advance warning, and directional guidance for the roadway users. The signs shall be located so the information needed are easily seen and in advance of the condition. Signs shall not be located where there will be conflict with vehicle turning movements and the swept path of vehicles. Since the signing and striping for a roundabout can get complicated a larger scale drawing for the roundabout signing and striping may be required. It may be necessary to have two separate drawings to avoid clutter and overlapping information between signs and striping. See Section 4.09.6 for additional information.

### 2.11 Survey Control Drawing

2.11.1 For all work within public right-of-way a survey control drawing shall be included in the civil plan submittal and shall contain the following:
template for a “P” design vehicle shall be used to confirm this standard is met.

4.04.2.08.4 Each motor court with a shared drive lane longer than 100 feet from the public street shall have a fire hydrant to the shared drive lane at a point determined by the Fire Department.

4.04.2.08.5 City utility meter pits shall be located on the motor court side of the dwelling units.

4.04.2.08.6 Public access easements, fire lane easements, and/or utility easements shall be dedicated for Motor Courts as needed.

4.04.2.09  **Loop Lanes**

4.04.2.09.1 The width of the Loop Lane shall be 18 feet wide for one-way travel. For two-way travel the Loop Lane shall be 23 feet wide. See City Code Section 146-1108(B)4 for parking and ownership/maintenance requirements. Loop Lanes shall be private and dedicated as a public access easement, firelane easement, and/or utility easement, if needed.

4.04.2.09.2 No portion of the Loop Lane shall extend more than 250 feet from the public street to which it gives access.

4.04.2.09.3 The Loop Lane shall be surfaced with concrete, minimum of six-inches thick. A jointing plan shall be included with the civil plan submittal.

4.04.2.09.4 The Loop Lane design shall permit a passenger vehicle to back out of an individual driveway and turn 90 degrees in either direction without any portion of the vehicle: (a) leaving the individual driveway from which the vehicle is exiting or the loop lane, or (b) entering on or over the individual driveways of any other residence. The AASHTO turning template for “P” design vehicle shall be used to confirm these standards are met.

4.04.2.09.5 Each Loop Lane with a shared driveway longer than 100 feet from the public street shall have a fire hydrant adjacent to the shared driveway at a point determined by the Fire Department.
4.04.2.10  Sight Triangles

4.04.2.10.1  Obstruction prohibited.  No person shall place or maintain any structures, fences, landscaping, or any other objects within any sight triangle area described in Section 4.04.2.10.2 that obstruct or obscure sight visibility through such structures, fencing, landscaping, or other objects in the vertical plane above the sight triangle area between a height of 36 inches and 84 inches above the roadway surface. The following are exceptions to these restrictions:

4.04.2.10.1.01  Landscaping, structures, or fences that protrude no more than 26 inches above the adjacent roadway surface may be permitted within the sight triangle area.

4.04.2.10.1.02  Landscaping, structures, fences, or any other objects that obstruct or obscure sight visibility less than or equal to 25 percent through such structures, fences, landscaping, or other objects in the vertical plane above the sight triangle area between a height of 24 inches and 36 inches above the roadway surface. See Figure 4.04.2.10.1.02.1.

4.04.2.10.1.03  Trees may be planted and maintained within the sight triangle area if all branches are trimmed to maintain a clear vision for a vertical height of 84 inches above the roadway surface. The location of the trees planted, based on the tree species' expected mature height and size, shall not obstruct sight visibility by more than 25 percent of the sight triangle area.

4.04.2.10.2  Sight triangle area.  For purposes of this section, the sight triangle area shall be based on the criteria found in Detail TE-13, Roadway Design & Construction Specifications, latest edition.
4.04.3 Design Speed  Design speed shall be as shown in Table 4.04.4.1.

4.04.4 Horizontal Curves  The minimum centerline radius for horizontal curves shall be as shown in Table 4.04.4.1. Variances from the requirements of Table 4.04.4.1 for local streets only will be considered on a case-by-case basis.
### Table 4.04.4.1
Horizontal Alignment Controls, Including Urban Centers and TODs

<table>
<thead>
<tr>
<th>STREET CLASSIFICATION</th>
<th>DESIGN SPEED MPH</th>
<th>MINIMUM RADIUS***</th>
<th>STREET CLASSIFICATION</th>
<th>DESIGN SPEED</th>
<th>MINIMUM RADIUS</th>
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<tbody>
<tr>
<td>ARTERIALS</td>
<td>50</td>
<td>930'</td>
<td>Boulevard 4 or 6 Lanes</td>
<td>50</td>
<td>930'</td>
</tr>
<tr>
<td>LOW DENSITY RURAL</td>
<td>45</td>
<td>720'</td>
<td>Multiway Boulevard – 4 or 6 Through Lanes</td>
<td>50*</td>
<td>930'</td>
</tr>
<tr>
<td>COLLECTOR 3-LANE</td>
<td>35</td>
<td>425'</td>
<td>Main Street 2 Lanes with Median / Center Turn Lane</td>
<td>35 30</td>
<td>375' 250'</td>
</tr>
<tr>
<td>COLLECTOR 2-LANE</td>
<td>35</td>
<td>425'</td>
<td>Main Street – Median 4 Lanes</td>
<td>40 35</td>
<td>575' 425'</td>
</tr>
<tr>
<td>LOCAL TYPE I</td>
<td>30</td>
<td>250'</td>
<td>Main Street – 2 Lanes with Parallel Parking</td>
<td>30</td>
<td>250'</td>
</tr>
<tr>
<td>LOCAL TYPE 2**</td>
<td>25</td>
<td>150'</td>
<td>Main Street – 2 Lanes with Diagonal Parking</td>
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<td>250'</td>
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<tr>
<td>LOCAL TYPE 3</td>
<td>35</td>
<td>375'</td>
<td>One Way Couplet 2 Lanes</td>
<td>35 30</td>
<td>425' 250'</td>
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<tr>
<td>Local Urban 2 Lanes</td>
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<td></td>
<td>Residential Parkway 2 Lanes</td>
<td>30</td>
<td>250'</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Neighborhood 2 Lanes</td>
<td>30</td>
<td>250'</td>
</tr>
</tbody>
</table>

*The posted speed limit for the access road for the Multiway Boulevard will be 25.
**Local Type 2 streets on dead-end cul-de-sacs shall use Local Type 2 criteria except minimum road centerline radius may be reduced to 100’ with curve widening. See Section 4.04.5.04.
***Arterial Roads and for some selected 4-Lane Collectors and Low Density Rural Roads, when the minimum street radii are used these roads shall also be superelevated. See Section 4.05.3.

### 4.04.5 Intersections

#### 4.04.5.01 Turning Radius
All roadways shall intersect at 90 degrees ± 5 degrees. For the minimum allowable intersection turning radius on cross streets intersecting arterial streets, see Standard Detail S2.4.

#### 4.04.5.02
For any intersection with double turn lanes or non-standard geometry, the design shall provide an analysis of turning radii using an appropriate design vehicle. Consult with the Engineering staff to discuss criteria prior to performing the analysis.

#### 4.04.5.03 Curb Return and Property Line Radii
Minimum curb return and property line radii shall be as shown in Table 4.04.5.02.
4.07.1.01 Fire lane widths shall be as provided in City Code Section 66-32 and shall be designated on all plats, site plans, and civil plans. Where fire lanes turn the inside radius shall be 29-feet and the outside radius shall be 52-feet. Where the fire lane width is 26-feet wide the inside radius shall be 26-feet an outside radius of 52-feet.

4.07.1.02 Fire lanes shall be paved full width with asphalt, concrete, or hidden pavement structures. Where hidden pavement structures are used the fire lane must be marked in some way so the Fire Department, if they need to, will know where the fire lane is located.

4.07.1.03 A fire lane shall not be considered by the City for acceptance as a public street, unless it meets all current public street standards.

4.07.1.04 See Sections 4.04.1.05 and 4.04.1.06 for additional fire lane information.

4.07.2 Pavement Design Pavement design for fire lanes, private streets or drives, and parking lots shall be in conformance with Section 5.00 PAVEMENT DESIGN.

4.07.3 Drainage Report Preliminary and final drainage reports are required. See Section 2.04, STORM DRAINAGE PLANS AND REPORTS.

4.07.4 Pavement Cross Slopes All asphalt surfaces shall have a minimum grade of 1.00%. If grades are less than 1.00%, the pavement shall be concrete. Inverted crowns used for driveways, fire lanes, or parking lots shall have a swale "V" design with 1.00% minimum positive slope along the flow line. Drainage pans shall continue to an inlet or other acceptable outfall and will not drain to an asphalt surface. If the pan slope is between 0.5% and 1.0%, a concrete drainage pan shall be installed. The pan shall have a minimum width of 4 feet, and shall be a minimum 6 inch thick in parking lot areas, a minimum of 10 inch thick in fire lanes, and driveways. The center depression of the pan shall be ¼ inch per foot of pan width (total) minimum. Where bituminous paving adjoins the pan, paving must be 1/8 inch to 3/8 inch higher than the elevation of the lip of pan. Reinforcing shall be as required by standard detail S4.1. If drainage is appropriately provided and the perpendicular parking spaces and adjoining private street form a continuous crowned section, the drainage pans may be omitted.

4.07.5 Transitions Transitions in private street width shall be smooth and shall not pose a hazard to traffic (refer to Section 4.05.11, OFFSITE DESIGN AND
CONSTRUCTION). Transitions shall not encroach on the limits of the existing private street width. Horizontal alignment and pavement widening in curves shall conform to Section 4.04, HORIZONTAL ALIGNMENT.

4.07.6 Curbs  Vertical or mountable curb and gutter shall border all private streets. Refer to the City approved site or contextual site plan.

4.07.7 Parking Area and Parking Lots  Island noses for landscaping, utility access, or pedestrian access may be located within areas of perpendicular parking stalls but no island may project within 18 feet of centerline of a private street. Curb radii shall be a minimum of 18 inches, except at locations allowing drive-through access. All parking areas shall be surfaced with concrete, asphalt, brick pavers, or stone pavers.

4.07.7.01 Accessible Parking

4.07.7.01.1 Accessible parking shall be provided within TODs and Urban Centers streets with diagonal parking. There shall be two universal spaces per each side of the street, per block, where there is diagonal parking. One of the universal spaces shall be van accessible. Additional accessible parking shall be provided at locations designated on the approved site plans or parking plans.

4.07.7.01.2 Accessible parking spaces shall be a minimum of nine feet wide. Access aisles adjacent to accessible spaces shall be a minimum of five feet wide. Two accessible parking spaces may share a common access aisle. One space in every eight accessible spaces, but not less than one, shall be served by an access aisle at least eight feet wide, and shall be designated “Van Accessible”. The depth of the parking spaces shall be in conformance with Figure 15.3 located in City Code Section 146-1500.

4.07.7.01.3 Parking access aisles next to accessible spaces shall be part of the accessible route to the building or facility entrance. Curb cuts or curb ramps shall be required for all new construction and reconstruction. Accessible spaces serving a particular building shall be located on the shortest accessible route of travel from parking to an accessible entrance.

4.07.7.01.4 Accessible parking spaces shall be marked and maintained with striping or other surface painting to distinguish accessible spaces from other parking spaces. Accessible parking spaces shall also be posted with an above grade
sign at each accessible space incorporating the international symbol of accessibility and the following language: “Reserved Parking, Tow Away Zone.” Such sign shall adhere to the provisions of Section 2B.46: Parking, Standing, and Stopping Signs of the Manual on Uniform Traffic Control Devices, 2009 Edition.

**Figure 4.07.7.01.4.1 – Signage for Accessible Parking**
4.07.7.01.5  The resultant grade in any direction within accessible parking areas shall not exceed two percent.

4.07.7.02  Parcel / Parking Access

4.07.7.02.1  Only the minimum number of curb cuts necessary to serve the subject parcel/parking lot shall be permitted.

4.07.7.02.2  Access drives shall be oriented substantially at right angles (90 degrees) to the street.

4.07.7.02.3  Higher density residential access driveway widths shall not be less than 20 feet nor more than 30 feet, unless there are medians in the driveways.

4.07.7.02.4  Access to parking lots along arterials shall be from the local side street wherever possible, except between commercial parking areas bordered by residential property.

4.07.7.02.5  Access drives shall be located as follows and is based on centerline to centerline measurement:

4.07.7.02.5.01  Access points shall be no closer than 300 feet to arterial intersections. Depending on site characteristics access control may be required.

4.07.7.02.5.02  Access points shall be no closer than 150 feet to collector or local intersections. Depending on site characteristics access control may be required.

4.07.7.02.5.03  Access points shall be no closer than ten feet to any adjacent property line, unless they are shared accesses.

4.07.7.02.5.04  Residential driveways shall be located as far from street intersections as possible, 75-feet preferred with the distance measured from the intersecting street’s flowline. See Section 4.04.2.01.1 for additional requirements.

4.07.7.02.5.05  Access points shall align with other access points/streets across from the cross street, unless otherwise allowed by the Engineer.

4.07.7.02.5.06  If adherence to the above criteria would leave a parcel with no access, then the Director of Planning, or his designee, and the City Engineer may vary the requirements to provide a single point of access on a case-by-case basis.
SECTION 5.00 PAVEMENT DESIGN

5.01 Pavement Design


5.01.2 Scope

5.01.2.01 Placement of pavement within public right-of-way or public access easements maintained by Aurora requires a geotechnical investigation and pavement design report (hereafter called “geotechnical and pavement design report” or “report”) approved prior to issuance of a permit to perform the work. All new street and public access easements maintained by Aurora shall be paved with a composite Asphaltic Concrete and Aggregate Base Course section or Portland Cement Concrete section. Edge drains will be required for the composite sections (See Standard Detail S1.19), unless the geotechnical and pavement design report indicates the subgrade soil’s permeability is greater than 10 feet per day. Where edge drains are installed the base course material shall conform to Type 6 (See Section 23.02, Table 23.02.1). The edge drain shall outfall into an adjacent storm sewer inlet. Edge drains shall be installed 100 feet either side of low points (sump inlets) in streets or upstream from on-grade Type R Inlets, unless geotechnical analysis requires additional protection. For work within an existing paved street, the City Engineer or authorized representative may approve the use of a pavement cross section based on the existing pavement condition or a previously approved pavement design report.

5.01.2.02 Placement of pavement for new or existing private parking lots, fire lanes, driveways and private streets shall equal or exceed the default sections listed in Tables 5.01.2.03.1 through 5.01.2.03.4 below, unless a site specific pavement design is approved. A geotechnical and pavement design report is not required for paving of new or existing private parking lots, fire lanes, driveways, and private streets (other than TODs and Urban Centers). The civil plans shall have the default pavement thicknesses labeled on the plans and a note indicating the type of soils within the project. A paving permit for these private infrastructure is not required. A Private Development
Pavement Certification shall be required to be submitted prior to issuing a Certificate of Occupancy (see example after the end of Section 5.12.7).

<table>
<thead>
<tr>
<th>Table 5.01.2.03.1</th>
<th>PRIVATE PAVEMENT DEFAULT SECTIONS¹</th>
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<tr>
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<td>PRIVATE STREET OR DRIVE</td>
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### SOIL GROUP “A”
A-1 thru A-5 (R-Value)

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A-2 thru A-5 (CBR)

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A-2-4 & A-2-6 (Qₚ)

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### SOIL GROUP “D”²
A-6 (Qₚ)

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<td>4.0&quot; + 8.0&quot;</td>
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### SOIL GROUP “E”²
A-7-6 (Qₚ)

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Note 1  Based on ACPA Software StreetPave 12

Note 2  For swelling soils see Table 5.06.1.1 for subgrade preparation requirements.
Table 5.06.1.1
Moisture Treatment Requirements

<table>
<thead>
<tr>
<th>Swell Potential ¹</th>
<th>Depth of Moisture Treatment ²</th>
<th>Depth of Chemical Stabilization</th>
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<tr>
<td>&lt; 3% swell</td>
<td>moisture treat to a depth of 1'</td>
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<tr>
<td>&gt; 3% &lt; 5% swell ³</td>
<td>Moisture treat to depth of 2.5' or</td>
<td>---</td>
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<tr>
<td></td>
<td>Moisture treat to a depth of 1.5'</td>
<td>Stabilization treat to a depth of 1'</td>
</tr>
<tr>
<td>&gt; 5% swell ³</td>
<td>Moisture treat to a depth of 1.5'</td>
<td>Stabilization treat to a depth of 1'</td>
</tr>
</tbody>
</table>

¹ Indicates highest percentage of swell as recorded to the nearest whole number.
² From the top of finished subgrade, moisture treatment shall not go deeper than 30 inches without written direction from the engineer.
³ The moisture content for the subgrade moisture treatment shall be + 4 to + 6 percent optimum moisture content.

5.06.2 Resilient Modulus

5.06.2.01 For soil types, A-1, A-3, A-2-5, A-2-7, A-4, and A-5 Resilient Modulus, $M_R$ shall be determined by R-Value conversion. R-Value shall be determined in accordance with AASHTO T 190. The following formula based on Colorado Department of Transportation, "Roadway Design Manual" shall be utilized to convert Hveem "R" to $M_R$.

$$M_R = (0.75) 10^Z; \text{ where } Z = 0.0142R + 3.4098$$

Equation 5.06.2.1

5.06.2.02 For soil types A-2-4 and A-2-6: $M_R = 1.67 q_u$

For soil type A-6: $M_R = 1.61 q_u$

For soil type A-7-6: $M_R = 2.35 q_u$

For Claystone: $M_R = 1.26 q_u$

Where $q_u =$ Unconfined Compressive Strength (remolded at 2% over OMC and 95% of MDD) in psf, AASHTO T 208; and where $M_R$ is in psi

For fine-grained soils with a soaked CBR between 5 and 10, use the following equation to correlate CBR to resilient modulus (Mr):

$$\text{Design Mr (psi)} = 1,500 \times \text{CBR}$$

Equation 5.06.2.2
For non-fine-grained soils with a soaked CBR greater than 10, use the following equation:

$$Mr = 3,000 \times CBR^{0.65}$$  \hspace{1cm} \text{Equation 5.06.2.3}

The above values may be multiplied by a coefficient of 1.33, if one of the following applies: an edge drain system is provided; subgrade permeability is greater than 10 ft. per day; it is a Low Density Rural roadway section with drainage ditches; or the subgrade is gneiss or granite in nature.

Remarks - Note unusual conditions or other data that would be considered necessary to properly interpret the results.

**5.06.2.03 Effective Modulus of Subgrade Reaction** For rigid pavement design, laboratory soil resilient Modulus MUST be converted to Modulus of Subgrade Reaction based on the formula: \( k = M_r/19.4 \) or Figure 3.3 or 3.4 of the AASHTO Guide. Figure 3.6 of the AASHTO Guide must also be applied with \( LS = 2.5 \) to obtain the Effective Modulus of Subgrade Reaction, \( k \), before entering this value into the appropriate rigid pavement design nomograph, N-5.3 or N-5.4, or computer program.

**5.07 Traffic - Equivalent Single Axle Loads (ESAL)**

**5.07.1** ESAL is defined as total number of equivalent 18,000 lb. single axle load applications for the design lane. Local streets shall use a 20-year design period. Collectors and Arterials shall use a 30-year design period. The design period for pavements within the Core and Transition Zones of TOD’s and Urban Centers is 30-years. Calculated ESALs must be equal to or greater than the Minimum ESALs listed in Tables 5.07.1.1 and 5.07.1.2 below. For Collector and Arterial streets the ESALs shall be weighted by a factor of 1.5 on the right lane due to the Regional Transportation District’s bus routes. The intersections of Collector and Arterial streets shall increase the ESALs by a factor of 1.5. See Section 5.09.2.01 for additional requirements for pavement sections. The City Engineer may increase the minimum ESAL at any location, if, in his opinion, traffic conditions warrant.
### Table 5.08.4
**MINIMUM PAVEMENT SECTIONS**
**LOCAL STREETS**

<table>
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<tr>
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<td>A-1 thru A-5 (R-Value)</td>
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<tr>
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<td>AC and Aggregate Base</td>
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<td>A-2 thru A-5 (CBR)</td>
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**Note 1** Based on ACPA Software StreetPave 12

**Note 2** For swelling soils see Table 5.06.1.1 for subgrade preparation.

### 5.09 Pavement Materials

#### 5.09.1 Asphalt Cement Concrete (AC) shall be plant mix hot bituminous pavement (also referred to as HBP). Use of other than AC, PCC, or gravel base requires submittal of appropriate test data for approval. Materials and construction shall comply with Section 24.00, **BTUMINOUS PAVEMENT MATERIALS**, Section 31.00, **CONCRETE PAVEMENT**, or Section 23, **STREET CONSTRUCTION AGGREGATES**.

Both sides of the street must be of the same material.
Minimum lengths for any one type of pavement material shall be as specified in Table 5.09.2.01 below.

5.09.2 Where arterial/arterial, boulevard/boulevard, multi-way boulevard/multi-way boulevard intersections are already partially paved with PCC the remaining portions of the intersection shall be PCC beginning 250' behind each PCR and extending through the entire intersection when the intersection is completed.

5.09.2.01 Where new arterial/arterial, boulevard/boulevard, multi-way boulevard/multi-way boulevard intersections are paved with a composite Asphal tic Concrete and Aggregate Base Course section with the top lift being Stone Matrix Asphalt (SMA) the Aggregate Base Course through the intersection (100-feet beyond the PCR on all legs of the intersection) shall be thickened to allow for the Asphal tic Concrete section to remain uniform from the street section through the intersection. Edge drains will be required with outlets to storm sewer inlets, unless the geotechnical and pavement design report indicates the existing subgrade soil’s permeability is greater than 10 feet per day.

### Table 5.09.2.01.1

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<th>STREET TYPE</th>
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<tr>
<td>Collector, Main Street – 4 and 2 Lane w/ Median, Residential Parkway</td>
<td>one block, if longer than 500’</td>
</tr>
<tr>
<td>Local access, Main Street – 2 Lane, One Way</td>
<td>one block, if longer than 300’</td>
</tr>
<tr>
<td>Couplet, Local Urban, Neighborhood</td>
<td></td>
</tr>
<tr>
<td>Cul-de-sac*</td>
<td>300’</td>
</tr>
<tr>
<td>Parking Lot</td>
<td>no restrictions</td>
</tr>
</tbody>
</table>

*Must be same material as intersecting street if less than 300’ long.

5.09.3 Alternate paving materials are (see Section 5.01.3 for requirements regarding TOD and Urban Center developments):

5.09.3.01 Aggregate base courses (ABC) plus AC or PCC

5.09.3.02 Chemically treated or stabilized subgrade plus ABC and AC or PCC

5.09.3.03 Other material as approved by the City Engineer

5.10 Pavement Design Procedure

5.10.1 Flexible Pavement

5.10.1.01 Determine the street classification, zoning, and ESAL.
SECTION 7.00 CONSTRUCTION REQUIREMENTS

7.01 Scope

This section specifies the requirements for permits, licenses, and construction observation required for public improvement construction work and designated private construction work. Requirements stated in this section shall be supplemented by, and be in compliance with, any additional requirements or conditions required by City Codes, specifications, or administrative requirements.

City Offices
Aurora Municipal Center
15151 East Alameda Parkway.
Aurora, Colorado 80012

<table>
<thead>
<tr>
<th>City Contacts</th>
<th>Room</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building – Permits, Licenses and Certificates</td>
<td>2400</td>
<td>303-739-7420</td>
</tr>
<tr>
<td>Cashier's Office</td>
<td>1300</td>
<td>303-739-7064</td>
</tr>
<tr>
<td>Contractor Business Licenses</td>
<td>1100</td>
<td>303-739-7057</td>
</tr>
<tr>
<td>Contractor License</td>
<td>2400</td>
<td>303-739-7420</td>
</tr>
<tr>
<td>Dry Utility Inspections - Utility Company Permits</td>
<td>2400</td>
<td>303-739-7420</td>
</tr>
<tr>
<td>Public Improvements Permits, Fees and Inspections</td>
<td>2400</td>
<td>303-739-7420</td>
</tr>
<tr>
<td>Life Safety Inspection</td>
<td>2400</td>
<td>303-739-7420</td>
</tr>
<tr>
<td>Traffic Services</td>
<td>3200</td>
<td>303-739-7300</td>
</tr>
<tr>
<td>Water and Sewers - Extension Agreements</td>
<td>3600</td>
<td>303-739-7375</td>
</tr>
</tbody>
</table>

13636 East Ellsworth Ave., Aurora, Colorado 80012

<table>
<thead>
<tr>
<th>City Contacts</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td>303-326-8015</td>
</tr>
</tbody>
</table>
7.02 Licenses

7.02.1 Any company, contractor, or firm engaging in construction work of public improvements shall have a contractor's right-of-way license.

Licenses and licenses for public utility companies shall be required unless otherwise indicated in their franchise agreement. Utility company contractors shall comply with the applicable licensing and bonding requirements. Contractors Licenses shall be obtained from the Building Division.

7.02.2 Public improvement construction work shall be supervised by an individual who has a Supervisor Certificate which is applicable to the type of work being performed. Supervisor Certificates shall be obtained from the Building Division.

7.02.3 Contractors engaging in the maintenance or construction of private water and sewer lines shall have either a Class D5 Excavators License (Drain Layers and Caisson Drillers License) or a Plumbers License. Such licenses are valid only for work on private property and can be obtained from the Building Division.

7.02.4 A Contractor Business License is required and shall be obtained from the Business Licensing Division on the first floor of the Aurora Municipal Center.

7.03 Permits

7.03.1 Permits are required for the following.

- Any public improvement construction or any other work in the public right of way;

- The construction or repair of any private utilities, including storm drainage, sanitary sewer, water service lines, fire suppression lines, and dry utilities located within public right-of-way.

7.03.2 Permits shall be obtained before any work is authorized or allowed. Permits will be issued only to a contractor actually performing the work and licensed and bonded for the type of work. For City contracts, permits may be issued to a general contractor
only when such contractor and his subcontractors are in compliance with licensing and bonding requirements.

7.03.3 Permits are issued only after:

- the Public Works Engineering Division has approved the plans for the specific improvements to be constructed and
- all applicable permit fees have been paid.

Permits for public streets are issued after pavement design reports are submitted to and approved by the Public Works Engineering Division. Additionally, paving permits require prior acceptance or approval of any newly-constructed utilities which are under the proposed paving. This acceptance or approval requires the submittal and approval of the applicable utility compaction test reports. Compaction test reports shall be submitted to the City Materials Testing Laboratory for review and acceptance.

Permits for private driveways are required.

7.03.4 A complete set of approved drawings, specifications, and a valid permit shall be on the job site and available to the construction observer at all times.

7.04 Work Hours

7.04.1 Work between sundown and sunrise may be authorized by the Project Manager if adequate lighting is available and noise will not disturb nearby residents or businesses. See Section 94-107 of City Code.

7.04.2 When Public Improvement Observers or other City personnel are required to work overtime or on legal holidays (New Year's Day, Martin Luther King, Jr. Day, Presidents’ Day, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day, the day after Thanksgiving, and Christmas Day), it shall be at the Contractor's expense. Public Improvement Observers normally work an eight-hour day from 7:30 a.m. to 4:00 p.m. Monday through Friday. Other days or hours will be considered overtime and will be at the Contractor's expense. A minimum charge of four hours will be charged for any overtime work requested and performed on weekends and legal holidays. The Contractor's payment for all overtime work shall be made by check to the City of Aurora or paid online.
7.05  **Authority of the Project Manager**

The Project Manager is designated by the City Manager to exercise all authority on behalf of the City to ascertain that all construction of facilities is equal to or better than the minimum construction requirements set forth in the project specifications. The Project Manager shall be represented by a Public Improvement Observer who will observe work performed under a permit issued for construction, including all materials to be incorporated in the work, excavation, bedding, backfill, and all construction methods and practices. The Project Manager shall have the sole authority to issue, in writing, deviations from the provisions of the project specifications or changes to previously-approved drawings.

7.06  **Authority of the Public Improvement Observer**

Public Improvement Observers are assigned by the Project Manager to assist the Contractor in complying with the approved project specifications. Observers have the authority to reject inferior materials or defective workmanship and to suspend work not in accordance with the City "Roadway Design and Construction Specifications" until such time as corrections are made and approved. The Public Improvement Observers are not authorized to alter any provisions or to issue instructions contrary to the project specifications, or to make any changes to approved drawings.

7.07  **Construction Observations**

7.07.1  The Contractor shall obtain the Observer's approval of any material before placement and before beginning any work.

7.07.2  The Contractor shall call for observation giving 24-hours minimum notice. Observation may be requested from the Public Improvements Permits Office at 303-739-7420. For utility company observation, please call Public Works Department at 303-739-7420.

7.07.3  In the event any of the work or material fails to meet any of the requirements of the specifications, written notice of the rejection shall be given to the Contractor, and work shall be halted until corrective action is taken.

7.07.4  Periodic construction observation is only an aid to the Contractor and in no way reflects any responsibility on the part of the City for quality or quantity control, and in no way implies acceptance of the work, or any part thereof, by the City.

7.08  **Defective Materials and Work**

Whenever materials and/or work are found to be defective, the Contractor, at his expense, shall promptly remove such defective materials and construction from the job site and replace all
defective portions to the satisfaction of the Project Manager. Work performed or covered without observation is subject to rejection. In the event the Contractor fails to remove the defective items from a City project job site within ten days of written notice, the Project Manager may arrange for such removal at the expense of the Contractor.

7.09  **Protests**
If the Contractor considers any work demanded of him by the Observer to be outside the requirements of the approved specifications, he will immediately ask for a written decision or instruction and shall proceed to perform the work to conform with the Observer's ruling. If the Contractor considers such instructions unsatisfactory, he will, within 24 hours after their receipt, file a written protest with the Project Manager for a City project and the Public Improvement Inspections Supervisor for private projects stating his objections and the reasons therefore. Unless protests or objections are made in the manner specified and within the time limits stated herein, the Contractor hereby waives all grounds for protests.

7.10  **Inspection Facilities**
The Contractor shall furnish all reasonable facilities and shall assist the Observer as necessary for the proper inspection of materials to be used and workmanship involved in the construction.

7.11  **Initial Acceptance**
When the final clean-up has been performed, the Contractor will notify the Observer all work has been completed and schedule an inspection. The observer will perform all necessary inspections and notify the Contractor of any noted defects. Until the NOTICE OF INITIAL ACCEPTANCE is issued, the Project Manager may direct the newly-constructed public improvements be barricaded to prevent public use of the improvements.

The NOTICE OF INITIAL ACCEPTANCE OR SUBSTANTIAL COMPLETENESS begins the warranty period and will be issued when the following items are completed.

7.11.1 All major work elements have been accepted by the Observer.

7.11.2 For City of Aurora capital or maintenance projects a "Release and Indemnification" statement has been delivered to the Project Manager.

7.11.3 Compaction and Materials Testing Reports, in compliance with the applicable specifications and the requirements of Section 32.00, MATERIALS TESTING, have been delivered to and approved by the City's Materials Testing Laboratory.
7.12 Warranty Period

The warranty period is for one year from the date of initial acceptance or substantial completion, unless otherwise specified or mutually agreed upon in writing.

7.12.1 A final inspection will be performed by Public Improvements Inspections on, or about, the expiration of the one-year warranty period. The Public Improvements Inspection Division of the Public Works Department will schedule a final inspection of the warranty work with the contractor.

7.12.2 The Public Improvements Inspection Division shall inform the contractor of any necessary repairs in writing. The contractor shall schedule an onsite meeting with the Public Improvements Inspector to discuss the required warranty repairs 24 hours prior to beginning the warranty repairs. After the completion of the repairs and a final inspection by the Public Improvements Inspector a written notice shall be issued to the contractor the completed work/project is acceptable to the City. No work/project shall be considered accepted by the City until all necessary repairs are complete and a letter of final acceptance has been issued.

7.12.3 Warranty repairs shall be completed within 30 days of the date of written notification of required repairs, dependent on weather and work/project complexity.
SECTION 23.00 STREET CONSTRUCTION AGGREGATES

23.01 Scope

This specification specifies materials and methods to be used for the construction of aggregate bases and subbases for streets, parking lots, walks, drainage ways, and other work requiring the use of aggregates. The work covered shall include general requirements applicable to aggregate base course. All workmanship and materials shall be in accordance with the specifications, and in conformity with the lines, grades, depths, quantity requirements, and the typical cross section shown on the plans, or as directed by the Project Manager. See Section 20.06.10 Subgrade, Base Course, and Pavement Surface Grade Checks.

23.02 Materials

Aggregates shall be crushed stone, crushed slag, crushed gravel, or natural gravel which conforms to the requirements of AASHTO M 147 as herein supplemented. Aggregate shall meet the grading requirements specified below. The type used shall be specified on the plans or special provisions. The maximum liquid limit (LL) shall be as shown in Table 23.02.1.

Table 23.02.1
CLASSIFICATION TABLE FOR AGGREGATES

<table>
<thead>
<tr>
<th>Use</th>
<th>Subbase</th>
<th>Base</th>
<th>Base</th>
<th>As Specified</th>
<th>As Specified</th>
<th>Base</th>
</tr>
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<tbody>
<tr>
<td>Sieve</td>
<td>Percentage by Weight Passing Square Mesh Sieve</td>
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</tr>
<tr>
<td>6&quot;</td>
<td>100</td>
<td>--</td>
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<td>--</td>
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</tr>
<tr>
<td>2&quot;</td>
<td>95-100</td>
<td>--</td>
<td>--</td>
<td>100</td>
<td>100</td>
<td>--</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>--</td>
<td>--</td>
<td>100</td>
<td>--</td>
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</tr>
<tr>
<td>1&quot;</td>
<td>--</td>
<td>100</td>
<td>90-100</td>
<td>--</td>
<td>--</td>
<td>100</td>
</tr>
<tr>
<td>3/4&quot;</td>
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<td>--</td>
<td>60-90</td>
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<td>75-100</td>
<td>30-100</td>
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<td>No. 8</td>
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<td>--</td>
<td>5-25</td>
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<td>No. 10</td>
<td>--</td>
<td>25-50</td>
<td>20-50</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>No. 50</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>0-7</td>
<td></td>
</tr>
<tr>
<td>No. 40</td>
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<td>15-30</td>
<td>10-30</td>
<td>60 MAX.</td>
<td>60 MAX.</td>
<td>--</td>
</tr>
<tr>
<td>No. 200*</td>
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<td>3-15</td>
<td>3-12</td>
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<td>5-20</td>
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<td>35</td>
<td>25</td>
<td>25</td>
<td>35</td>
<td>35</td>
<td>--</td>
</tr>
</tbody>
</table>

* Percent passing No. 200 determined by Wash Test (ASTM C 117). Fraction passing No. 200 shall not be greater than 2/3 of the fraction passing No. 40.

** Must be used when edge drains are installed at the edge of streets, unless otherwise approved by the City Engineer.

*** Use of a lean Asphalt or Cementitious application may be advisable for binding the aggregate together.
For Type 2 and 2A aggregate base course, the plasticity index (PI) shall not exceed 15 when the aggregate is tested in accordance with AASHTO T 89 and T 90, respectively. The liquid limit of the Type 2 and 2A material shall not exceed 30. The R value, AASHTO T 96, is a minimum of 78 at 300 psi with less than 10 point difference between 100 psi and 300 psi exudation. Los Angeles abrasion shall not exceed 45%.

At least two weeks in advance of the beginning of placing any aggregates, the Contractor shall submit suitable samples of the proposed material to an approved Materials Testing Laboratory for tests to determine the compliance with the requirements of this specification. The results of all tests shall be submitted to the Project Manager for approval prior to the placement of any aggregate material. Tests shall be at the Contractor's expense.

Under certain conditions, the Project Manager may allow the substitution of Type 1 aggregate for Type 2 or Type 2A aggregate. The Project Manager will consider the substitution if the liquid limit of the Type 1 material does not exceed 30, the R Value, AASHTO T 96, is a minimum of 78, at least 300 psi with less than a 10 point difference between 100 psi and 300 psi exudation pressure. The depth is at least 2 times the maximum size of the coarse aggregate. If Type 1 material is used, it shall be overlaid with a minimum of 4” of Type 2 or Type 2A material.

### 23.03 Construction Requirements for Base Course Material

**23.03.1 Placing** The base course material shall be placed on the previously prepared subgrade at the locations and in the proper quantities to conform to the typical cross sections as shown on the plans and as directed by the Project Manager. The material shall be placed without segregation. Any segregated areas shall be removed and replaced with uniformly graded material at the Contractor's expense. Blue tops shall be used on all new construction.

The base material may be placed in lifts of up to 6”, providing that after compaction, uniform density is obtained throughout the entire depth of the lift. If the required depth exceeds 6", it shall be placed in two or more lifts of approximately equal thickness. If uniform density cannot be obtained by 6” lifts, the maximum lift shall not exceed 4" in final thickness.

**23.03.2 Compaction** Rolling will be continued until the base material has been compacted to not less than 95% of maximum density as determined by AASHTO T 180, Method D (Modified Proctor). Water shall be uniformly applied as necessary during compaction to obtain moisture content within 1% of optimum and to aid in
30.03.6 Enforcement of Strength Requirements  
Strength requirements shall be in accordance with ACI 214, Section 4.2. The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength, $f'c$, and no individual strength test result falls below the specified strength $f'c$ by more than 500 psi. Should the strength level be unsatisfactory, the Project Manager shall have the right to require changes in mix proportions to apply on the remainder of the work. In the event of failure of test specimens for any portion of the work, the Project Manager may require that portion of the structure be removed and replaced at the Contractor's expense.

30.04 Mixing Concrete  
All concrete shall be thoroughly mixed in a batch mixer of an approved type and capacity for a period of not less than two minutes after all the materials, including water, have been placed in the drum. During the period of mixing, the drum shall be operated at the speed specified by the manufacturer of the equipment. The entire contents of the mixer shall be discharged before recharge, and the mixer shall be cleaned frequently. The concrete shall be mixed only in such quantities as are required for immediate use. No retempering of concrete shall be permitted. Hand-mixed concrete shall not be permitted except by written approval of the Project Manager.

30.05 Ready-Mixed Concrete  
At the option of the Contractor, ready-mixed concrete may be used in lieu of concrete mixed at the job. The use of ready-mix concrete in no way relieves the Contractor of sole responsibility for proportioning, mixing, delivering, or placing concrete as specified. Ready-mixed concrete shall conform to all the requirements of these specifications and AASHTO M 157. The Project Manager shall have free access to the mixing plant at all times. Ready-mixed concrete shall be continuously mixed or agitated from the time the water is added until the time of use. The concrete shall be completely discharged from the truck mixer or truck agitator as soon as possible, but shall be rejected when the concrete temperature is greater than 90 °F. Retempered concrete shall not be allowed. The organization supplying ready-mixed concrete shall have sufficient plant and transportation facilities to assure continuous delivery of concrete at the required rate. When requested by the Project Manager, the Contractor shall collect delivery or batch tickets from the ready-mix driver for all concrete used on the project and turn them over to the Project Manager. Batch tickets shall provide the following information: weight and type of cement, weights of fine and coarse aggregates, weight (or gallons) of water, including surface water on fine and coarse aggregates, quantity (cu. yds.) of batch, times of batching and discharging of the concrete, name of batch plant, name of Contractor, type, name and amount of admixture, date, mix identification, and truck number.
30.06 Placing Concrete

30.06.1 Placing  Before depositing concrete, debris shall be removed from the space to be occupied by the concrete, and the forms, including any existing concrete surfaces, shall be thoroughly wetted. Concrete shall not be placed until all forms and reinforcing steel have been observed by the Project Manager. Concrete shall be handled from the mixer to the place of final deposit as rapidly as possible by methods which prevent separation or loss of ingredients. To avoid rehandling, it shall be deposited in the forms as nearly as practical in its final position. It shall be deposited in continuous layers, the thickness of which generally shall not exceed 12 inches. Concrete shall be placed in a manner that will avoid segregation and shall not be dropped freely more than five feet. If segregation occurs, the Project Manager may require the concrete to be removed and replaced at the Contractor's expense. Concrete shall be placed in one continuous operation, except where keyed construction joints are shown on the plans or as approved by the Project Manager. Delays in excess of 45 minutes may require removal and replacement of that pour, as determined by the Project Manager. Concrete will not be placed until the subgrade compaction requirements have been met.

30.06.2 Vibrating  Concrete shall be thoroughly consolidated. All machine placed concrete shall be consolidated by internal vibration using mechanical vibrating equipment. Concrete in floor slabs, sidewalks, or curb and gutter placed against a form, shall be vibrated. Care shall be taken in vibrating concrete to vibrate only enough to bring a continuous film of mortar to the surface. Vibration shall stop before any segregation of the concrete occurs. Mechanical vibrators shall be an approved type as specified in ACI 309, Chapter 3. Vibrators shall not be used to move or spread the concrete. Any evidence of lack of consolidation or over consolidation shall be regarded as sufficient reason for requiring the removal of the section involved and its replacement with new concrete at the Contractor's expense. The Contractor shall be responsible for any defects in the quality and appearance of completed work.

The rate of vibration shall be not less than 5,000 vibrations per minute for surface vibrators and 9,000 vibrations per minute for internal vibrators. The amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete more than 1 foot from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.
SECTION 32.00 MATERIALS TESTING

32.01 Scope
The requirements of this section shall apply to all testing agencies and required materials testing services for soils, asphalt, and concrete.

32.02 Responsibilities of the Testing Agency

32.02.1 General All materials and operations shall be tested in accordance with these specifications and as directed by the Project Manager. Agencies testing soil and rock shall meet the requirements of ASTM D 3740. Agencies testing asphalt or concrete shall meet the requirements of ASTM D 3666 or D 1077, respectively. All testing agencies shall meet the requirements of ASTM E 329.

A trained and properly qualified representative of the testing agency shall observe, sample, and test the materials and work on the project, as required by these specifications and as directed by the Project Manager. If any materials furnished or the work performed by the Contractor fails to fulfill the specification requirements, such deficiencies shall be reported to the Project Manager and the Contractor, immediately. Preliminary written field reports of all tests and observation results shall be given to the Contractor or Developer immediately after they are performed. Field reports shall be made available to the Project Manager by the testing agency. Final reports shall be forwarded to the Project Manager no later than one week following the testing. Results of all tests taken, including failing tests, shall be reported.

Reports shall bear the seal and signature of a Professional Engineer licensed in the State of Colorado and competent in the required testing practice. All test reports shall show the horizontal location where the test was performed or where the work or batch represented by the test was placed. Test reports shall include all information specified in the AASHTO or ASTM test procedure used. Improperly completed reports will not be accepted. A Certificate of Occupancy, or initial acceptance, will not be issued until all final reports indicating compliance with these specifications are reviewed and placed on file by the City. The testing agency personnel are not authorized to stop work, to revoke, alter, relax, enlarge, or release any requirements of the specifications, or to approve, accept, or reject any portion of the work.
32.03 Testing

32.03.1 General All testing methods and procedures performed by the testing agency personnel shall be in accordance with the applicable AASHTO and ASTM requirements and procedures (see Tables 32.03.1 – 32.03.6). Test reports shall include the AASHTO and ASTM test designations of all tests taken. All testing and retesting services shall be at the expense of the Contractor or Developer, except on City contracts. Initial testing on City contracts shall be at the City’s expense; all retesting due to failing tests shall be at the Contractor’s expense.

When changes in materials or proportions are encountered during construction, or when the work fails to pass tests or fails to meet the specifications, additional tests shall be taken as directed by the Project Manager. Failure of the Contractor or Developer to furnish satisfactory test data shall be sufficient cause for rejection of the work in question.

32.03.2 Soil Testing

32.03.2.01 All testing shall be according to AASHTO or ASTM as designated in Table 32.03.1 and Table 32.03.2.

32.03.2.02 When density and moisture content are determined by a nuclear device, a sand cone density test shall be taken daily or at the discretion of the Project Manager or the City. If the results of the sand cone tests do not agree with the nuclear tests, use of that nuclear device shall be immediately discontinued until the cause of the disagreement is determined and corrected.

32.03.2.03 A moisture-density determination shall be taken for each soil type encountered. For A-6 and A-7 soils, AASHTO T 99 shall apply. All other soils use AASHTO T 180.
LOCAL STREET TYPE 1

LOCAL STREET TYPE 2

LOCAL STREET TYPE 2 ALTERNATE
RESIDENTIAL CUL-DE-SAC LESS THAN 250' IN LENGTH ONLY

*COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO THE BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL S1.19.

City of Aurora, Colorado

LOCAL ROADWAY CLASSIFICATIONS AND TYPICAL CROSS SECTIONS S1.1
LOCAL TYPE 3

LOW DENSITY RURAL

NOTE:
AT CUL-DE-SACS WITH 5 LOTS OR LESS, DRAINAGE DITCHES MAY BE REDUCED TO FIT TYPICAL SECTION INTO A 50' R.O.W.

* Composite pavement section. Extend base course to bottom back of curb. Edge trench drain shall be required to drain base course. See Detail S1.19.
STANDARD

80' ROW

15'  50'  15'

6'  WALK  LANDSCAPE  BIKE LANE  7'  TRAVEL LANE  11'  TURN LANE  14'  TRAVEL LANE  11'  TRAVEL LANE  7'  BIKE LANE  6'  LANDSCAPE  WALK  0.5'

4:1

2%  2%  2%  2%  2%  2%  2%  2%

VERTICAL CURB & GUTTER
SEE STD. S7.1

VERTICAL CURB & GUTTER
SEE STD. S7.1

THREE LANE COLLECTOR

80' ROW

15'  50'  15'

6'  WALK  LANDSCAPE  PARKING LANE  6'  TRAVEL LANE  6'  TRAVEL LANE  6'  PARKING LANE  8'  WALK  LANDSCAPE  6'  0.5'

4:1

2%  2%  2%  2%

VERTICAL CURB & GUTTER
SEE STD. S7.1

VERTICAL CURB & GUTTER
SEE STD. S7.1

TWO LANE COLLECTOR

66' ROW

15'  36'  15'

6'  WALK  LANDSCAPE  BIKE LANE  7'  TRAVEL LANE  11'  TRAVEL LANE  11'  TRAVEL LANE  7'  BIKE LANE  6'  LANDSCAPE  WALK  0.5'

4:1

2%  2%  2%  2%

VERTICAL CURB & GUTTER
SEE STD. S7.1

VERTICAL CURB & GUTTER
SEE STD. S7.1

ALTERNATIVE TWO LANE COLLECTOR

* Composite pavement section. Extend base course to bottom back of curb.
Edge trench drain shall be required to drain base course. See Detail S1.19.
FOUR LANE ARTERIAL: RAISED MEDIAN
MEDIAN TURN LANE WIDTH = 10'

FOUR LANE ARTERIAL: PAINTED MEDIAN
MEDIAN TURN LANE WIDTH = 10'

FOUR LANE ARTERIAL: SEPARATED BIKE LANE
MEDIAN TURN LANE WIDTH = 10'

*Composite pavement section. Extend base course to the bottom back of curb. Edge trench drain shall be required to drain base course. See Detail S1.19.
TYPICAL ALLEY CROSS SECTION
RESIDENTIAL: CONCRETE

* POLYPROPYLENE FIBERMESH 1-1/2 LBS. PER CU. YD. -3/4" LONG FIBERS IN PLACE OF WIRE MESH ON RESIDENTIAL ALLEYS ONLY.

TYPICAL ALLEY CROSS SECTION
COMMERCIAL OR INDUSTRIAL: CONCRETE

NOTES:
1. SEE S19.1 FOR JOINT SAWSING PATTERN.
2. ALL REINFORCEMENT STEEL SHALL BE IN SHEETS. LAP ALL JOINTS A MINIMUM OF 5".

City of Aurora, Colorado

ALLEY ROADWAY CLASSIFICATIONS AND TYPICAL CROSS SECTIONS

S1.6
SMITH RD.
PEORIA ST TO CHAMBERS RD**

SMITH RD.
CHAMBERS RD TO PICADILLY RD

SMITH RD.
EAST OF PICADILLY RD**

USE 4-LANE ARTERIAL: PAINTED MEDIAN STD EXCEPT NO WALK AND CURB AND GUTTER ON THE NORTHERLY SIDE OF THE STREET WHERE ADJACENT TO RAILROAD. SECTION WHOLLY CONTAINED IN THE 100' R.O.W. FROM UPPR. ADD 4' PAVED SHOULDER THEN GRADE 4:1 TO EXISTING GRADE.

* 14' ACCE/DECAL LANE MAY BE REQUIRED BASED ON TRAFFIC STUDY
** AT STREET INTERSECTIONS THE CROSS SECTION MAY BE MODIFIED TO ACCOMMODATE TRAFFIC OPERATIONS.
*** COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL S1.19.

City of Aurora, Colorado

SMITH ROAD TYPICAL CROSS SECTIONS

S1.7

1/27/2017
CITY ENGINEER DATE
SPECIAL ARTERIAL AT
AIRPORT BOULEVARD
ALAMEDA AVENUE TO 40TH AVENUE

*ALAMEDA AVENUE TO COLFAX AVENUE
34' - 20' - 34'

COLFAX AVENUE TO SMITH ROAD
36' - 16' - 36'

SMITH ROAD TO 32ND AVENUE
34' - 20' - 34'

32ND AVENUE TO I-70
36' - 16' - 36'

I-70 TO 40TH AVENUE
36' - VARIES - 36'

1. CONTACT PARKS, RECREATION & OPEN SPACE DEPARTMENT FOR LANDSCAPE/HARDSCAPE MEDIAN REQ'TS.

** Composite pavement section. Extend base course to bottom back of curb. Edge trench drain shall be required to drain base course. See Detail S1.19.

City of Aurora, Colorado

AIRPORT BOULEVARD
TYPICAL CROSS SECTIONS

S1.8

11/27/2017
CITY ENGINEER DATE
*MAY BE REDUCED OR ELIMINATED WHERE PRIVATE IMPROVEMENTS ENCROACH WITHIN THIS ZONE. BUILDING FOUNDATIONS SHALL NOT EXTEND INTO PUBLIC RIGHT-OF-WAY.

**GENERALLY, THE LANDSCAPED TREE LAWN SHALL HAVE A TRANSVERSE SLOPE OF 2%. HOWEVER, ON A CASE BY CASE BASIS THIS TRANSVERSE SLOPE MAY BE INCREASED TO A MAXIMUM OF 4:1 WITH PRIOR APPROVAL FROM THE CITY ENGINEER.

*** COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL S1.19.

NOTE:
25' CLEAR MINIMUM PAVED SURFACE SHALL BE PROVIDED EVERY 150' OF ROAD LENGTH FOR EMERGENCY VEHICLE SETUP, SEE STD. S23.1

City of Aurora, Colorado

URBAN CENTER & TOD TRANSITION ZONE ROADWAY CLASSIFICATIONS AND TYPICAL CROSS SECTIONS

S1.9
STANDARD

LOCAL URBAN - 2 Lanes

* MAY BE REDUCED OR ELIMINATED WHERE PRIVATE IMPROVEMENTS ENCROACH WITHIN THIS ZONE. BUILDING FOUNDATIONS SHALL NOT EXTEND INTO PUBLIC RIGHT-OF-WAY.

** COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL S1.19.

*** HARDSCAPE DESIGN MAY INCLUDE LANDSCAPING AND STREET FURNITURE BUT MUST INCLUDE AN ACCESSIBLE WAY OF NOT LESS THAN 6 FEET.

NOTE:
25' CLEAR MINIMUM PAVED SURFACE SHALL BE PROVIDED EVERY 150' OF ROAD LENGTH FOR EMERGENCY VEHICLE SETUP, SEE STD. S23.1
ONE WAY COUPLETS - 2 LANES

* BIKE LANE SHALL BE ON RIGHT HAND SIDE OF TRAFFIC FLOW.

** MAY BE REDUCED OR ELIMINATED WHERE PRIVATE IMPROVEMENTS ENCROACH WITHIN THIS ZONE. BUILDING FOUNDATIONS SHALL NOT EXTEND INTO PUBLIC RIGHT-OF-WAY.

*** COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL S1.19.

**** HARDSCAPE DESIGN MAY INCLUDE LANDSCAPING AND STREET FURNITURE BUT MUST INCLUDE AN ACCESSIBLE WAY OF NOT LESS THAN 6 FEET.
**STANDARD**

**MAIN STREET - PARALLEL PARKING - 2 LANES**

*May be reduced or eliminated where private improvements encroach within this zone. Building foundations shall not extend into public right-of-way.*

** Composite pavement section. Extend base course to bottom back of curb. Edge trench drain shall be required to drain base course. See details S1.19.**

*** Hardscape design may include landscaping and street furniture but must include an accessible way of not less than 6 feet.*

City of Aurora, Colorado

URBAN CENTER & TOD TRANSITION OR CORE ZONE ROADWAY CLASSIFICATIONS AND TYPICAL CROSS SECTIONS

S1.12

City Engineer 11/27/2017
**MAIN STREET - ANGLED PARKING - 2 LANES**

* MAY BE REDUCED OR ELIMINATED WHERE PRIVATE IMPROVEMENTS ENCROACH WITHIN THIS ZONE. BUILDING FOUNDATIONS SHALL NOT EXTEND INTO PUBLIC RIGHT-OF-WAY.

** COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL 51.19.

*** HARDSCAPE DESIGN MAY INCLUDE LANDSCAPING AND STREET FURNITURE BUT MUST INCLUDE AN ACCESSIBLE WAY OF NOT LESS THAN 6 FEET.
RESIDENTIAL PARKWAY - 2 LANES

* MAY BE REDUCED OR ELIMINATED WHERE PRIVATE IMPROVEMENTS ENCROACH WITHIN THIS ZONE. BUILDING FOUNDATIONS SHALL NOT EXTEND INTO PUBLIC RIGHT-OF-WAY.

** GENERALLY, THE LANDSCAPED TREE LAWN SHALL HAVE A TRANSVERSE SLOPE OF 2%%. HOWEVER, ON A CASE BY CASE BASIS THIS TRANSVERSE SLOPE MAY BE INCREASED TO A MAXIMUM OF 4:1 WITH PRIOR APPROVAL FROM THE CITY ENGINEER.

*** COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL 51.19.

NOTE:
25' CLEAR MINIMUM PAVED SURFACE SHALL BE PROVIDED EVERY 150' OF ROAD LENGTH, SEE STD. $23.1.
MAIN STREET - MEDIAN - 2 LANES

MEDIAN TURN LANE WIDTH = 10.0'

* MAY BE REDUCED OR ELIMINATED WHERE PRIVATE IMPROVEMENTS ENCROACH WITHIN THIS ZONE. BUILDING FOUNDATIONS SHALL NOT EXTEND INTO PUBLIC RIGHT-OF-WAY.

** ALTERNATIVE SECTION: PAINTED MEDIAN IN LIEU OF RAISED MEDIAN. MEDIAN WIDTH SHALL BE 14 FEET AND THE RIGHT-OF-WAY WIDTH SHALL BE 96 FEET.

*** COMPOSITE PAVEMENT SECTION. EXTEND BASE COURSE TO BOTTOM BACK OF CURB. EDGE TRENCH DRAIN SHALL BE REQUIRED TO DRAIN BASE COURSE. SEE DETAIL S1.19.

**** HARDSCAPE DESIGN MAY INCLUDE LANDSCAPING AND STREET FURNITURE BUT MUST INCLUDE AN ACCESSIBLE WAY OF NOT LESS THAN 6 FEET.
**MAIN STREET - MEDIAN - 4 LANES**

**Median Turn Lane Width = 10.0'**

*May be reduced or eliminated where private improvements encroach within this zone. Building foundations shall not extend into public right-of-way.*

**Composite pavement section. Extend base course to bottom back of curb. Edge trench drain shall be required to drain base course. See detail S.1.19.*

***Hardscape design may include landscaping and street furniture but must include an accessible way of not less than 6 feet.*
**BOULEVARD - 6 LANES**
MEDIAN TURN LANE WIDTH = 11.0'

*May be reduced or eliminated where private improvements encroach within this zone. Building foundations shall not extend into public right-of-way.*

**Generally, the landscaped tree lawn shall have a transverse slope of 2%. However, on a case by case basis this transverse slope may be increased to a maximum of 4:1 with prior approval from the city engineer.**

*** Composite pavement section. Extend base course to bottom back of curb. Edge trench drain shall be required to drain base course. See detail S1.19.
NOTES:
1. FOR RETROFITTING EXISTING ROADWAYS, DEPTH OF DRAIN PIPE MAY VARY BASED ON EXISTING STREET STRUCTURE AND/OR SOIL CONDITIONS.
2. 6" SOLID WALL PVC SDR 35 PIPE SHALL BE USED FOR ALL CLEANOUTS AND LATERAL CONNECTIONS UNDER THE ROADWAY.
3. CLEANOUTS SHALL BE INSTALLED EVERY 250' OR AT CHANGES IN PIPE SIZE OR DIRECTION, AND SHALL BE PROTECTED WITH A CAST IRON CLEAN OUT BOX SUCH AS A CASTINGS INC CO 8030 C.I.
4. EDGE DRAINS SHALL BE INSTALLED 100 FEET EITHER SIDE OF SUMP INLETS IN STREETS OR UP STREAM FROM ONGRADE TYPE 'R' INLETS, UNLESS PAVEMENT DESIGN REPORT RECOMMENDS ADDITIONAL LENGTH.

FILTER MATERIAL GRADATION

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Mass Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0 mm (3/4&quot;)</td>
<td>100</td>
</tr>
<tr>
<td>4.75 mm (No. 4)</td>
<td>60 - 100</td>
</tr>
<tr>
<td>300 μm (No. 50)</td>
<td>10 - 30</td>
</tr>
<tr>
<td>150 μm (No. 100)</td>
<td>0 - 10</td>
</tr>
<tr>
<td>75 μm (No. 200)</td>
<td>0 - 3</td>
</tr>
</tbody>
</table>

DEPTH SHALL BE TO THE BOTTOM OF ANY OVER-EXCAVATION OR 1' BEYOND BASE COURSE MIN. DEPTH IS 3'.

GRAVEL WRAPPED WITH NON-WOVEN FILTER FABRIC, AASHTO M288 CLASS 3, MIRAFI 140N OR EQUIVALENT.

NOTES:
1. 6" PERFORATED PVC SDR-35 PIPE
2. 3/8" Ø PERFORATIONS DOWN @ 5º O.C. AND TWO ROWS @ 30 DEGREES FROM VERTICAL.
3. PIPE SHALL BE SLOPED TO DRAIN, DRAIN SLOPE TO MATCH STREET GRADE, OUTFALL TO STORM SEWER SYSTEM.

City of Aurora, Colorado

11/27/2017

CITY ENGINEER

ROADWAY EDGE DRAIN

S1.19
NOTES

1. THREE NO. 4 REBARS SHALL BE USED IN ALL CURB RETURNS WITH 25' OR LARGER RADI. THE REBAR SHALL BE USED FROM BEGINNING TO END OF THE CURB RETURN.

2. AT EACH LOW POINT OF EACH MEDIAN CURB, A DRAINAGE SLOT SHALL BE INSTALLED - SEE DRAINAGE SLOT DETAIL ON S2.4.

3. SLIP FORM TEMPLATE FOR VERTICAL CURB AND GUTTER SHALL NOT BE ALLOWED FOR POURING STANDARD MEDIAN CURB.

4. WHERE CONCRETE PAVEMENT IS USED, PLANS SHOULD SHOW MONOLITHIC CURBS.
STANDARD MEDIAN CURB

MEDIAN CATCH CURB

TRUCK APRON MEDIAN SPILL CURB

NOTES
1. SEE S2.1-S2.3 FOR LOCATION OF REQUIRED SPLASH BLOCKS. CONTRACTION JOINTS IN SPLASH BLOCKS SHALL MATCH MEDIAN CURB JOINTING.
2. SEE S2.4 FOR DRAINAGE SLOTS AND MONOLITHIC NOSE.
3. SEE S7.1 FOR LOCATION OF DRAINAGE SLOTS.
4. WHERE CONCRETE PAVEMENT IS USED, PLANS SHOULD SHOW MONOLITHIC CURBS.
5'5' TO 10' SIDEWALK

SLOPE 2% FROM BACK OF WALK TO FACE OF WALK

SIDEWALK

NOTE: WHEN WALK IS ADJACENT TO A CURB CUT, MATCH THICKNESS AND REINFORCING WITH CURB CUT. (SEE S7.4)

1/8" R (TYP.)

1/8"

1-1/2" MIN

* 1.5" IF TEMPLATES ARE NOT USED

CONTRACTION OR
WEAKENED PLANE

JOINT

1/2" PREFORMED JOINT MATERIAL.
(SEE NOTE)

EXPANSION JOINT

NOTE: IN GUTTER FLOWLINES RECESS EXPANSION JOINT 1/2" AND SEAL WITH FLEXIBLE SEALANT.

SEE STD. S19.1 THRU S19.4 FOR TYP. CONC. PAVEMENT JOINT DETAILS
NOTES:
1. BACK OF CURB CUT EXTENDS TO BACK OF WALK. IF NO WALK IS PRESENT, EXTEND BACK OF CURB CUT TO BACK OF FUTURE WALK (SEE S1.1 TO S1.5).
2. END OF CURB CUT SHALL NOT BE CONSTRUCTED WITHIN 5' OF A PROPERTY LINE OR 20' OF AN INTERSECTING STREET R.O.W. UNLESS APPROVED BY THE CITY ENGINEER.
3. CITY ENGINEER SHALL APPROVE LOCATION OF CURB CUT BEFORE CONSTRUCTION.
4. REBAR SHALL BE CONTINUOUS IN CURB CUT AND ADJACENT WALK EXCLUDING SINGLE FAMILY CURB CUTS.
5. WALK ACROSS DRIVEWAY SHALL BE SAME THICKNESS WITH SAME REINFORCEMENT AS CURB CUT.

CROSS-SECTION THROUGH CURB CUT

* APT. BLDGS. WITH LESS THAN 5 UNITS MAY USE 6" THICKNESS.

<table>
<thead>
<tr>
<th>TYPE OF CUT</th>
<th>WIDTH OF DRIVEWAY</th>
<th>TOTAL WIDTH</th>
<th>MINIMUM THICKNESS</th>
<th>GRADE 60 REBAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE FAMILY</td>
<td>12'-16'</td>
<td>22'-26'</td>
<td>6&quot;</td>
<td>#4 @ 18&quot;, E.W.</td>
</tr>
<tr>
<td>MULTI FAMILY*</td>
<td>16'-25'</td>
<td>26'-35'</td>
<td>10&quot;</td>
<td>#4 @ 18&quot;, E.W.</td>
</tr>
<tr>
<td>COMMERCIAL</td>
<td>30'-40'</td>
<td>40'-50'</td>
<td>10&quot;</td>
<td>#4 @ 12&quot;, E.W.</td>
</tr>
</tbody>
</table>
STANDARD

NOTES:
1. BACK OF CURB CUT EXTENDS TO BACK OF WALK. IF NO WALK IS PRESENT, EXTEND BACK OF CURB CUT TO BACK OF FUTURE WALK (SEE S1.1 TO S1.5).
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3. CITY ENGINEER SHALL APPROVE LOCATION OF CURB CUT BEFORE CONSTRUCTION.
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<td>&quot;10&quot;</td>
<td>#4 @ 18&quot;, E.W.</td>
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<td>COMMERCIAL</td>
<td>30'-40'</td>
<td>40'-50'</td>
<td>10&quot;</td>
<td>#4 @ 12&quot;, E.W.</td>
</tr>
</tbody>
</table>

*APARTMENT BUILDINGS WITH LESS THAN 5 UNITS MAY USE 6" THICKNESS WITH NO REINFORCING.

City of Aurora, Colorado

ARTERIAL ROADWAY CURB, GUTTER AND WALK CURB CUTS

5 of 7

S7.5

City Engineer

DATE: 11/27/2017
EXPANSION JOINT AT 50' O.C.
SEE DETAIL BELOW

PLAN VIEW

CONTRACTION JOINT (TYP.)

SECTION A-A

*5" IN AREAS OUTSIDE OF FIRELANES AND TRASH TRUCK ACCESS ROUTES.

DETAIL

EXPANSION JOINT

PRIVATE LONGITUDINAL CONCRETE PAN

City of Aurora, Colorado

S7.6
Table 1 - Driveway Widths

<table>
<thead>
<tr>
<th>Driveway Type</th>
<th>Width (W)</th>
<th>Min. Thickness</th>
<th>Rebar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family</td>
<td>12'-16'</td>
<td>6''</td>
<td>-----</td>
</tr>
<tr>
<td>Multi-Family</td>
<td>16'-25'</td>
<td>10''</td>
<td>#4 @ 18'' E.W.</td>
</tr>
<tr>
<td>Commercial</td>
<td>30'-40'</td>
<td>10''</td>
<td>#4 @ 12'' E.W.</td>
</tr>
</tbody>
</table>

*Apartment buildings w/ less than 5 units may use 6'' thick concrete w/ no reinforcing.

NOTES:
1. BACK OF CURB CUT EXTENDS TO BACK OF WALK. (SEE STANDARD DETAIL S1.1 TO S1.5).
2. EDGE OF CURB CUT SHALL NOT BE CONSTRUCTED WITHIN 5' OF A PROPERTY LINE OR 20' OF AN INTERSECTING STREET R.O.W., UNLESS APPROVED BY THE CITY ENGINEER OR DESIGNEE.
3. CITY ENGINEER SHALL APPROVE LOCATION OF NEW CURB CUT BEFORE CONSTRUCTION.
4. REBAR SHALL BE CONTINUOUS IN CURB CUT AND ADJACENT WALK EXCLUDING SINGLE FAMILY CURB CUTS.
5. WALK ACROSS DRIVEWAY SHALL BE SAME THICKNESS WITH SAME REINFORCEMENT AS CURB CUT.
6. DRIVEWAY SHALL BE PAVED A MINIMUM OF 3' BEHIND SIDEWALK.
7. SIDEWALK AND/OR CONSTRUCTION EASEMENT MAY BE REQUIRED.
8. CONTRACTOR SHALL GRADE DRIVEWAY AT 14% MAX BEHIND SIDEWALK UNTIL ELEVATION EQUALS TOP OF CURB. IF 6'' VERTICAL CURB THIS ELEVATION EQUALS FLOWLINE PLUS 6''. IF 4'' MOUNTABLE CURB THIS ELEVATION EQUALS FLOWLINE PLUS 4''.
9. DRIVEWAYS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 4.07.9 OF THE COA ROADWAY DESIGN & TECHNICAL CRITERIA MANUAL.
10. 5' TRANSITION PANEL SHALL BE CONSTRUCTED AT EDGE OF CURB CUT. THIS WILL TRANSITION SIDEWALK WIDTH AND GRADES BACK TO EXISTING SIDEWALK WIDTHS AND CROSS SLOPES.

Cross Section A-A
See Table 1
1-1/2 to 2'' Lip
1'' Radius
2% max.

Cross Section B-B
6'' Curb & Gutter
2% max.
6'' Concrete Sidewalk

Cross Section C-C
4'' Mountable Curb & Gutter
2% max.
6'' Concrete Sidewalk

Note: Both vertical and mountable curb and gutter shown for graphical representation. Use appropriate treatment per approved plans or as existing conditions require.

City of Aurora, Colorado
CURB CUT
ATTACHED SIDEWALK (RETROFIT ONLY)

S7.7

11/27/2017
DATE
NOTES:
1. IF COLORED PAVING IS NOT USED, THEN CONTINENTAL STRIPING MUST BE USED, SEE TE-12
2. STRIPING AND STOP SIGN LOCATION SHALL MEET CURRENT MUTCD STANDARDS.
3. PLACE SIGN POST WITHIN 4"Øx12", SCH. 40, PVC PIPE WITHIN SIDEWALK. PLACE PIPE FLUSH WITH TOP OF CONCRETE WALK.
Provide landing area with a slope no greater than 2% in any direction and with dimensions not less than 3' x ramp width.

*DEPENDING ON STREET GRADE
THIS DIMENSION MAY NEED TO INCREASE

SECTION A-A

NOTE:
REFER TO CITY OF AURORA DETAIL S9.4 FOR TRUNCATED DOME DETAILS AND SECTION INFORMATION